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Summary of 3.4.4

Number of books and chapters in edited volumes / books published per teacher during the year

Year	2021	2022
Number	107	103
Total	210	
No. of Teachers	312	325
Avg. No. of Teachers	318.4	
No. of books and chapters in edited volumes per Teachers	0.66	

Supporting Documents

1. Published Books
2. Papers in book chapters
3. Papers in Conference Proceding

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Synthesis, characterization and tribological study of zinc oxide nanoparticles

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ABSTRACT

This work presents and discusses the study of ZnO (zinc oxide) as nanoparticles and its idiosyncratic characteristics. Zinc oxide nanoparticles were synthesized employing a facile Sol- gel method, with zinc chloride, zinc nitrate and sodium hydroxide at room temperature as starting materials .The prepared ZnO nanoparticles were then characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscope (TEM) ,UV–visible spectroscopy and Fourier transform infrared (FTIR) spectroscopy.SEM and TEM images provide morphological interpretation of the synthesized nanoparticles while its average crystalline size was ascertained from XRD peaks at full width at half maximum and incorporating the Debye-Scherrer's model. Moreover, interpretation through UV–Visible absorption spectra supported a high absorption confirming its transcendent electrical and optoelectronic properties. The spectral characteristic peaks of the produced zinc oxide nanoparticles were studied using Fourier transform infrared (FTIR) spectroscopy at optimum condition. This paper further focuses on the application of zinc oxide nanoparticles on improving tribological performance as lubricant additives on the grounds of smoothing out the shearing surface and improving colloidal stability.

1. Introduction

Nanotechnology is a branch of science which studies fabrication and designing with immense augmentation of nanostructural materials. In nanolevel, material exhibits unique features with variation in physio-chemical attributes. Investment in nanotechnology research and development between the year 1997 and 2005 by governments and industrial organizations has escalated from $432 million to $4.1 billion around the globe. Owing to their large surface area, small size and high surface energy, nanoparticles are contributing significantly in medicines, photonics, electronic systems, field effect transistors, photodetectors, semiconductors, and photodetectors and predominantly in tribology [1-6].

In 2012 a study conducted by Holmberg [7], inferred that losses incurred due to friction in transmission, engines and brakes were up to one third of the total fuel energy consumption. Calculations reveal that these frictional losses can be decreased by 18% in 5–10 years owing to the new friction reduction technology involving nanoparticles in the automotive industry, saving up to 174,000 million euros globally.

As a result of which, in recent years, nanoparticles have caught pace as potential antiwear additives and friction modifiers [8-17]. According to recent research communication morphology, concentration and size of the nanoparticles dispersed in the lubricating system have a significant effect on cutting down friction and hence the subsequent wear rate. Zhang [18] in their paper incorporated the application of copper nanoparticles as oil additives to improve friction reduction performance and anti-wear behavior of lubricating oil.Choi [19] in his work made observation on silver and graphite nanoparticles mixed nanofluids to show an enhanced anti-wear and load-carrying properties.

Literature has cited nanoparticles from copper dioxide to zirconium dioxide [20,21] showing promising antiwear characteristics when investigated as additives in lubricating base. The mixture of these particles with base oil has shown enhancement in anti-wear, and friction-reducing properties of the lubricating base oil. Among all the metal oxide nanoparticles zinc oxide stands out to be the most versatile materials, owing to its environmental friendliness, diverse characteristics and functionalities [22-27].The investigation on ZnO has been of growing interest to researchers

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Mathematical Modelling of Hover Board

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Abstract. A self-balancing scooterate (also"hoverboard",self-balancingsystem on board) is a self-balancing transport system consisting of motorized wheels have pad on which the rider places her or his feet and stands on pad to drive. The driver or a person controls the velocity of Hoverboard by leaning forwards or backwards, and provide direction with a steering command. The study of balancing of a person on Hoverboard can be explained with the help of a complex computer algorithm that stabilizes the under-actuated system . The methodology or The Concepts used for controlling the Hover board mechanism through mathematical modelling can be studied by explaining through kinematic model, the dynamic model (using Lagrange approach) that are presented to control the Two-Wheel personal Balancing Transporter (TWPBT) as follows.

1. Introduction

A self-balancing scooterate (also “hover board”, self-balancing system on board) is a self-balancing transport system with wheel-variants connected to a self-balancing control mechanism using built-in gyroscopic and a sensor pad on which the rider places her or his feet and stands on pad to drive. In 2019, hover boards now feature a self-balancing mode, in which the motors automatically engage the gyroscope in the opposite direction. This way, when the rider leans forward or backward the board is always attempting to level itself, making it easier to ride than its 2016 predecessors The device will accelerate forward when the rider leans forward and decelerate when the rider leans back. And provide direction with a steering command. The study of balancing of a person on Hover board can be explained with the help of a complex computer algorithm that stabilizes the under-actuated system.

Since 2001, Segway PT are available in the market used as a two-wheeled self-balancing vehicles and recognized as a powerful personal transporter and commercial vehicle as a versions. Another successful example is -so called- Hover board: .The Hover board may be consider as an evolution of the first, it has driven mechanism and has the advantage of being minimum weight, portable and smaller in size.

The device has three 6.5 inches (170 mm), 8 inches (200 mm), 10 inches (250 mm) diameter wheel variants connected to a self-balancing control mechanism using built-in gyroscopic and a sensor pad. By tilting the pad the rider can control the speed and direction of travel achieving speeds from 6 to 15 miles per hour (9.7 to 24 km/h) with a range of up to 15 miles (24 km) dependent on model, terrain, rider weight and other factors

Another section The problem of controlling the Two-Wheel Personal Balancing Transporter (TWPBT) starts with the mathematical modelling that controls the energy (i.e. both kinetic energy and potential energy) which are govern by kinematic modelling, the dynamic modelling that are explained through Lagrange mathematical Equation .

Experimental investigation of milling process under optimum lubricant use

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Abstract. Performance of the machining and the efficiency of milling operation depend on several process variables among which hardness of work material is of great significant. In this study, experimentation was carried out to investigate the effect of work hardness on end milling process. Workpiece material hardness is used as a noise factor. Input parameters used are spindle speed, feed; depth of cut and tool diameter. The experiments performed under wet and minimum Quantity lubrication and results of both compared. further for getting optimal lubricant conditions the experiments performed for various levels of flow rates of minimum quantity lubrication to get the best optimal setting.Output parameters are surface roughness, material removal rate, cutting force and tool wear. Design of Experiment (DOE) with Taguchi L27 Orthogonal Array (OA) has been explored to produce 27 specimens on Al2024 aluminium by end milling operation at three different levels of hardness of material. The experiments performed under wet and minimum quantity lubrication condition and results compared. Further For optimal lubricant condition the experiments performed at various flow rate of Minimum Quantity Lubrication and "best" optimal setting is identified.
Keywords: Al2024-T4 workpiece material, GRA,, Taguchi Method, ANOVA, S/N ratio

1. Introduction

[1] "Due to the development of new engineering materials and high-speed cutting, cutting fluid plays an important role in machining. Commonly, the cutting fluid can decrease cutting temperature, reduce the friction between tool and work piece, extend tool life, and improve machining efficiency and surface quality. These effects of cutting fluid were mainly obtained from its basic functions including cooling, lubrication, corrosion protection, and cleaning". If cutting fluids, correctly selected and applied, it reduces the problems associated with the high temperature and high stresses. Unfortunately, waste cutting fluids create process-generated pollution. Conventional cutting fluid leads to environmental pollution and also health problems.

Therefore, the use of cutting fluids is an important part of a machining process system. Without cutting fluid, tools have only a short life, which makes the machining process costly. Solid tools need regrinding so that they can be reused and insert-type cutting tools require the cutting edges to be rotated so that a new cutting edge is ready to cut. These processes add extra costs.

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Automation of sundry board machine used in Paper-Cardboard mills

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ABSTRACT

The aim of this study is to design a fully automatic Sundry board machine for reduction of congestion in the cardboard making process and increase the quality and quantity of production. For this purpose, the manual cutting and transfer of sheet is replaced by automated mechanism. The mechanisms include the incorporation of the cutting arrangement in the cutting drum itself, deployment of air pressure to separate the sheet edge from the cutting drum, a cross cutting mechanism and a mechatronic system to control these all mechanism. The initial review is done on the semi-automatic machine followed by the requirement definition. The required components are brainstormed and individually developed. A time based relation is designed such that a microcontroller can be programmed later on for the synchronism of all the components. Thisrelation is visually represented and the entire system is now ready for assembling.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Advances in Materials Research – 2019.

1. Introduction

The Sundry Board Machine is a machine for converting the wet pulp into cardboard sheets of desired thickness. These sheets are further dried, ironed and then cut into the desired standard dimensions. Thus the input to the sundry board machine is the pulp that comes from a device called the pulper. The pulp is moulded into sheets with the help of a former and mould arrangement. The sheets so formed are wet and are carried via a felt. The water from the so formed sheet is absorbed via a vacuum pump giving a particular moisture content to the sheet. The sheet are now wound on a drum called the cutting drum. Say, for one revolution of this drum the thickness will be 't'. Then for the 2nd revolution the available thickness will be '2t'. Thus for the desired thickness say 'n*t', 'n' number of revolutions are required. After 'n' revolutions two cuts are to be made to get the sheet of the desired thickness with the length of the sheet equal to the circumference of the cutting drum. If the cut is made manually then this machine will be semi-automatic, as the processes up to the cutting of the sheet is already automatic. Currently the majority of sundry board machines in India are semi-automatic. The fully automatic machines, in which there are automated cutters, are also used in India. But these machines are all imported and not manufactured in India. The scope of this paper is limited only to the design of the mechanism for automation. Long G. *et al.* [1] discussed the process of board making for further production of Corrugated cardboard. The process states the use of reprocessed papers for making the cardboard. The process stated also gives the rough layout of the board making machine. Kalle Ekman *et al.* [2] discussed the effect of consistency of pulp upon paper grading. Depending upon the consistency of the pulp the grade of the board is decided. Depending upon the grade the cutting forces are calculated. A. V. Gusakov *et al.* [3] discussed the properties of the felt to be used to carry the wet layer of the pulp. The material of the felt discussed are polyester staple yarn and high-strength polyester reinforcing monofilaments. The characteristics of the felt determines how much water will be drained and hence the grade is dependent on it. Jerome P Brezinski *et al.* [4] discussed the mechanism used to carry the Couch Rolls. Depending upon the pressure exerted by the couch rolls, the thickness of the single layer and the water consistency varies. These factors affect the force required to cut the sheet. ED Beachler *et al.* [5] discussed the roller arrangement to be used for driving and supporting the felt. The arrangement of the rollers is of utmost importance as if affects the bonding between the fibers of the wet pulp. Thus, if the fibers are too elastic, then a cross travel of the blade will be difficult.

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Space optimized design of a flywheel for punching press

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Abstract. Flywheel is a mechanical device which acts as a saving bank account where one can deposit extra money and withdraws whenever required likewise flywheel also store the energy when the demand is less and deliver it when the demand is high. It is mounted in between driver and the follower. It act as a energy store. This paper is focused on the use of mathematical modeling of flywheel and space optimized design for punching press. Flywheel has to be designed for a punch which has to make 20 holes/minute in a plate of thickness 12 mm with constrained of space. 1200mm is the limiting value of diameter of flywheel. The flywheel design is based on the space limitations. The various parameters and stresses induced are determined. At the end it is seen that diameter of the flywheel is less than the permissible value therefore design is safe and optimized for available space.
Keywords: Rotor, fluctuation of energy, stresses, Flywheel, energy storage capacity, peripheral velocity.

1. Introduction

Flywheel is a very ancient device used for storing energy and this stored energy could be used for completion of desired task. Size of flywheel was used to design based upon energy storage capacity and the space available. Material was selected using trial and error concept and best option was given a prime importance. Later on it becomes most useful tool for many applications because of uniform and constant torque requirement. Many prime movers generate fluctuating or variable power so applications subjected to vibrations and leads to failure due to fatigue.

In this paper specific flywheel is designed for the space available and so called as space optimized design.

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Compression deformation analysis of cellular lattice structure for structural optimization in additive manufacturing

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ABSTRACT

Additive manufacturing has Cellular structures as its prominent component because of their ability to overshadow the solid ones on account of more strength-to-weight ratio, porous and light-weight nature. A lattice structure called vintile was designed and the effect of change in unit size, lattice kernel position, volume reduction coefficient, and cellular structure optimization on mechanical properties were discussed in this study. Samples with different cell sizes, lattice kernel positions, were 3-D printed using Polylactic acid (PLA) material on MakerBot Replicator Plus 3D printer. Finite element analysis (FEA) and experimentation work was performed on the designed cellular structures so as to make the estimation and evaluation of the mechanical properties of these cellular structures. Output of the work shown that the vin tile lattice topology cellular structure with lattice kernels on both sides of the central hole geometry bears less stress and very little deformation than the other cellular structures with kernels on only either side. Experimental results were in conformation with simulation results. The study does not limit itself to design of cellular structure only but also compared mechanical behavior through volume reduction coefficient (VRC) and surface area coefficient (SAC). Final testing of vin tile cellular structures was done using FEA and experimental work have been carried out on fabricated samples. The results of both concluded that the optimized cellular structure had less stress and deformation than the non-optimized cellular structure.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Futuristic Research in Engineering Smart Materials.

1. Introduction

The mechanical properties of most biomaterials are seen to be mostly related to their Cellular structures. These structures which are abundantly found in nature are the source of inspiration for designing various cellular structures through engineering applications. These engineered structures are lightweight and use less material. The manufacturing process used for developing these structures is simple and is less power consuming as compared to the conventional ones. The natural cellular structures were morphologically designed so that they could adapt to surroundings and are functionally as well as structurally optimized [1]. The key functional requirement by nature to design these cellular structures is to reduce down the weight without compromising the energy efficiency to create them and they should be optimized in every manner. Some of the examples of these cellular structures are wood, hexagon, honeycomb, bone, foam, etc.Fig. 1.

Looking at human anatomy, bone is the one which is considered to be strength-wise similar to cast iron and as lightweight as wood when subjected to the same stress conditions. The lightweight nature of these cellular structures is because they possess low material density, which ultimately yields material savings and considerable weight reduction in final products. Based on the arrangement of cells within the structure, cellular structures are categorized as periodic and stochastic. Both of these have been extensively used in industry through various manufacturing techniques like vapor deposition method, casting, sintering, and foaming [2]. Though these methods are used in the conventional manufacturing of cellular structures, they face difficulties dealing with complex cellular geometries and density variation so as to attain the intended mechanical performance. However modern techniques specifically Additive Manufacturing (AM) provide a way to deal with these manufacturing difficulties [3–8]. Unlike

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Formulation of empirical correlation for internal forced convection

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ABSTRACT

Empirical equations correlating experimental results with the aid of dimensional analysis or analogies are not able to explain heat transfer mechanism convincingly. Therefore, the experimental results for low viscous liquids like acetone, benzene, n-butyl alcohol, kerosene and water are correlated in terms of tube diameter, mass velocity, thermal conductivity, viscosity and specific heat by considering their effect individually. It is found that the heat transfer coefficient increases with the ascending value of tube diameter, attain maxima at about 20 mm and then reduces when the tube diameter is further increased to 50 mm. The mechanism of heat transfer is presented by considering overall turbulence which depends upon the mobility of sub-layer and core turbulence.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Futuristic Research in Engineering Smart Materials.

1. Introduction

The pioneering work of Stanton [1], guided by Professor Reynolds, will be remembered forever as he was the first to measure the heat transfer coefficients in tubes. Due to the underdeveloped experimentation, the heat transfer coefficients reported by Stanton [1] are exceptionally high. This procedure, to measure heat transfer coefficients, is still followed by the investigators since last 110 years. A large volume of information has been made available in the literature [2–7] since then, covering maximum aspects of this important field. However, any addition to the information will prove useful in operation and design of exchangers; in this era of energy crisis.

An attempt is made in this direction through the present investigation. Reynolds number is considered as an index of turbulence and as such, heat transfer coefficient should be a direct function of its value. However, when Reynolds number $(Du\rho/\mu)$is increased in ascending values of tube diameter, the heat transfer coefficient evaluated by using empirical correlations is found to decrease! This strange observation is shown in Table 1 for some of the more common correlations, from where it can be seen that correlations based on dimensional approach [8] as well as on analogies [3,7,9] show decrease in heat transfer coefficient when the Reynolds number is increased from 10,000 to 20,000 by two-fold increase in tube diameter. To resolve this anomaly, the experimental results for liquids, available in the literature along with our own covering a diameter of tube range of 6.0 mm to 50.0 mm are computed in the terms of basic measured variables and are presented in the following paragraphs.

2. Effect of thermal properties on heat transfer coefficient

During experimentation, it was identified by Kripalani [10] that there is no effect of density on heat transfer coefficient at constant mass velocity for gases. In the literature also the similar observations are reported [11–13]. It was, therefore, thought that, if the density doesn't have any effect on heat transfer coefficient in case of gases, when mass velocity is considered as a parameter, then the same should not affect the heat transfer behavior in case of liquids also. The heat transfer coefficient, therefore, can be expressed in terms of parameters defining the turbulence and thermal properties as,

$$h = g\, D^a\, G^b\, \mu^c\, Cp^d\, k^f \quad (1)$$

It was decided to find out the values of constants in Eq. (1) from the available data in the literature. The data, available only in the form of measured variables, was useful in the present analysis. The experimental results presented by investigators in the form of correlations or graphs were of not any use. During the course of processing of experimental results, it was observed that the heat

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Application of hybrid Taguchi-Grey relational analysis (HTGRA) multi-optimization technique to minimize surface roughness and tool wear in turning AISI4340 steel

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Abstract. In this paper, an attempt is made to optimize the turning process by minimizing Surface Roughness and Tool Wear. The independent l factors used are Environmental Condition, Feed Rate, Depth of Cut, Nose Radius and Tool Types. The dependant factors are Surface Roughness and Tool Wear. Experimentations are conducted on CNC Spinner Lathe machine. AISI 4340 steel is selected as workpiece material. Three different types of Cutting tool are considered for the study. Grey Relational Analysis and Taguchi Philosophy together are used to optimize the process. As per the Taguchi method L27, Orthogonal Array (OA) is finalized for the experimentation. For the computation of the response table and ANOVA table, the Taguchi based data Analysis is used. The Variance Analysis (ANOVA) and S/N ratio (SRN) are employed to find the contribution and ranking of contribution parameters to optimize multiple output parameters.
Keywords: Multi- Optimization Technique, Taguchi Method, Grey Relational Analysis, Turning Process, ANOVA, Surface Roughness, Tool wear

1. Introduction

'Customer satisfaction' is a very important term which helps the company to rule in the market. Customers can be satisfied if they get the product with less cost and in the said time but also without scarifying the product quality. This can be attained successfully with the help of the Optimization Method. Various optimization methods are available to find an optimal setting for one output parameter of the particular process. But these methods are not applicable for multiple output parameters. It is obvious that the same optimal setting obtained for one output factor is not suitable for multiple output factors as their nature may be different. So, it becomes crucial to obtain one optimal machining condition for all responses so that all objectives could be optimized simultaneously. This can be achieved by a multi-objective optimization technique. In this perspective, it is important to translate all the objectives into an corresponding single objective function to meet up preferred multi-quality features of the multi responses. For that, the specialized multi-objective optimizations (MOO) should be useful.

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Surface finish generated in turning of medium carbon steel parts using conventional and adhesive bonded tools

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ABSTRACT

Cutting tool technology is fully developed to the maximum extent. Still, an alternate cutting tool material is gaining popularity against conventional tool materials over the past few years. A bonded tool with Ana bond 220, as an adhesive is being searched for its feasibility. This paper reports some important characteristics of the surface roughness produced in the turning of a medium carbon Steel using adhesive bonded tools and conventional brazed tools. Experimentation is performed and surface roughnesses are measured. A statistical mathematical model of the process is obtained by using factorial experimentation, regression analysis and movement along the gradient. The coefficient of correlation R values for the surface roughness for all the models represented are in the range of 0.965–0.992, indicating the better correlation between the experimental and predicted values. A function approximation method is used to train the neural network with different optimization algorithms, transfer functions and topology. Overall neural network performed very well with coefficient of determination R^2 as 0.977 and 0.978 respectively for the adhesive bonded tools and brazed tools. Finite element analysis is successfully used as an alternate tool to comprehensively represent the performance of adhesive bonded tools in the metal cutting operation. The surface roughness of the machined components produced by the adhesive bonded tools are significantly less than that with brazed tools and hence adhesive bonded tools is a better alternative with distinct advantages in the field of tool manufacturing.

Selection and peer-review under responsibility of the scientific committee of Cutting-edge Research in Material Science and Chemistry (CRMSC-2021).

1. Introduction

In machining of parts, surface quality is one of the most significant customer requirements. It affects the functional performance of the machined parts. The perfect surface quality in turning is difficult to achieve even in the absence of irregularities and deficiencies of the cutting process [1]. The set of parameters that influence surface roughness of the machined components most, includes cutting speed, feed rate, depth of cut, coolant flow rate, tool angle, tool shape, tool material, nose radius, cutting tool properties, chip formation, work piece hardness, vibrations etc. Micro fissures resulting from high temperature of brazing operation and inadequate contact stiffness in mechanical clamping adversely affects surface roughness of machined components and is subjected to more vibrations of tools [2]. The desire to impart better surface finish to the machined components has led the use of adhesive bonding as a possible alternative to conventional processes of brazing and mechanical clamping [2,3]. Adhesive bonded tools are rarely used in turning operations. A model based on finite element method reveals a high temperature gradient in the conventional brazed inserts and thus causes high thermal and mechanical stresses in the brazed tools compared with the adhesive bonded tools [3,4]. Cutting tool technology is fully developed to the maximum extent [5]. Still, an alternate cutting tool material is gaining popularity against conventional tool materials over the past few years. A bonded tool with Ana bond, as adhesive bonding is being searched for its feasibility. This paper reports some important characteristics of the surface roughness produced in the turning of medium carbon steel using adhesive bonded tools and conventional brazed tools. Experimentation is performed and surface roughness is measured. The average surface roughness (Ra) is selected as a characteristics of surface finish in turning operations [6,7]. A statistical mathematical model of the process is obtained by using factorial experimentation, regression analysis and movement along the gra-

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Effect of gas tungsten arc welding on the microstructural, mechanical and corrosion properties of Ti-stabilized 439 ferritic stainless steel

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Electrochemical behaviour

ABSTRACT

In the present study, the gas tungsten arc welding was employed on Ti-stabilized 439 ferritic stainless steel using 308L austenitic stainless steel filler electrode. The formation of retained austenite (RA) at ferrite grain boundary and ferrite grains inside the grain boundary were observed through optical microstructure and it's further confirmed by X-ray diffraction analysis. In heat affected zone (HAZ), the grains coarsening occurred near the fusion boundary due to elevated temperature. The scanning electron microscopy shows the formation of peppery structure inside the ferrite grains in HAZ and the peppery structures consisted of carbide precipitates. The micro-hardness of weld zone is higher than the HAZ and base metal ascribed to the formation of RA at ferrite grain boundary. The tensile test results in higher strength of WZ because of formation of mixed microstructure. The potentiodynamic polarization test was used for corrosion study and the WZ depicted higher corrosion resistance as compare to base metal.

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1. Introduction

The ferritic stainless steel (FSS) is widely used material in automobile, pressure vessel, mining, power generation etc. attributed to its good formability, good high temperature oxidation resistance and cheaper as compared to austenitic stainless steel [1]. The FSSs also possess excellent resistance to stress corrosion cracking, pitting and crevice corrosion [2]. For these major applications, the fusion welding is inevitable production technique for fabrication of FSS.

The fusing welding is challenging in FSS because it consequences in reduction in toughness, ductility and corrosion resistance ascribed to grain coarsening in weld zone (WZ) and heat affected zone (HAZ) [3]. The problem of grain coarsening occur due to absence of phase transformation from liquid to solid through which grain refinement would occur. In FSS grain refinement can be minimized by limiting heat input or by employing low heat input welding process [4]. As compared to ASSs, the carbide precipitation also occurs faster in FSS due to less solubility of carbon in FSS [5].

In fusion welding of FSS, the selection of welding process and filler electrode plays an important role in producing the sound joints. During welding of FSS, due to grain coarsening in WZ, the filler electrode with same composition as base metal (BM) results in the reduction of mechanical properties as well as its corrosion resistance [6]. Lippold and kotecki [7] reported that austenite fillers facilitate the formation of mixed microstructure (austenite and ferrite) which enhanced the mechanical as well as corrosion properties. Lakshminarayanan et al. [8] investigated the effect of different welding processes, gas tungsten arc welding (GTAW), shielded metal arc welding (SMAW) and gas metal arc welding (GMAW), on the microstructural and mechanical properties of 409M FSS and reported that lower heat supplied in GTAW process enhanced the mechanical properties. Kose et al. [9] investigated that effect of heat input on microstructure and mechanical properties of plasma arc welded 410 FSS and reported that grain coarsening occurs in higher heat input and results in the reduction of mechanical properties with increase in heat input. Ambade et al. [10] investigated that effect of heat input and welding processes on corrosion behaviour of 409M FSS and reported that SMAW process resulted in grain coarsening in WZ and HAZ and also shows higher corrosion rate due to high heat input as compared to GTAW and GMAW process. Bansal et al. [11] investigated effect of post

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Design and simulation of AI-based low-cost mechanical ventilator: An approach

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ABSTRACT

In this situation of COVID 19, many people are being exposed to coronavirus, resulting in difficulty in breathing and a drop in oxygen percentage of blood. A mechanical ventilator is playing a vital role in tackling this situation but the ventilation process is neither readily available nor affordable. The idea behind this work is to propose a simplified design of a mechanical ventilator to reduce the cost and automate the Mechanical ventilation process. The simplified design, it's working, and required components are elaborated in this paper. The simulation of the proposed design is made in MATLAB/Simulink platform which is also discussed below. Taking into account the work done in the area of cost reduction of the mechanical ventilation process, the mechanical ventilator with a simplified design comprising of compressed air and oxygen source is being considered. The parameters considered for mechanical ventilation are positive end-expiratory pressure (PEEP), pressure wave, respiratory rate (RR), tidal volume, etc. These parameters of oxygen and air mixture are to be controlled with the help of electronic devices which are pressure regulator, solenoid valve, flow sensor, proportional valve, microprocessor, etc depending upon the condition of patient and type of disease. Simulation results are promising and precise which allows the study on ventilator model without jeopardizing the life of human subjects as in clinical approach and hides the complexity of computational models from the user. Furthermore, advancements in this model are done by the machine learning approach.

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1. Introduction

Mechanical Ventilation is an important process used to provide breathing support to those patients who face inconvenience in natural breathing. This treatment is generally provided in serious lung diseases like Acute respiratory distress syndrome (ARDS), Hypoxemia, Chronic Bronchitis, etc. The goal of mechanical ventilation is to overcome the body's inability to meet the need for adequate oxygen delivery or natural carbon dioxide removal.

The ventilation process must be done with adequate care, a small mistake in the process will cause some serious harm to the patient's alveoli as well as the lung in a broader perspective. It is one of the lifesaving inventions in medical history but right now this technology is very advanced, complex, and expensive. Mechanical Ventilators need a skilled professional to operate them as well as to set the mode and parameters of the mechanical ventilator according to the condition of the patient. This can be dangerous for the operator, physicist, or medical professional in case of contagious diseases like COVID-19. Thus, it leads to our research as an attempt to find a solution for the drawbacks.

For the cost reduction approach, the BVM (Bag Valve Mask) type of mechanical ventilator is mostly used to construct an emergency portable mechanical ventilator in which a BVM is automated. The BVM (Bag Valve Mask) ventilation is an important tool used in the ventilation of patients in an acute care setting. It is frequently used by respiratory therapists (RTs) during cardiopulmonary resuscitation (CPR), patient transport, rapid response scenarios, and other emergencies. But, due to manual operation, High peak pressures delivered via bag valve mask (BVM) can be dangerous for patients. Manual ventilation with high volume and pressure can cause severe complications for patients, particularly vulnerable patients suffering from Acute Respiratory Distress Syndrome (ARDS), including those infected with COVID-19.

In the research work of Rachel E. Culbreth, the performance of respiratory therapists with different levels of experience in this

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Effect of process parameters on mechanical properties of 3d printed samples using FDM process

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ABSTRACT

Additive Manufacturing is also known as 3D printing is the most popular and widely used Advanced manufacturing technique, which has emerged to satisfy modern-day industrial requirements like rapid manufacturing etc. Fused deposition modelling has proved to be a better and widely used technique among all normal standard 3d printing techniques. FDM uses layer-by-layer deposition of the material for printing objects. But usually, the parts printed by the FDM technology may possess varying properties (like mechanical, surface finish, layer adhesion, etc.) which largely depends upon the various process parameters. Parameters like Layer thickness, cooling rate, and printing orientation directly affect the build time, layer adhesion, and ultimately tensile strength. Thus, proper optimization of such parameters is necessary otherwise the mechanical strength can be reduced hence, this study focuses on varying the layer thickness, print orientation, and cooling rate and analyses the tensile strength and build time for each value of the specified parameters to increase the mechanical strength, surface quality and to reduce build time. The material used here for printing is Polylactic acid (PLA) which is a commonly used material for industrial purposes.

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1. Introduction

The demand for quickly fabricate the parts and gauge the engineering product design resulted in the rise of the new archetype in the market called Rapid Prototyping (RP) or 3D printing. Being time redeemable and ability to fabricate the complex parts which are quite problematic to produce from other subtractive manufacturing methods, Additive manufacturing (AM) is increasingly used for mass customization [1]. With this research, one can conclude that 3D printing is the best economical way to survive the manufacturing industry in this era of mass customization and the digital world. Additive manufacturing technique-built parts layer by layer directly from CAD data file results in anisotropic mechanical properties. Fused deposition modeling is the most widely used Additive Manufacturing Technique in recent time developed by Stratasys in 1988. Fused Deposition Modelling (FDM) deposit the molten material layer by layer extruded through the nozzle. As a resulting fracture or tensile strength is depends on the built orientation of the part in the 3D printer this process is governed by G-codes. There is various slicing software which is available in the market such as CURA to slice the 3D part and guide the 3d printer to print the part. As the printing is governed by G-codes in printer there are various process parameters such as infill density, infill patterns, layer thickness, layer height, orientation angle, feed rate, etc. which affects the mechanical properties and the time required of the printing part. To enhance the strength and time required we have studied and experimented with the change in various such process parameters (Fig. 1).

Among the literature presented till most of the research is based on parameters such as infill density, infill pattern, orientation, and material composition which affect the mechanical properties of printed parts. Baier et al. [2] investigated and optimize 3D printing process parameters such as printing temperature, layer height, and cooling rate. Using Polylactic acid (PLA) material, samples were manufactured for finding the effects of different process parameters on the tensile strength of printed parts. It considered the cooling rate at 50% and 100% and layer height with 0.1 mm, 0.3 mm. According to the study, the impact of the cooling rate is smaller at lower printing temperatures. And printing at higher temperatures has higher tensile strength. The values of tensile strength obtained are in the range of 29–57 MPa. It is found that higher printing temperature, cooling rate, and lower layer height, lower

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Optimization of FDM process parameters for dual extruder 3d printer using Artificial Neural network

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ABSTRACT

Fused Deposition Modelling is one of the most widely used processes of additive manufacturing or 3D printing. The FDM process of 3D printing deposits material in the form of a continuous flow, layer-by-layer to make objects. As the FDM-based products are used in various fields it becomes important to look after the mechanical aspects, part quality, and the economical aspect of FDM 3D printing and hence optimize the necessary process parameters. In this study, critical process parameters like layer thickness, air gap, raster width, build orientation, raster angle, and the number of contours is optimized for enhancing the properties of FDM printed part such as tensile strength surface roughness, and build time. The material used for 3D printing is polylactic acid (PLA). The task of training the data sets and optimizing them was accomplished by using function approximation of Artificial Neural Network. ANN can predict experimental data with a coefficient of correlation R = 0.9981,0.9984,0.99837 subsequently for tensile strength, Build time, and surface roughness and root mean square error as 0.5543, 0.578 and 0.241 for three outputs. Further, it is revealed that build orientation is the most important parameter for optimum results.

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1. Introduction

Additive manufacturing technology is used for fabricating parts by depositing layers one by one over other layers. It is an advanced manufacturing technology also known as 3D printing or rapid prototyping. It's is said to be as rapid prototyping as it not only reduces production time but also speeds up the product development process. The use of additive manufacturing in manufacturing sectors such as biomedical implants, aerospace, dental restoration, electronics, automobile, etc., is extensively increasing due to its ability to produce products of high quality with different engineering materials. There are many additive manufacturing processes such as Fused Deposition Modeling (FDM), Selective Laser Sintering (SLS), Direct Metal Deposition (DMD), Ink Jet Modeling (IJM), Laminated Object Manufacturing (LOM), and Stereo-lithography (SLA). These processes have different process parameters, printing material, the magnitude of precision, and the end-use application. FDM, one of the 3D printing techniques, is being widely used due to its ability to produce complex parts and its compatibility with different thermoplastics material to produce the parts. FDM was developed by Stratasys Inc. in the USA in the 1990 s.

Vaezi, M. et al. [1] covers a decade of research on multiple material additive manufacturing technologies that can produce complex geometry parts with different materials. Optimization of the mechanical properties of the parts and by adding functional features in the final parts improves the capability to fabricate multiple material parts. Gibson, I. et al. [2] elaborate a detailed conceptual overview of rapid prototyping and additive manufacturing. The possible impact of mechanical properties of the material and various parameters of additive manufacturing was elaborated with comprehensive application domains. Anitha et al. [3] investigated the effect of some important FDM process parameters such as layer thickness, road width, and speed of deposition on the surface roughness of the ABS prototype. Taguchi's design matrix, signal to noise ratio (S/N), and analysis of variance (ANOVA) was used in this study. Layer thickness had the most influence on the surface roughness compared to other parameters that were road width and speed. It also pointed out that there was an inverse relationship between layer thickness and surface roughness. Thirumurthulu et al. [4] used a real coded genetic algorithm to develop an analytical model to predict the optimum part orienta-

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Experimental and Numerical Investigation of Flat Plate Solar Water Heater

R. B. Chadge, Neeraj Sunheriya, Chetan Mahatme, and Jayant P. Giri

Abstract As the world is developing, energy consumption is also increasing very rapidly. Conventional energy sources are able to fulfill todays energy demand, but they have their own disadvantages. Main conventional sources for energy production are the fossil fuels till now. But these fuels are available in limited quantity as well as the environmental issues make the world think for the renewable energy sources. The weaknesses of conventional sources can be eliminated by renewable energy sources. Among the available renewable energy sources, solar is one of the most promising areas nowadays, in which solar-operated water heating system is most widely used in thermal applications. Solar water heater is not only eco-friendly, but also it requires less maintenance and operational cost. This paper aims to modify the simple solar water heater with V-trough reflectors and compare the experimental results with ANSYS software. The results obtained through the experimentation are quite good to promote the inclusion of V-trough reflector with SSWH. The efficiencies are 79.5%, 91%, and 84% while using V-trough reflector at an inclination of 65, 70, and 75 degrees with absorber plate compared to the 78% efficiency of SSWH during typical days of experimentation.

Keywords Solar water heater (SWH) · V-trough reflector · Numerical analysis

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1 Introduction

Solar water heater is a system used to convert the incident solar radiation into thermal energy with the help of flat plate or evacuated tube collector. This thermal energy application-based appliances can be used for domestic and industrial purpose. The rapid growth rate of solar water heater proves that it has great potential worldwide. India, China, and Europe are among the major market share for solar water heater.

Overall, the cost of solar water heater is expensive and less efficient. So, there is a need to investigate and develop high efficient solar water heater (SWH).

1.1 Abbreviation and Acronyms

SHW—Simple water heater, V-SHW—V-trough solar water heater, FPC—Flat plate collector, AP—Absorber plate, DTI—Digital temperature indicator.

1.2 Equations

The efficiency of flat plat collector is generally based on the input radiation and heat utilized [5]. Various equations to analyze the performance are illustrated below:

$$\text{Energy input (Qi)} = \int \text{I x A dt} \tag{1}$$

$$\text{Energy Output (Eo)} = \text{m } c_p(\Delta T) \tag{2}$$

$$\text{Overall Efficiency } (\eta) = (\text{Eo/Qi}) * 100\% \tag{3}$$

where

I = Input radiation (W/m^2)
A = Input area (m^2)
m = Water mass flow rate (kg/s)
c_p = Specific heat of water @ constant pressure (J/kg.K)
ΔT = Temperature differential of incoming and outgoing water in Fahrenheit.

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Design of multipurpose mechanical Machine

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ABSTRACT

This paper focuses on designing of Multi-Purpose Mechanical Machine. The research specializes in design and development of multi-purpose machine tool which is able to perform multiple operations like drilling, cutting and grinding simultaneously and can also performs one operation at a time as per the requirement. The functions of machine tools are to transform the raw substances with the help of machining operation to finished part with precise geometry, dimensions and surface quality. The call for is increasing to provide elements with high standard at minimal cost, the machine tools are required to have better machining, precision and speed. This research paper proposed a machine which can perform operations like drilling, cutting and grinding simultaneously which means that industrialist have no need to purchase different machines for different operational task.

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1. Introduction

Industry usually refers to production and manufacturing at the most economical production cost, low processing cost and low inventory maintenance. This research paper work subject is one in which actually we are learning theoretical concepts in practical view. In this high demand and upgrading world where all operation has been made with high accuracy, quicker and faster due to technological development but this development is also urging to large investment. Every production industry eager to produce high quality and standard produce product at the minimal cost [1]. The fundamental function of machine is to convert the raw substance with given mechanical operation to a finished part with required accuracy, dimensions and surface quality [2]. As the demand is increasing to produce parts with higher quality at low cost, the machine tools are required to have higher machining precision and faster workability [3]. In recent years, the demand is also increasing with machining difficulties to cut material and parts with high tolerance geometry [4]. As the production lot size becomes smaller, a single part with complicated geometry has to be machined without a trial cut [5]. In order to overcome such demand, the machine are expected to have multiple functions with modular and reconfigurable design architectures of the parts which may include various operations like cutting, grinding, drilling processes and other finishing processes also. These three tasks may be carried out in any order. In order to make such machining parts in maximum quantity within minimum time, it is necessary to have one machine tool which can perform different manufacturing processes confine within one machine. Various kinds of multifunctional machine with integrated processes capabilities have been developed for general as well as for specific purposes. (See Fig. 1)

Singh et al. [6] have carried out experimentation of turning process by using HSS single point cutting tool. In this paper Turning parameters are being optimized by considering constant length of material by maching. Pramoth Kumar et al. [7] studied feasibility of scotch yoke rather than conventionally used crank and slider mechanism. It contains mainly two parts i) a rolling scotch and ii) a sliding yoke. The yoke is driven by a pin eccentrically placed on the scotch. Since proximity of the mechanism is nearer to the source, the loss accounted is less in the case of scotch yoke. In this work both crank-slider and scotch-yoke are examined through simulation using MSC ADAMS software and the maximum velocity of that can be achieved is obtained analytically through Kinematic analysis of scotch-yoke mechanism.

Davim et al. [8] in direct provides essential information on modern machining technology for industry with emphasis on the process used regularly across several major industries. His book provides essential information on modern machining technology,

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Design and analysis of walker with sit to stand assistance

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ABSTRACT

A walker that can provide sit-to-stand assistance to the user. As the sit-to-stand motion can define the functional independence of a person, it must be considered as an important parameter in life. Currently, various types of walkers are available from traditional to smart walkers, some walkers are developed specially according to the requirement or disability of the patient. But the main problem while using the traditional walker is that the user or the patient has to lift the walker and place it forward so that he can walk this requires a considerable amount of energy of the upper extremity of a user and because of that the patient can get easily tired or feel fatigued neither the traditional walker can help the user with such kind of problem, nor the technological advance smart walkers could help. Thus, there is a requirement of a simple cost-effective walker which can address the problem. This paper provides in detail the design and analysis of such a walker.

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1. Introduction

According to Population Census 2011 there are nearly 104 million elderly persons (aged 60 years or above) in India. A report released by the United Nations Population Fund and Help Age India suggests that the number of elderly persons is expected to grow to 173 million by 2026. Due to improved medical treatment, the people above the age of 60 will grow, and also people with disabilities will grow rapidly this will create a need for assisting devices to promote mobility and help the disabled. As the age of the population increases, there is a lack of muscle strength in elderly people so the need for a walker and other assistive devices might increase. There are various assisting devices, problems related to walkers, and various research going on in this area. The research areas in walkers are invalid walkers [1], foldable rolling walkers [2,3], assistive walking devices [4–6], walkers with lift [7–9], sit to stand walkers [10,11]. Smart walkers with different features and assistive capability [12–15], the research also point out many problems associated with walkers and problems encountered by elderly people using walkers [16–20].

The transition from sitting to standing is one of the most physically demanding maneuvers for the elderly and overweight. It can also be difficult after a traumatic injury, such as a spinal cord injury, or due to weakness in the lower extremity muscles. In the current situation, such a walker that can assist the user is uncommon. To address these issues, we set out to design a walker that would assist the user during the sit-to-stand motion.

2. Problem statement and objectives

Lifting and positioning a traditional walker requires a lot of upper body strength. This results in poor posture and a bad walking habit, resulting in a slow and awkward gait and a user who is easily fatigued. It also causes issues when attempting to stand from a seated position without the assistance of another person. A walker that reduces or eliminates the need for another person to assist and accompany a physically impaired walker user as he or she stands, walks, and sits with the walker safely is desirable.

The goal of this walker is to save patients time, energy, and the risk of falling. Walkers assist the elderly in standing without the use of much upper body strength and allow users with permanent disabilities to move independently.

Reduce the amount of time and energy handicapped people need to walk. It can reduce the risk of patients falling or being

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Maintenance optimization of goliath crane in supply current cable trolley system

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Abstract. Gammon India limited is one of the leading tower companies with exposure in extra high voltage transmission line and distribution projects since 1984. They have in-house facility for design, testing and tower manufacturing capacity (110,000 TPA) and have supplied towers/structure over 6, 00,000 metric tons including 87,000 metric tons to different countries. They are ISO certified for design, testing, manufacturing and turnkey projects. The various types of cranes utilized in transmission Tower Company like goliath or gantry crane, electrical overhead travelling crane and hydra (JCB) to shift unprocessed materials, semi-process and end products from one station to another station. The goliath/gantry cranes are placed in unprocessed and processed yard and it is used to transfer unprocessed materials from raw yard to different machine in machine shop-1 and machine shp-2 also it transfer end products from steel yard to different automobile vehicles like box truck, recreational vehicle, camper etc. The high breakdown occurs in goliath/gantry cranes due to breakage of supply current trolley cable, so high maintenance and production cost is involved and after every two years supply current trolley cable is replaced by new one. In this paper an entire though is given as regards how to optimize breakdown and production loss by implementing bus-bar/ current collector system on gantry/goliath crane. The current collector or bus-bar system is employed to provide three phase current to different motors of gantry/goliath crane. This paper presents evolving a maintenance optimization of gantry/goliath crane in supply current cable trolley system.
Keywords: Transmission Tower Company, goliath crane, cable trolley system, bus-bar system.

1. Introduction

Present Status of Operation: -

Following are the various sorts of crane utilized in transmission Tower Company to transfer materials from one station to a different station.

1. Goliath Crane.
2. EOT Crane (Electrical Overhead Travelling)
3. Mobile Crane (Hydra 12MT)

1.1 Goliath Crane

The goliath/gantry crane are used to shift raw materials from raw material yard to various machinery in production shop-1 and 2 such as CNC ,plate shearing, stamping, band saw, power press punching and universal punching and cutting machine etc. It is also wont to shift finish product from steel yard to different transport vehicles. In live system of gantry /goliath crane cable trolley system is employed to provide three phases current from main panel to Goliath

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Effect of welding processes and heat input on corrosion behaviour of Ferritic stainless steel 409M

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ABSTRACT

In the present work, Ferritic stainless steel 409M is welded with shielded metal arc welding (SMAW), gas metal arc welding (GMAW) and gas tungsten arc welding (GTAW) of welding current 90A, 100A and 110A. Four mm thick plates were used as base material and single V-joint was prepared for welding. Single pass welding was carried out. Microstructures in the transverse section were observed for base metal, Heat Affected Zone (HAZ) and weld joint. Corrosion rate of welded joints have been evaluated by weight loss method in sodium chloride (NaCl) solution. In this investigation results reveal that, corrosion rate of welded joint is more than the base metal. It is also found that corrosion rate increases on increasing welding current. It is observed that corrosion rate is more in SMAW than GMAW and GTAW weld joint. Results are discussed in the light of microstructure. Increased corrosion rate is attributed to welded structure and formation of HAZ due to variable welding heat input.

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1. Introduction

Ferritic stainless steel (FSS) is a specific type of stainless steel with 10.5 to 27% Chromium and less than 0.1% of Carbon [1]. These stainless steels are magnetic and incapable of hardening through heating [2]. FSS was developed as a type of stainless steel which provides resistance to oxidation and corrosion, mainly stress cracking corrosion (SCC) [3]. The FSSs owing to their high Chromium and low Carbon contents, possess specific set of characteristics viz, ductility, high strength and high resistance to corrosion [4]. The material finds typical applications in industrial equipments, kitchenware and automotive parts [2]. Nowadays, the FSSs with 12% or more chromium and less than 0.03% carbon content are used in fabrication because of their mechanical properties and weldability [4].

FSS 409M is becoming a preferred construction material for railway wagon and containers owing to its better corrosion resistance and strength [5]. On welding, it suffers grain-growth and martensite formation [6–9]. It reduces the ductility, strength, toughness and corrosion resistance, although the steel has better properties in the wrought condition. The FSSs may have different corrosion resistance on the basis of the chromium content. By alloying their properties can be future improved for example, addition of 1–2% molybdenum improved pitting resistance and hardness [10]. Though FSSs with 12 wt% Cr have good weldability, the FSS 409M grade still suffers from the coarsening of grain in the fusion zone and heat affected zone (HAZ) and as a result mechanical property are deteriorated [11]. When the base metal is heated above a critical temperature (above 955 °C), the grain coarsening takes place and material suffers intense grain growth [12–14]. The grain coarsening in the HAZ and the weld zone of FSSs is attributed to direct solidification without any intermediate phase transformation from the liquid to the ferrite phase [15]. Therefore, these alloys are suggested for welding at high welding speed and low welding heat input [16]. The ductility is also reduced due to formation of martensite, even in small amounts [17–19]. This can be avoided by lower welding heat input with proper welding process [12,13].

Properties of FSS 409M welds are also strongly influenced by the chemical composition of the filler metal, weld heat input and welding processes employed, because the microstructure of the alloy is altered [20,21]. The present work, therefore, investigates the effects of different welding processes with varying heat input on corrosion properties and microstructure of FSS 409M.

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Classification and Prediction of Oral Diseases in Dentistry using an Insight from Panoramic Radiographs and Questionnaire

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***Abstract*— The healthcare domain is a very important research field with rapid technological advancement, where programmed medical assistance systems or mathematical devices are high in demand to utilize the advances in research in Machine Learning (ML). Comparing with rapidly growing artificial intelligence research in other healthcare domain and dental care is relatively slow in dental care. This paper will discuss predictive analytics in the specialized field of oral health care, i.e. Dentistry, which is considered as a branch of medicine dealing with anatomy, development, and diseases of teeth. The emphasis is given to this field because it is a difficult mission, due to short of precise data availability in dentistry for diagnosis and prediction. Predictive analytics help practitioners to take sensible decisions connecting to the patient's physical condition and cure.**

In this paper, an approach towards the diagnosis, prediction, and classification of oral health diseases in dentistry is implemented and discussed with the help of the machine learning techniques on the self-created dataset of 133 patients. Now a day's panoramic dental x-ray images are an essential diagnostic tool to detect the symptoms at an early stage by dentist, but always exposure to radiation for every patient is not possible so at some extend we have to avoid it. So to solve this issue diagnosis at early stage is very important. Early diagnosis can be done on the basis of symptoms of patient. To detect the possibility of disease (in this study tooth wear) is considered at an early stage, for which one questionnaire is created which is collection of data from different patients on the basis of symptoms. Mainly tooth wear is the damage of tooth tissue and structures not due to caries. It can happen in numerous forms either attrition, abrasion, erosion, non-caries cervical lesion (NCCL) or an amalgamation of two or more forms. This questionnaire contains all the possible parameters for occurring diseases are considered. Here classification and prediction is done for four different classes (class 1, 2,3and 4) based on severity ratio (class 1-Low severity and class 4-High severity). To perform the classification and prediction on the questionnaire which is in CSV format support vector machine is used. The objective of this study is to determine the patterns and associated etiologies of tooth wear among adults for Indian population.

Keywords—Classification, SVM, Machine Learning, Predictive Analytics, Oral disease, dentistry, OPG X-ray.

I. INTRODUCTION

A population of geriatric (elderly) people has developed a global concern that tainted the epidemiological continuum. The residents of geriatric people aged above 65 years have exceed around 150 million [1] as per the World Health Organization (WHO). Survey conducted in the year 2019. The World Health Organization (WHO) has emphasized to the significance of oral health as a major component of general health as it also affects the quality of life. Mouth problems and aging have a long interrelated history. This is shown in Figure.1a and 1b. Figure 1a Illustrated the statistic of infection in different age groups and Figure 1b Illustrates how periodontal diseases grows in different ages in Indian population. With the help of the results of statistic, it has been observed that how conventionally oral diseases and edentulousness (lack of teeth) are typical of aging issues. It has been also found that the rate of periodontal diseases is higher in the age group of 35-44 years. This output helped me to maintain the dataset for my further research. As per dental healthcare situation, there is a connection of oral health with various systemic conditions such as diabetes; cardiovascular disorders, pregnancy, and it bang on the class of living. So oral health-related diseases need to be properly diagnosed and predicted accurately. Usually, oral diseases and edentulousness (lack of teeth.), were archetypal of aging. Mouth problems (e.g., wear of a tooth, dental cavity (decay), periodontal disease, periapical disease, tooth loss, dry mouth, and oral lessons or ulcers and oral cancer) can affect older people to different health disorders such as malnutrition. This paper is organised in different section including background and motivation of study then need of automated system in oral health care, importance of diagnosis of tooth wear in dentistry then the related work in oral health care field to understand the need and availability of data for research. On the completion of related work study dataset preparation is done. To check the feasibility of created dataset Support vector machine is used and results are analysed.

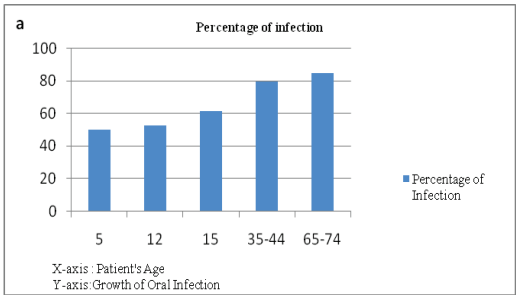

Fig. 1. a: Analysis of oral infection

Instant messaging using xmpp

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Abstract— This paper discusses a web based instant messaging application based on XMPP protocol. This application can be used from any platform to send and receive texts and also be used for push notifications and broadcast news across the clients. The paper discusses the client server architecture in a single server system that can be used in smaller organization for secure message delivery. The clients can also use group chats or multi user chat rooms other than individual chats. The scope of the proposed application can be expanded to and not limited to file sharing system to share files(.pdf, .ppt, .docx) and multimedia files(.jpeg, .jpg). A daily task list or timesheet can also be added so that employees can use this application to add or remove daily work reminders.
Keywords: XMPP, messaging, broadcast, prosody IM

1. Introduction

In the present day scenario, an organization cannot exist without a proper channel of communication between the employees, staff and higher level authorities. To overcome this challenge most organizations use certain applications on a subscription basis to provide its employees a host of services. This method can generally be profitable for larger organizations but smaller organizations suffer due to high prices of such subscription services. Also many times companies and organizations come across the incidents of data theft and communication leaks that happen due to less secure communication with third party services. The proposed application aims to reduce such incidents as the account creation privileges would be with the admin only, admin would be notified every time an employee logs in or logs out. Another functionality of the XMPP is that it also gives out presence status of the client, i.e. if an employee is away from his workplace or is not working during the office hours then the message won't be delivered if he/she is unavailable. It will instead notify the sender that the recipient is simply unavailable at the moment.

This application is developed by keeping the smaller organizations in mind that by the use of this application can save their revenue and utilize it someplace else. The application is particularly useful when the organization has to broadcast some information to all of the employees. As it is a web based application, it can be accessed by employees irrespective of the device category or the type of operating system.

2. Working with xmpp, prosody im, strophe.js

XMPP or Extensible Messaging and Presence Protocol is an open source technology for instant and real communication, XMPP or Extensible Messaging and Presence Protocol is an open source

A comparative study of energy and task efficient load balancing algorithms in cloud computing

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Abstract. The future growth of the Internet of Services has fundamentally changed the emergence of cloud computing. Cloud data centres serve multiple tenant demands for cloud applications that discharge vast amounts of electricity, leading to high operating costs and environmental diffusion of carbon dioxide (CO2). To fix this is the need for preservation to enable potential use by building a new structure and measuring the effect in a cloud data centre. Consequently, the use of pruned electricity reduces the cost of processing power. In order to meet energy-efficient data centres in the cloud, adjusting to optimal load balancing processing a good way for energy savings. To minimise the large energy use of cloud data centres herds, this focuses on increasing efficacy by breaking the workload evenly. In this paper, we plan to provide a comprehensive comparative analysis in cloud computing of current load balancing algorithms.
Index Terms— Cloud computing, Load balancing, Energy efficiency, Green computing

1. Introduction

Cloud Computing is an emerging modern platform for broad based technologies, for example: Computing and data from computers and PCs have been transferred into larger desktops have been reinventing their customers' studios on top of PCs Large businesses are interested in cloud computing in order to expand their technologies, its reachability and the economy associated with applications. Cloud computing distinguishes ISO as a business model (IaaS), Application as a Service (PaaS), Software as a Service (SaaS), and Protection as a Service (SEaaS) into the device models. These four shared in a single online portal which is powered by a virtual computer (VMs). VM's build the imagination of a dedicated computer for laptops. As a result of the improvement also improves according to the cost specifications, the host produces Vms. load exceeds the threshold values given to each system output is altered. Thus, reaching the power of datacentres is a difficulty. So, in such an environment, data centres were found to absorb 0.5percent of the global demand for electricity in 2018. A annual improvement trend in data centres Last year, data centres' general capacity utilization has exponentially. Cloud storage eliminates consumption of energy due to the usage of the VM and its proper relocation during the load balance. Via high power demand the data centres deliver large amounts of carbon dioxide (C02). Think it again is another key concept. It includes power equation counselling methods to minimize turbines for cloud computing [3]. Other innovations such as the improvement of software applications, the virtualization of computing resources

Mental Health During COVID-19 Pandemic

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Abstract

The outburst of coronavirus in December 2019 from Wuhan, China led to the global COVID-19 pandemic. COVID-19 was declared as a pandemic by the WHO at the beginning of 2020. This resulted in lockdowns in many countries as a preventive measure. Due to the lockdowns, people were forced to stay at home, which increased the feeling of loneliness, anxiety, depression, or suicidal thoughts. Mental health is the least discussed topic but most important. With the outbreak of the highly infectious virus, public fear, anxiety, stress due to lethality, and uncertainty also follows. This review article is aimed to explore the impact of the COVID-19 pandemic on the mental health of individuals and groups of individuals. A twenty percent increase in mental illnesses was reported in a survey by the Indian Psychiatric Society since the coronavirus outbreak in India. In China, a study showed 16.5% moderate to severe depressive symptoms, 28.8% moderate to severe anxiety symptoms, and 8.1% moderate to

Artificial intelligence and machine learning for internet of things

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Abstract. For decades, humans have been intrigued by the concept of an intelligent and independent self-learning machine. The idea behind Machine Learning (ML) is to simplify the development of analytical models such that, with the help of available data, algorithms can learn continuously. Internet of Things (IoT) enabled devices are the major sources of data generation with a number of multiple modalities and differing data consistency, defined by velocity in terms of time and position dependence. Intelligent processing and analysis of this generated data (Big Data) is the key to developing smart IoT applications. ML may be used in cases where the desired effect is defined (supervised learning) or where data itself is not defined beforehand (unsupervised learning) or where learning is the outcome of the interaction among the learning model and the environment (reinforcing learning).In this chapter, we present and discuss a taxonomy of machine learning algorithms that can be used with IoT. Furthermore, how different machine learning techniques are used to derive higher-level information from the data is illustrated. Lastly, we investigate, what are the real-world IoT data characteristics that involve an interpretation of the data?

1. Introduction

IoT is a combination of integrated technology, comprising wired and wireless networking, sensor and actuator applications and physical objects linked to the Internet [1, 2]. It is a generic term for technologies which have intelligent interfaces that communicate actively. If things connect with each other and have smart interfaces, they can have new functionality outside their own current characteristics [3]. With the growth of IoT, applications have grown smarter and interconnected devices are being used in all areas of various applications. Because the amount of data generated grows, ML approaches can be used to further improve the intelligence and effectiveness of applications.

1.1. Artificial intelligence (AI), Machine Learning (ML), and Deep Learning (DL)

Figure 1. expresses the relationship between AI, ML and DL.

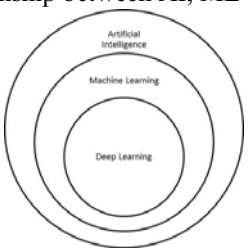

Figure 1. Relationship between AI, ML and DL

Energy efficient quaternary capacitive DAC switching scheme using sar analog to digital converter

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Abstract: This article shows the outline of successive approximation register- ADC used to convert the signals obtain from the brain into electrical signal. Quaternary capacitive exchangin vitality conspires (QCS) within the execution of (C-DAC) is utilized which makes the vitality utilization in the C-DAC free of the yield advanced output code.This method accomplishes a 50% diminishment within the normal vitality utilization. The design is actualized in 0.25nm technologyusing complementary metal-oxide semiconductor (CMOS).

1. Introduction:

We need to note document the readings of brain neural action as it is imperative to analyze the neurological clutters such as seizure disorder, sadness, and Parkinson's illness. To document the brain's neural movement there's extraordinary request to scale down fixed coordinates microsystems. Numerous past works have appeared advance toward planning moo control Microsystems [1]-[5].

The Figure 1 appears the square graph of neural prosthetic BMI framework. This neural prosthetic BMI framework regularly comprises of documenting and incitement routing. The incitement route bargains with the final essential of the BMI and controls the development of the diverse parts of body. The documenting route bargains with the basic requirement of the BMI and basically called as NRF conclusion. The most part of NRF conclusion is to sense, intensify, and convert into digital neural signals extricated from the neurons without undermining it with electronic clamor. The NRF conclusion regularly comprises of a multi electrode cluster for recording the neural movement, taken after by a group of moo commotion intensifiers (LNAs), and A to D converter to digitally convert the neural data recorded.

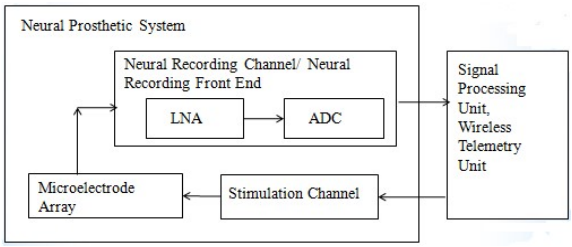

Figure 1. Implantable framework for BMIframework.

Nadi pariksha: IOT-based patient monitoring and disease prediction system

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Abstract. Nowadays, peoples are suffering from different types of diseases and detection tests for these diseases are costly and it is painful for poor people. In Ancient, Nadi Pariksha is the supernatural technique to recognize the health status of the patient and to approximate the quantity of Tridosha i.e. Vata, Pitta and Kapha in the body which are helpful for detection and diagnosis of diseases. The main aim of this paper is to propose IOT-based pulse examination system which is used to oblige doctors in diagnostic practice for prediction of diseases.

1. Introduction

According Ayurveda, any kind of components present in the nature, same elements discover in the smallest part of the human body and vice versa. Ayurveda said that there are five components available in the nature i.e. earth, water, fire, air and space which controls the body by means of three Dosha's called as Tridosha[1][4][8]. Nadi Pariksha is used to recognize the health status of the patient and to approximate the quantity of Tridosha i.e. Vata, Pitta and Kapha in the body and are considered the basic components of health and the steadiness between these components called as good health and instability called as ill. In ancient, vaidya (doctor) inspect Nadi (Pulse) at right wrist of the male and left wrist of the female for detection and diagnosis of diseases [1][2].

Tridosha's, Vata is combination of air and space and pass on sensational input from the numerous organs to the brain. Pitta is a combination of water and fire and superintends for digestion, vision and skin complexion. Kapha is combination of water and earth and come up with moistness and lubrication, strengthening and stability. These three pulses are of different in characteristic. The vata pulse, pitta pulse and kapha pulse has characterized as snake like motion, jumping like frog and floating like swan respectively [1][8].

Nadi is a waterway within the body in the form of blood vessels and the term Nadi Pariksha indicates the examination of pulse and the absence of pulsing denotes death. The method of Nadi Pariksha includes placing of vata (index), pitta (middle) and Kapha (ring) finger on forearm[1][2][8] as shown in fig. 1 and the pressure of pulse on three represents illness.

An intelligent system for transforming natural language queries into SQL and its execution.

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Abstract. In today's world information storing and retrieval plays an important role. Database systems play a key role in the new commercial system for information storage. For accessing the data from database, a person who is not having the knowledge of SQL may find themselves handicapped while dealing with the database. This presents a significant limitation in a developing country such as India, because even today, a very large majority of the population does not have the technical knowledge of how to deal with database systems.
In such a case, Natural language processing (NLP) assumes a significant job. NLP is getting perhaps the most dynamic strategies utilized in Human-PC Interaction. It is a part of AI which is utilized for Information Retrieval, Machine interpretation, and Language Analysis. This paper, proposes a system which allows the user to query the database in a compatible mode language, through a convenient Graphical User Interface which results in the data required by the user.
Keywords: Natural language processing, Database , Artificial intelligence, Information retrieval.

1. **Introduction :**

Conventionally everyone is more comfortable in the language which they speak, writes and, understands. The official language of India is English(UK). Now a day's most of the people in India speak/understand English but they are not acquainted with technical language like SQL. A programmer or a naïve user can interact with the database system.[1] Natural language processing provides the platform through which not only programmer but every user can communicate with the system without having the knowledge of the technical language. To extract the data from a database management system like MS access, Oracle user must have knowledge of structured query language. To understand this consider the database of library books. Suppose the user wants to access the information for books of a particular author. For retrieving this type of information in oracle user needs to fire a query select * from library where author_name="xyz"; The role of an intelligent system comes here . An intelligent system is developed for the people to interact with database using simple English statements. Using this system instead of remembering all DDL and DML commands it is possible for a user to ask the required data using simple English statement like give me the name of books whose author is xyz. A keen layer is planned which acknowledges basic client's basic sentences as information and converts them into standard SQL questions to recover information from social data sets dependent on an information base. This sort of cooperation is frequently valuable to the individuals who are not experts in informatics; they are intrigued uniquely with regards to looking into information. They might be chiefs or experts, or a person's getting to the information base.

An IoT Framework for Healthcare Monitoring System

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Abstract. As a result of the developments made in medical and technical aspects, the healthcare sector has been constantly evolving. Over the decades, healthcare has developed by using the best available PC technology. It has become an in-depth source of valuable analytical and analysis data.The health aspects of the person need to be monitored with the utmost concern and treated with appropriate medications. Proactive monitoring of one's health can cure and prevent several diseases. In recent decades, technology has evolved to its height due to the availability of many wearable devices and health tracking gadgets on the market. Expert doctors also find it difficult to estimate the disease from the symptoms seen from the diseased, but using advanced technical tools such as the Internet of Things (IoT), cloud/edge computing, machine learning and AI along with Big Data will make it much easier for doctors to dig out and describe the root cause of the disease and predict its severity using modern algorithms. The objective is to be able to extract relevant and important information from the massive data usually produced in IOT devices by the front-end sensor frameworks and few intelligences that could be included in the front-end module itself to allow the front-end to make a decision based on data priority.

1. Introduction

The fundamental component of our lives is healthcare. The conservation and enhancement of health by prevention and diagnosis of diseases is healthcare and security. With the aid of diagnostic equipment such as CT, MRI, PET, SPECT etc., any ruptures or anomalies that are present deep under the skin are also diagnosed; it is also possible to detect such abnormal conditions such as heart attack, epilepsy, long before they occur. The steady growth in the population and also the unpredictable spread of chronic diseases among the masses have placed a strain on modern healthcare systems, and the demand for services from hospital beds to doctors and nurses is therefore extremely high. A solution is clearly needed to reduce the burden on healthcare systems while preserving the quality of health care at its optimum level. The Internet of Things (IoT) may be a possible solution for reducing healthcare system pressures and has thus been the primary focus of recent research.

IoT (Internet of Things) is a platform that offers solutions for reality using sensors, network connectivity, computation and big data. For optimum control and efficiency, these types of solutions and systems are built. IoT is a technology that has made advances in related technologies such as sensors, communications and computing. Any leaf node system capable of "sensing" environments that can compute and can be addressed through a wireless network by a network address that enables solutions to be built that map "real life" entities to a corresponding virtual entity. Using available communication technologies, these virtual objects can interact with each other and keep the "real life" individual updated about the state of "things". As part of this framework/solution, a control

Information Retrieval using Machine learning for Ranking: A Review

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Abstract. The Ranking is one of the big issues in various information retrieval applications (IR). Various approaches to machine learning with various ranking applications have new dimensions in the field of IR. Most work focuses on the various strategies for enhancing the efficiency of the information retrieval system as a result of how related questions and documents also provide a ranking for successful retrieval. By using a machine learning approach, learning to rank is a frequently used ranking mechanism with the purpose of organizing the documents of different types in a specific order consistent with their ranking. An attempt has been made in this paper to position some of the most widely used algorithms in the community. It provides a survey of the methods used to rank the documents collected and their assessment strategies.

1. Introduction

Ranking is the main issue in the area of information retrieval. To rank all the significant records from the given corpus for a given client question as per their pertinence is the focal issue in the field of Information Retrieval (IR).In machine Learning , for positioning relevance and similarity based on ranking “Learning to Rank “ approach is widely used. Learning-to-rank framework uncommonly utilizes the supervised machine learning algorithms and finds the best request of a rundown as indicated by their inclinations, rank or score [1]. Most of studies in learning to rank focused on generation of new model for different types of data’s and different applications such as recommendation system, Web information retrieval, pattern Matching. While creating models generate appropriate feature vector is important focusing area of in information retrieval. The use of machine learning approaches for ranking make it possible to find out relevance between the relevant documents in context of given user query and place them in order of their relevance on the top of first non-relevant document in the list. Machine learning models for ranking is categories into two types. First one is scoring function and second one type of loss function [2]. Scoring functions includes gradient boosting tree [3], neural net [4], SVM [5]. SVM and boosting trees mostly applied on multiclass classification problems. Neural nets are used in variety of Information retrieval task. Mostly preferred when data is very large. It used on document and query using distributed representation. Loss functions are used as integral part of learning to rank model. Most of ranking functions works for optimization of loss function. Various documents feature are accepted as input and generate appropriate score based on used model. This loss function approached divided into three different categories Pointwise approaches [6], pairwise approaches [4], and Listwise approaches [7]. Major challenges for leaning to rank algorithm are include first one is mismatched between correct order in training and actual rating which leads the generation of proper loss function for rating and for ordering

Heart disease prediction using data mining

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Abstract. There is huge amount of information accessible within the healthcare systems. But there do not exist enough analysis tools to mine uncovered, unusual but useful patterns in data. Data mining has been used successfully in various fields to discover hidden patterns and trends, alerting about the hidden anomalies in the data or simply helping in the decision making process. This paper how classification techniques in data mining can be applied for heart disease prediction. To predict and alert about any future coronary ailment in the patients techniques like Naïve Bayes, and Decision tree are applied and efficiency of these algorithms is compared. The dataset taken is Cleveland dataset with 14 attributes.
Keywords: Data mining, Naïve Bayes, Decision tree, health care systems, heart disease

1. Introduction

Heart diseases are one of the most prominent causes of death all around the world. It brings down the profitability of an individual and furthermore builds the costs on medical care. India has suffered huge financial loss due to heart related or cardiovascular diseases in last decade. Thus, feasible and accurate prediction of heart related diseases is very important.

In recent years, awareness to make use of the advancement of data mining technologies in healthcare systems is growing. Data mining is a process of discovering patterns and trends in large datasets using statistical methods, machine learning, and database systems. Knowledge extracted by data mining process is frequently utilized for different applications, for example healthcare services industry. This paper proposes automated technique for diagnosing heart infections dependent on earlier information. like symptoms, manifestations and body conditions of the patient. Different parameters that indicates the risk of heart illness, are smoking tendency, cholesterol percentage, any prior family history of heart diseases, lack of physical exercise, heftiness, and hypertension.
In recent years, healthcare industry generates great deal of knowledge about patients, their disease, treatments and so on. But the major issue faced by Healthcare industry is providing good quality of service. Quality of service refers to diagnosis of illness accurately and giving powerful medicines to patients. Poor diagnosis can prompt awful results which are unsatisfactory.

1.1. Overview of the Disease

The heart is critical organ of human body. It siphons blood to all aspects of human life systems. On the off chance that it neglects to work accurately, at that point the cerebrum and different organs will quit working and inside couple of moments the individual may pass on. Life is totally hooked in to

Analysis of AI techniques for healthcare data with implementation of a classification model using support vector machine

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Abstract. Artificial intelligence (AI) is imposed to impersonate human cognitive functions. AI Techniques are most popular across healthcare. The motive behind implementing an AI system is to make the system more fast and efficient. Now, AI can assist medical physician for fast and accurate diagnosis of diseases. When the time of deployment of the AI system will come then, systems need to be 'trained' for a huge amount of data will be generated from different clinical performance data. Now a day's data is available in a structured, unstructured and, semi-structured format. For supporting, retrieving results and knowledge from this data, its analysis using different AI techniques are available. This includes machine learning methods for structured data and unsupervised learning for unstructured data which is useful for retrieving features when the outcome for some subjects is missing. In this paper different conventional machine learning techniques used in healthcare, domains is analyzed using different data types. Also, a comparison of different methods used in Artificial intelligence fiction in the healthcare domain is explored. A flow from clinical data creation, through NLP data enhancement and Machine learning data analysis for making clinical diagnosis decisions and its predictions are discussed and implementation using a support vector machine (SVM) on the healthcare dataset consisting of the patient questionnaire isdone.
Keywords: Artificial intelligence, supervised learning, unsupervised learning, support vector machine, healthcare, machine learning, natural language processing,classification.

1. Overview of Medical Artificial Intelligence (AI) Research

Currently, artificial intelligence techniques are most popular across the healthcare domain for disease diagnosis and prediction. The motive behind implementing an AI system is to make the system morefast and efficient. Now, AI can assist medical physician for fast and accurate diagnosis of diseases. When the time of deployment of the AI system will come then systems need to be 'trained' as a huge amount of data will be derived from different clinical actions such as screening, images, patient history, and diagnosis treatment, and so on. The following given graph as shown in figure 1.1 represents the type of data considered for medical study using AI techniques, where the different data types are measured in the artificial intelligence literature. In the given graph comparison is given which is obtained through searching the diagnosis techniques in the artificial intelligence literature from the year 2013 to date and it is observed that the data of Diagnostic imaging is highly used for a

Combating Fake News with Computational Intelligence Techniques pp 327–343

Framework for Fake News Classification Using Vectorization and Machine Learning

Yogita Dubey, Pushkar Wankhede, Amey Borkar, Tanvi Borkar & Prachi Palsodkar

Chapter | First Online: 16 December 2021

Part of the Studies in Computational Intelligence book series (SCI,volume 1001)

Abstract

Fake news are widely offered in digital media to raise the visitors hit and in an offbeat, it acts on users emotions. The foremost ordinary example of such fake news throughout this pandemic, are the various remedies to cure covid. As a result of which individuals are unable to acknowledge any kind of genuine news. People try and attempt numerous things which will never help in curing this contagious disease. Moreover, it might lead to some other major health issues. In this paper, a framework is provided for the classification of news as fake vs real. Text data is pre-processed using

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Enhancement Techniques for Analysis of Satellite Images through ERDAS Software

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***Abstract*—With a view of accomplishing the needs for further analysis on image, Image pre-processing methods are applied on an image for its betterment. Image enhancement is a pivotal part in digital image techniques. The main objective behind image enhancement is to apply an algorithm to original image, so that the resultant image is well suited for a specific task. Digital image enhancement is apt in providing diverse methods for better visualization of image for purpose of object detection and recognition by the machine. Enhancement techniques help us to view the image more efficiently by integrating color and intensity in it. This paper provides detail analysis of different basic enhancement techniques like Min-Max Filter, Gaussian filter, Invert filter, Histogram equalization and Contrast stretching for enrichment of image using ERDAS software. After the analysis an enhanced image is achieved using histogram equalization due to the dynamic range of pixels can grow best for better visualization of an image for better analysis.**

Keywords—Enhancement Technique, Image Processing, Histogram equalization, Filtering Methods, Gaussian Method

I. INTRODUCTION

Image enhancement techniques are mathematical techniques which aim at improving the quality of a given image. Before processing the original data in an image, it is enhanced to improve its quality and preserve original information content in it. In image enhancement focus is on the image interoperability and perception of information, for human comfort. Various images and pictures are used to obtain information in day to day applications and in communication sector. Hence we can say that image acts as a source in providing information for performing a task. So it is important that an image has least number of anomalies in order to provide precise and correct information. When images are re-casted from one form to another they are encountered with noise, blurring, and loss of information. Thus to preserve the original content, image enhancement is performed with disparate techniques. Thus Image enhancement techniques are extensively used in medical image processing, satellite image processing, biometric image processing etc [1],[2].

Several existing work was studied to gain better understanding of the happenings in the field of object based image classification. This section illustrates few recent research work related to testing of various image parameters and their properties to detect the region of interest. G. Deng and L.W. Cahill [3] discussed an adaptive Gaussian filter algorithm which depends on the Hudson's work. There are two basic methods which is pre-process an image operating many other filters after that they reveled ends in this filtered images and another method create filter variation modify to the local characteristics of image. Andre Jalobenu et. al. [4] discussed that main contribution of an automatic image debluring algorithm based on an adaptive gaussian model. The proposed methods consist of two parts namely approximation by wavelet based method and adaptive de-convolution. Ian T. Young and Lucas J. Van Vliet [5] described various alternative and shown the simple forward and backward difference approximation .discuss implementation is the speedy and that outcomes in 2-D is isotropic. Omprakash Patel et. al. [6] discussed different histogram equalization based image enhancement method. This method is referred as recursively separated and weighted histogram equalization (RSWHE).

Kartika Firdausy et. al. [7] proposed two dimension still image which is represented in X×Y matrix form, where X and Y are the width and height of the image. The described method used to enhance the contrast of the image. P. W. Verbeek et. al. [8] presented analysis on min max filter. This paper has application of UPP = MIN(MAX) and LOW =MAX(MIN) which are termed as upper and lower envelope filters. A detailed analysis on ramp and non-ramp edges, ramp thresholding and texture thresholding along with texture details as well as ramp edges and texture edge detection was precisely presented. Also the yields of the Lee edge detector were found to be similar to the modulus of linear laplace operator. Raupneet Kaur Hanspal and Kishor Sahoo [2] proposed the technique for image enhancement that remain dimensional domain technique and density domain technique dimensional domain method are depend on the operation of orthogonal transform of the image.

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IoT based Smart Cafeteria Management System

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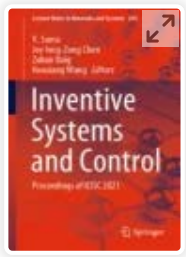
***Abstract*— Nowadays employees in the organizations are concerned about their cafeteria related problems which they are facing regularly in their workaday. The main purpose of the project contributes towards the ease and comfort attained by the employees even when they are away from the cafeteria such as at their work desks, cabins etc. This would help employees to book their seats in the cafeteria and place their orders from their work desk itself via an android application. The android application will show the occupancy and vacancy of the seats in the cafeteria. This will be done with the help of interfacing the IR Proximity Sensors with the microcontroller. The android application will also show a menu for the employees to place their orders. The application makes use of a Wi-Fi module which will be functioning through IOT (Internet of Things). The Wi-Fi module is used for the communication between the microcontroller and the server which in this case is Think Speak. The key feature is that this application will save time of the employees which they spend in the cafeteria by standing in long queues to have their food.**

Keywords*— *IR Proximity Sensors, Wi-Fi Module, Microcontroller, IOT, Think Speak.

I. INTRODUCTION

Online food delivery services play a vital role in the stirring the restaurant industry. Online food delivery system eases the life of restaurant industry and customer. It will provide online platform for ordering variety of foods from the different top restaurants. The emergence of digital tablets and user friendly touch screen technology can move to a whole new surface [2,4]. The Book my Show an online application is playing a decisive role in the development of E-Cinemas. In the book my show application, with the help of live tracking of vacant seats, booked seats of the movie hall the Revenue of the Film industry has boosted significantly [3]. The renowned hotels are using internet as a marketing tool for attracting the customers. The online mobile application will give all the services of hotel to the customers. Mobil application provides the flexibility to the hotel reservations [5]. The proposed application provides the rating of dish to the users. The application provides rating of dish with the help of optical character recognition. The AR system is used for projecting the rating of dishes to the users for superior user experience [6]. Online applications like Fasoos, Box8, Food panda, Beer café, Dominos, Just eat, Pizza hut Zomato, Swiggy are easy to use. All applications are vary user friendly and they are saving the money and time of the users [7,9]. The e food court application is based on the IOT technology. It provides sheltered and effective online food ordering amenities [8]. IOT technology is used for transmitting and receiving data from the other systems with the help of internet. IOT is use in many applications like smart homes, car parking system, medical and healthcare (IoMT). In the proposed system ESP12 Node MCU is acting as a brain of the system and the availability of slot is displayed on the LCD display unit [1]. By just the growing Internet the android application will book the seats of the employees in the cafeteria and will also place their orders. Once it is done the application will display the message: seat booked and order placed. The employees will verify the seat in the cafeteria before occupying it. The list of orders placed by



Inventive Systems and Control pp 867–876

A Novel Approach for Finding Invasive Ductal Carcinoma Using Machine Learning

Vaishali B. Niranjane, Krushil Punwatkar & Pornima Niranjane

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Abstract

Breast malignancy (invasive ductal carcinoma) is the commonest form of cancer found in women, and the fatality rate is high among them. Invasive ductal carcinoma diagnosis is a difficult task because it involves a doctor who scans the major diseases of the malignant region to ultimately identify high-risk areas. For quick detection of breast malignancy, there is a high scope of research in automated diagnostic system. Machine learning is an emerging field of science in data science that deals with how machines learn from experiences that eliminates human efforts and come up with advanced

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Color Image Segmentation using Fuzzy Histon

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***Abstract*—Fuzzy histon, an extension of histon, is a contour plotted on the top of the histograms of the color components such that the pixels with high degree of correlation are visualized as belonging to one singular value. In this paper, we propose a fuzzy histon roughness index based thresholding algorithm for the segmentation of color images. The quantitative evaluation of the proposed approach against the existing thresholding technique and Compression-based Texture Merging (CTM) algorithm proves its effectiveness.**

Keywords— histon, color image segmentation, roughness index.

I. INTRODUCTION

Image segmentation is a critical, yet essential preprocessing step in many applications in which an image is divided into a set of homogeneous regions such that the union of any two adjacent regions is non-homogeneous [1, 2]. The color image segmentation techniques may be viewed as combination of two or more approaches such as those based on statistical, region growing, thresholding, clustering, graph based, visual perception and those based on physical reference models [2, 3, 4]. Histogram based thresholding has been widely used as a tool for the image segmentation [5, 6, 7, 8]. This approach does not need any prior information of the image but, the drawback is that, it does not consider the spatial correlation of pixels with respect to each other. Whereas, in real-world images, there is usually a strong correlation among the pixels in an object [9].

The fuzzy histogram based techniques have been found more suitable for the segmentation of real world images as these techniques take into account the similarity of different colors from different bins and also the dissimilarity of the colors assigned to the same bin [10, 11, 12].

Mohabey and Ray [13, 14] proposed the concept of histon which is a contour plotted on the top of the histograms of three primary color components such that each bin contains all the points belong to the sphere of similar color with a radius denoted by a threshold value called expanse. Mushrif and Ray [15] proposed the Histon Roughness Index (HRI) measure by correlating the histogram and the histon with the lower and upper approximations of a rough set [16, 17]. The Roughness Index (HRI) measure incorporates both the color and the spatial information and thus, can be used for obtaining better thresholds for the segmentation [15, 18]. In histon, a pixel belongs to the set of similar color sphere only when the sum of the distances between a pixel and its neighboring pixels is less than a certain threshold called expanse. Thus the membership of a pixel to the set of similar color pixels is binary and the value of expanse i.e. the radius of the similar color sphere is chosen according to the psycho-visual analysis. Whereas due to high degree of correlation among the pixels in the real world images the membership of a pixel to the set of similar color pixels cannot be crisp.

We propose a concept of Fuzzy Histon where a sphere of similar color pixels is a complete universe and every pixel belongs to the set of similar color pixels to a certain degree depending upon on sum of its distances with the neighboring pixels. The Fuzzy Histon Roughness Index (FHRI) based thresholding approach is proposed for the segmentation of color images. The qualitative and quantitative analysis shows the effectiveness of the proposed algorithm.

II. CONCEPTS OF HISTON AND FUZZY HISTON

The histogram of an RGB image I, of size $M \times N$, for each of the R, G, and B components can be computed as:

$$h_i(g) = \sum_{m=1}^{M}\sum_{n=1}^{N} \delta(I(m,n,i) - g)$$
$$\text{for } 0 \le g \le L-1 \text{ and } i \in \{R,G,B\} \quad (1)$$

where $\delta(.)$ is the Dirac impulse function and L is the number of intensity levels in each of the color components.

The histogram does not consider the similarity across the different color bins and also the dissimilarity across these bins [11]. Fuzzy histogram, on the other hand, contributes to its specific bin and also to the neighboring bins of the histogram considering inter-color distance so as to incorporate the uncertainty and impreciseness of the color components [10, 12].

A fuzzy histogram of an image is may be defined as

$$f_i = \mu_c * h_i, \quad i \in \{R,G,B\} \quad (2)$$

where $*$ is a convolution operator and μ_c is the fuzzy filtering kernel [12]. The smoothing of the histogram by the fuzzy filtering kernel. ensures that each pixel's color influences all the histogram bins.

A. The histon and the fuzzy histon

The Histon [13, 14] is a graph plotted on the top of the histograms of the three primary color components of an image such that the set of all pixels whose intensities fall under the similar color sphere of the predefined radius belong to one single value. The histon value for every intensity is determined by adding the number of pixels that belong to the

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Design and Implementation of 111 MHz Frequency Compression Efficient CORDIC Based 2D-DCT using FPGA and its Power Performance

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***Abstract*: The new idea behind the CORDIC algorithm used for contemporary DSP applications is introduced in this work due to a very appealing and simple technique. This method not only reduces latency but also improves the throughput of output parameters and also reduces the complexity of 2D –DCT computations. This paper describes an FPGA-based CORDIC processor that provides an efficient area with low latency and high frequency. The DCT processor has sought to eliminate multiplication operations by increasing the amount of shift and addition operations using the CORDIC method to reduce the complexity of computation. Application such as Speech waveform 1D- DCT is a highly helpful application in Signal processing. This research provides the power performance study and FPGA implementation of the CORDIC algorithm work for 111.048 MHz frequency 2D-DCT using HDL simulation with the help of Xilinx ISE 14.7 and implemented it using Development board Altera Cyclone II.**

Keywords—1D-Discrete Cosine Transform, 2D-Discrete Cosine Transform, ATR, CORDIC.

I. INTRODUCTION

Forthcoming research on Discrete Cosine Transform i.e., DCT, which was proposed [1], has got more value in the field of Image Compression and video Compression. Nowadays, it is very useful for many international video and image formats like MP3, JPEG, MPEG, and H.264 in a compressed form.

The main requirement in the signal processing of both image and video with FPGA is as follows

- Data Compression at the output end
- Low computation complexity
- Less power consumption

CORDIC is Coordinate Rotation Digital **C**omputer which is called as a hardware efficient algorithm that has a beauty of it for the implementation of various powerful elementary, trigonometric as well as hyperbolic function such as sin, cos, tan,, sinh, cosh, tanh etc. Other methods like polynomial or rational functional approximation, which is slow in convergence, Look-up table requires an enormous memory, to achieve this CORDIC algorithm is used. As Compared to other CORDIC is a clear winner when hardware multiplier is unavailable and when we want to save the gates to implement. Now, based on this algorithm, one application of DCT is used in Digital signal processing i.e. Discrete Cosine Transform.

In most of the image-based applications, as many multipliers were used in DCT based algorithms for high speed [2] but more power is consumed in it. Hence use of a small number of multipliers used in Distributed Arithmetic based algorithm was proposed in [3]. A Distributed Arithmetic method for the computation of large data i.e., reconfigurable adder-based architecture, was proposed as the main complex calculations on many DSP applications [4]. In ROM-based DA architecture, the input signal vectors and process of quantization are broken such that the arithmetic operations get reduced. In this method of DA-based architecture has got some disadvantages for the number of inputs which increases the internal precision. A large size of ROM is required for such method, which increases the hardware complexity, power consumption and area.

The pipeline architecture was presented [4], uses algorithmic strength reduction technique, which has reduced the complexity in the computation of 1-D DCT with the decrease in power consumption.

In this paper, the novel idea is proposed to use the unfolded CORDIC architecture as parallel structure [5] because of its less power consumption and to reduce the complexity in the 2-D DCT for the signal processing of both the image and the video.

Section II included the basic CORDIC algorithm introduced by VOLDER in 1959, in which Unfolded and folded architecture is described. Section III includes the need of 2D-DCT algorithm along with the proposed architecture. The methodology and Simulation have been included in Section IV. Power Analysis along with the comparison table with other methodology is described in V section, which also includes the implementation on DE-2 board. Finally, the Results are concluded in conclusion along with the future work.

II. CORDIC ALGORITHM

Vector rotation is the basic mode for the implementation of CORDIC algorithm .It is the mode which can convert polar to rectangular and rectangular to polar form, for vector magnitude and applied in transforms like DFT and DCT [6]. In this method, vector rotation is used an arbitrary angle in the add and shift method.VOLDER, who is an inventor of this general rotation transform, has used this algorithm. If a

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IoT based Advance Pill Reminder System for Distinct Patients

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***Abstract*— When it comes to loved ones, humans strive to keep them fit and healthy at all times. But what if they forget to take their medicine and become ill as a result? Hence, many patients require medication at the health care center, and it is difficult for us to remind each patient to take medicine at a specific time. Traditional way requires lot of human effort to remind the patient to take medicine. But in this digital era, humans make use of machines to do certain works. Pill remainder has a wide range of uses, including use by patients at home, doctors in hospitals, and a variety of other settings. This paper presents a working of advance pill remainder setup, which can remove asymmetry in taking medicine dosages and remind the patient to take medicine at prescribed time and particular number of dosages. In this approach, the users are switching from human memory to automated supervision.**

Keywords*— *Pill-dispenser, ESP-8266, IR Sensor, Arduino Mega Microcontroller, Buzzer, LED.

I. INTRODUCTION

According to Census 2011, in india elderly people are approximately 10% of the total population. For better livelihood elderly people are highly depends upon technology and machines. Elderly people are likely to forget to take medicines on time due to their mobility. The main aim of the paper is to design the IOT based system for distinct patients which includes elderly people, Alzheimer patients to ease the life of the patients. The proposed system uses the IOT dependent system for Medicine Reminder. Bio sensors are used for monitoring different health parameters like temperature and heartbeat [1]. Pill remainder system for people suffering from dementia is proposed in this paper. AWS database is used for uploading data on the server [2]. The proposed system is based on the voice based medicine remainder system. The proposed system provided color based service selection process [3]. The model is useful to the elderly people for memorizing to munch their medicines without aid from anyone around them. In this era, Healthcare monitoring facilities requires a large amount of human effort and money [4-5]. Different sensors are used for capturing data related with human body, the data is stored in database for observing captured range of ECG and BP [6]. But if human forget about taking medicine, then it will generate irregularities, and this irregularity often leads to negligence and critical situations [7]. People are unaware about the damage imposed on human body by not taking medicine at the right time, leaving it midway or delaying intake, or even taking wrong dosages at wrong time [8]. Efficiency can be improved with the help automation technology. With the help of technology human errors can be avoided [9-11]. But taking medicine at right time is still not synchronized by modern technology. There are various programming languages are available for interfacing microcontroller, Wifi Module to the IOT system. Raspberry Pi uses python programming; it is very powerful programming language [12]. Android architecture consists of application layer, application framework, linux kernel, android runtime. It is well known operating system can be used for IOT device [13]. Zigbee is very important protocol in network application. It supports various network topologies like star tree and mesh network [14-15].

II. ADVANCE PILL REMAINDER

Figure 1 shows the block diagram of proposed system, it consist of Wifi module, ATMEGA, Sensors, LED, LCD, connectors and Buzzer. The Working consists of two parts, Application based and hardware based. In this the application part have the flexibility and option in which doctor schedules the dosage of medicine and have access to individual patient's name and details along with his

Analysis of Brushless DC Motor in Electric Vehicle

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***Abstract*—Energy management is a major gift to society in this era of conserving conventional fuels. Energy management is critical since it can extend the life of an electric vehicle's components. Energy management can help an electric car function better in a variety of ways. Electric vehicles, often known as battery electric vehicles, run entirely or partially on electricity. The analysis is the most effective method for extracting useful information from a set of data. As a result, it may be valuable in the design of an electric vehicle's control system. This article compares some statistical data to the vehicle's features and attempts to develop relevant outputs in this regard. It calculates electric vehicle data using relevant mechanical and electrical characteristics, resulting in the required outcomes. We can deduce from this study which motor type is best suited for electric vehicles.**

Keywords—Back EMF, BLDC Motor, Simulink, Torque, Tractive Force.

I. Introduction

Electric Vehicles are new future technologies that are alternatives to combustion engine vehicles. They are environmentally friendly and are considered as "Green Locomotives." It is one of the new ideas that can be used to reduce CO2 emissions. The essential component of an electric vehicle is its electric motor. How efficiently an E.V. can work will depend upon its motor performance. The motor performance will comprise of power performance and durability and safety of the motor. Through power performance, we can know how much maximum speed a vehicle can achieve in a particular interval of time. It can also tell us about how much inclination a vehicle can travel at a particular instance of time. The electric motor takes power from the battery and converts that power into mechanical power. Therefore, an Electric motor considers a vehicle's attributes entire in terms of speed, torque, power, current, voltage, and many more. The electric motor used for driving a vehicle should provide an adequate amount of torque and power to prevail overloads and unwanted forces acting on the vehicle. To check the vehicle's performance, the BLDC motor is taken into consideration. BLDC motor is an electronically commuted D.C. motor that does not have brushes. An electronic controller controls it. To see how this BLDC motor works under different conditions, the motor's analysis will be done by taking various parameters. Here we have mentioned some of the MATLAB simulation models based on the requirements of the data and, to observe the relations between various parameters.

II. Literature Review

Paper [1] designed BLDC motor analytically and analyzed using finite element analysis. To verify the characteristics mathematical modeling is done using MATLAB. On the basis of the vehicle dynamics, voltage balance, and rotor dynamic equations of BLDCM, a method for determining the modeling parameters of a motor was proposed to satisfy the power performance requirements of electric vehicles [2][5][10]. Parameter determination and power performance evaluation were established and analyzed. Paper [3] presents the analysis of recent developments done in brushless dc motors. On the basis of some parameters like torque, traction, grade ability and acceleration etc., the transmission system calculation of electric vehicle can be calculated easily [4].Paper [6-7] describes the procedure for proper selection of rating of electric motor with an example of Brushless DC motor for an electric car. Paper [8] presents one method of calculating the torque by considering required grade ability, acceleration and transmission system. In paper [9] by applying the statistical method of multiple linear regressions to real-world trip and energy consumption data for an EV three model for EV energy consumption prediction have been constructed. From [11] speed control of Brushless DC Motor paper develops PI & PID controller to verify the performance of BLDC motor. Paper [12-15] presents an overview which provides the status and future trends in electric vehicle technology. Also shown the importance of rapid development of electric motors, power electronics, microelectronics and new materials. Various electric drive systems and battery systems are compared.

III. Analysis of BLDC Motor

P.H. Trickey and T.G. Wilson introduced BLDC motors in 1962 for specific low-power applications. Robert E. Lordo designed the first high-power BLDC motor (i.e., 50 horsepower) at Powertec Industrial Corporation in the 1980s. A BLDC (Brushless DC motor) does not have the brush arrangement, but the commutation is done electronically as they are maintenance-free and have lower noise susceptibility and lesser power dissipation. The pulses of current are provided to the controller's motor windings, which control the speed and torque of the synchronous motor. Commutation with electronics has a broad scope of capabilities and flexibility. These motors are highly efficient in producing a

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Analysis of Brushless DC Motor in Electric Vehicle

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***Abstract*—Energy management is a major gift to society in this era of conserving conventional fuels. Energy management is critical since it can extend the life of an electric vehicle's components. Energy management can help an electric car function better in a variety of ways. Electric vehicles, often known as battery electric vehicles, run entirely or partially on electricity. The analysis is the most effective method for extracting useful information from a set of data. As a result, it may be valuable in the design of an electric vehicle's control system. This article compares some statistical data to the vehicle's features and attempts to develop relevant outputs in this regard. It calculates electric vehicle data using relevant mechanical and electrical characteristics, resulting in the required outcomes. We can deduce from this study which motor type is best suited for electric vehicles.**

Keywords—Back EMF, BLDC Motor, Simulink, Torque, Tractive Force.

I. Introduction

Electric Vehicles are new future technologies that are alternatives to combustion engine vehicles. They are environmentally friendly and are considered as "Green Locomotives." It is one of the new ideas that can be used to reduce CO2 emissions. The essential component of an electric vehicle is its electric motor. How efficiently an E.V. can work will depend upon its motor performance. The motor performance will comprise of power performance and durability and safety of the motor. Through power performance, we can know how much maximum speed a vehicle can achieve in a particular interval of time. It can also tell us about how much inclination a vehicle can travel at a particular instance of time. The electric motor takes power from the battery and converts that power into mechanical power. Therefore, an Electric motor considers a vehicle's attributes entire in terms of speed, torque, power, current, voltage, and many more. The electric motor used for driving a vehicle should provide an adequate amount of torque and power to prevail overloads and unwanted forces acting on the vehicle. To check the vehicle's performance, the BLDC motor is taken into consideration. BLDC motor is an electronically commuted D.C. motor that does not have brushes. An electronic controller controls it. To see how this BLDC motor works under different conditions, the motor's analysis will be done by taking various parameters. Here we have mentioned some of the MATLAB simulation models based on the requirements of the data and, to observe the relations between various parameters.

II. Literature Review

Paper [1] designed BLDC motor analytically and analyzed using finite element analysis. To verify the characteristics mathematical modeling is done using MATLAB. On the basis of the vehicle dynamics, voltage balance, and rotor dynamic equations of BLDCM, a method for determining the modeling parameters of a motor was proposed to satisfy the power performance requirements of electric vehicles [2][5][10]. Parameter determination and power performance evaluation were established and analyzed. Paper [3] presents the analysis of recent developments done in brushless dc motors. On the basis of some parameters like torque, traction, grade ability and acceleration etc., the transmission system calculation of electric vehicle can be calculated easily [4].Paper [6-7] describes the procedure for proper selection of rating of electric motor with an example of Brushless DC motor for an electric car. Paper [8] presents one method of calculating the torque by considering required grade ability, acceleration and transmission system. In paper [9] by applying the statistical method of multiple linear regressions to real-world trip and energy consumption data for an EV three model for EV energy consumption prediction have been constructed. From [11] speed control of Brushless DC Motor paper develops PI & PID controller to verify the performance of BLDC motor. Paper [12-15] presents an overview which provides the status and future trends in electric vehicle technology. Also shown the importance of rapid development of electric motors, power electronics, microelectronics and new materials. Various electric drive systems and battery systems are compared.

III. Analysis of BLDC Motor

P.H. Trickey and T.G. Wilson introduced BLDC motors in 1962 for specific low-power applications. Robert E. Lordo designed the first high-power BLDC motor (i.e., 50 horsepower) at Powertec Industrial Corporation in the 1980s. A BLDC (Brushless DC motor) does not have the brush arrangement, but the commutation is done electronically as they are maintenance-free and have lower noise susceptibility and lesser power dissipation. The pulses of current are provided to the controller's motor windings, which control the speed and torque of the synchronous motor. Commutation with electronics has a broad scope of capabilities and flexibility. These motors are highly efficient in producing a

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Mobile Internet based TELEDOCTOR CONSULTATION APP

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***Abstract*— Nowadays visiting doctor for even a normal consultation has been a thought of worry. Taking patients to doctor for normal consultation is still in practice. Sometimes family doctor advices to consult a specialist who is not from your town. So, it always a question whether to consult that doctor because it is a cumbersome process to move the patient. The aim of this project is to make the Doctor's consultation possible through video call. This will reduce the chances of getting affected by other patients when physically visiting the clinic. Also, can consult to any other specialist from different city which will reduce the pain of patient to physically visit the clinic for normal consultation. Mobile phones and computers are the Teledoc devices, and they can be accessed by no of peoples. Persons living in rural and urban areas who cannot directly connect with provider the facility should be improved. Caregivers can easily monitor the conditions of patient by these devices. Doctors can collect the information of patient and can give treatment to them without meeting physically to patients.**

Keywords — Diagnosis, Stepping foot, Mobile Internet, Teledoctor.

I. INTRODUCTION

A. Background

Teledoc is the data collection and transmission for providing medical treatment to patient by the use of different technologies without physical contact of doctor and patient. It also refers to the use of these technologies in the fields of medical education and clinical data management. The global pandemic has given a booster to the possibilities of Teledoc to stay relevant for times to come. There are new med-tech solutions that are being employed to help patients get easier access to medical services. Tele-doctor app aims to empower both patients and healthcare providers. It can be used in various real time applications which include medical consultation through video, telenursing. Tele-doctor app has the potential to become one of the most integral parts of the healthcare industry. This is supported by the Global Market which reports that Teledoc market will grow $38.3 billion to $130.5 billion by 2025.

B. Research Objective

The objective to carry this research is to design an application which help patients to direct contact with doctor with the help of mobile phones at any time and from anywhere without going directly to hospital and contacting directly with doctors. It reduces the time, and we can maintain distance between patients and doctors by not directly going to hospital.

II. METHODOLOGY

Consider if someone is not feeling better and the situations like covid 19 where no one wants directly to go to clinic if the conditions are not so serious there is no requirement to call ambulance but if by placing call in hospital and if lucky will get appointment easily but if it is the case that if not getting appointment to visit clinic or will get appointment after some days or a day latter but if are in need to take advice of doctor for family members health condition and if don't know any doctor who is in relation with family so at that time this app is very beneficial. For some normal condition where cannot go to doctor directly but want advice or initial medical treatment then through this app can directly make a call with doctor what the difficulty related to health are facing. Health problem can be shared with doctor. With the information provided and with some question and answer doctors can provide medicines to patients.so by using this app there is no requirement to remember any appointment by using any calendar or smartphone or don't have to remember appointment all day. patients can save travelling time as it is not necessary to visit to clinic and for some cases will get immediate actions through this app from doctor.

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Intelligent Healthcare

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Intelligent Vehicle Tracking System for Motorcycle Racing Competition

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***Abstract*—The purpose of the paper is to design a novel device for tracking the vehicle during motorcycle racing. In motor cycle racing, vehicles are supposed to follow a fixed path given by race organizers. Any deviation from fixed path should be detected and participant committing mistake will be disqualified. However, to keep track on the number of vehicles manually at various check points is tedious job. To solve this problem, this paper has proposed a system to track the vehicle and find out whether the vehicle is following the fixed path or not. Apart from this, the proposed model also provides the security button, which will be activated in case of accident.**

Keywords—vehicle trackin;zigbee;globle positioning system;

I. INTRODUCTION

This paper is focused on system designed for tracking the vehicle of person taking part in motorcycle racing. In most of the tracking system GSM and GPS are the two basic component used for tracking. In [1] authors proposed a tracking system based on GSM and GPS. Coordinates of vehicle given by GPS module is sent by GSM module to remote place, where person or agency needs to track a vehicle. In [2] authors developed antitheft system using fingerprint sensors.GSM module along with GPS module is also used for designing antitheft system [3].Google map is most commonly used for tracking vehicle along with GSM and GPS module[4].GSM and GPS are combine used for providing solutions to many problems in commercial vehicles. In [5] GSM and GPS are combine used for tracking inter-city buses. Kalman filter is also used to consider the delay because of climate change along with GSM and GPS module to predict arrival time of vehicle [6].Many developers have used Zigbee network instead of GSM module to transmit the data [7][8].In [9] authors proposed use of GSM and GPS modules along with another sensors to form a kit which can be used to track a vehicle as well as can be used for investigation in case of accident. Dan Song et al in [10] proposed multivehicle tracking algorithm which uses car following model (CFM) into tracking mechanism. In [11] author has proposed use of array of multiple camera and used Multi-perspective Tracking (MPT) framework for intelligent vehicle. In [12], authors have proposed the use of RADAR and vehicle-to-vehicle (V2V) communication technology. In [13] authors have used partial filter to track a vehicle in a video. To detect the lane of vehicle in different illumination condition the algorithm is proposed in [14]

I. METHODOLOGY

Basically tracking can be classified into two categories. First is GPS based tracking system and another is camera based tracking systems in which vehicle of interest has to be detected in every frame of recorded video or real time video. Detecting object of interest in a video especially in complex background is tedious job and requires complex algorithms to meet the challenges like change in the appearance of object and change in illumination conditions. As compared with camera based tracking system, GPS based tracking systems are easy to implement and therefore GPS based tracking is employed in the proposed system.

To make any competition fair, proper authentication of the participant is necessary. For authentication of a person, biometric sensor is used. Data obtained after biometric scanning i.e. thumb print is compared with the thumb print, which was given by the candidate at the time of filling an online form. Still, this does not really eliminate the chances of any fake person to go for further process. To deal with it, another biometric scan of candidate will be done before driving race just near the arena

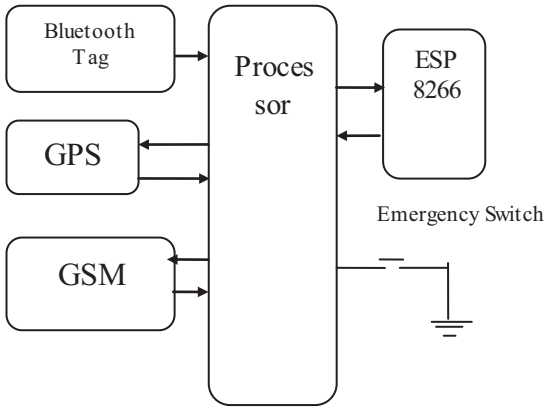

Fig. 1. Block Diagram of Hardware to be Carried by Vehicle

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Industry Monitoring System

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***Abstract*—Humans cannot operate the loads concurrently in the industries. So, with the help of rapid technologies, they can resolve the problems. This particular paper discusses a way to operate load at a time in industries. The system strives to make use of ZigBee along with the microcontroller to upgrade the industrial monitoring standard. To perform the existing regular monitoring purpose efficiently, this method employs the ZigBee wireless technology for remote monitoring. Several sensors are deployed in our project to monitor industrial parameters like temperature, current, voltage, etc. If there is any problem with the load, they will be cut off and the necessary information will be conveyed through the ZigBee to the server. The application of the ZigBee is combined with a microcontroller and hence the industrial measurements constitute an efficient innovative technology. Performing wireless and wired computing measurement and monitoring, this technique can do correct and methodical monitoring operations. Parameters were carefully selected based on the potential hazards which can help in the normal working of the industrial machines.**

Keywords—Sensors, PIC microcontroller, Zigbee Wireless Networks

I. INTRODUCTION

This paper tries to shed light on the regulation of load in industries by presenting a comparison between several wireless sensor system configurations for recording various physical parameters. In this system transfer of parameter data from a sensor element to a receiver, the element is achieved wirelessly, where the sensor element is composed of a sensor(s), microcontroller, and a radio transceiver, and the receiver has a receiving set attached to a Zigbee module via a microcontroller for the acquisition of data in real-time. A low-rate "IEEE 802.15.4/ZigBee standard" is used to predicate the wireless transmission between the receiver and sensor elements. A configuration with several sensors is connected by wire to a wireless sensor element.

We aim to develop a system that can monitor the sensor data, upload it on the internet and take crucial industrial decisions. Considering all the pros and cons of other microcontrollers we have selected the foremost beneficial microcontroller that is 'PIC 16F877A as it provides the least amount of delay in turn making our system more advantageous. This microcontroller has an operating speed of a maximum of 16 MHZ, voltage (2-5.5v), and its memory comprises of flash program RAM, EEPROM, and Data Memory. The program is designed to read the worth of the sensed data without much delay. Embedded C is used to complete the microcontroller program for control units.

Considering the facility factor, we've come up with a system with the tiniest amount of power consumption. Systems available in markets these days focus mainly on monitoring various types of equipment in case of any discrepancies these systems indicate the authorized person who later tries to solve the issue manually, making the physical presence of an individual necessary. Keeping this in mind we designed a system that can notify the user if the parameters like voltage or current exceed or deceed within the circuit, resulting in reduced instrumental damages.

In any economic controlling and monitoring system communication plays a crucial role. In wired communication systems the process of wiring and other configurations increases the complexity of the system. On one hand, thus the introduction of wireless systems industries proves to be advantageous by reducing the complexities faced by wired communication systems but on the other hand, their cost

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Urban Change Detection and Analysis of Symbiosis University Nagpur, India Based on Remote Sensing Techniques

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***Abstract* — Remote sensing is basically the method of detection of the physical parameters of a specific area along with that it also monitors the area by measuring the radiation parameters from satellite. The cameras are designed to gather remotely sensed images, which are used to sense things of the earth's surface. Like the cameras on the satellites and the airplanes takes pictures of the different area, allowing us to get every minute detail about it. Now, change detection is the process to identify the changes or differences in various parts of land characteristics at different intervals. This process can be carried by manual observation or by the use of remote sensing software. Because of the rapid urbanization there has been a significant impact on resources and urban environment. But with the use of high quality multi-spatial and multi-temporal remote sensing data, it is quite easy to possibly observe the changes in the urban environment. Therefore, the given study aims to quantify changes in the urban area of Symbiosis University Nagpur, Maharashtra India using Land satellite image. These changes of urbanization are detected by satellite images of Land-Sat MSS in march-2016, march-2018 and may-2020 using a geographic information system (GIS). The change of urbanization in Symbiosis University is for building, road, garden and ground are 17.35%, 20.71%, 1.65% and 0.89% respectively and the total change is 43.51%. From this change we will receive the taxes as per its ongoing construction and it will be easy for government.**

Keywords – Mobility patterns, K-means, GIS-image resolution, digital image processing, remote sensing, image classification, image thresholding, mapping of images etc.

I. INTRODUCTION

The satellite data is generally a high-resolution data with meters of spatial resolution. This data is often obtained simultaneously in panchromatic and multispectral mode with significant share of spectral bands covering infrared optical spectrum while some other satellites collects data in few weeks. Some modern satellites acquire data according to the customer's need. But in both the cases we get the archives of data having all the images since the launch of the satellite. The units on road are at a fixed distance with certain amount like to the access point in different wireless networks. And the infrastructure network is made of arbitrary set of wireless nodes with cooperation [1]. There are certain protocols which establish a communicating path in between source and destination as per [2]. In similar way nowadays one vehicle can communication with other along with the infrastructure also by developing hardware and software. These may provide various services with safety to the passengers [3]. The modernization in these wireless techniques has modified the life and also made opportunity to visualize the surrounding [4The enhancement depends on the quality of the pictures captured by the camera if the images are better, then better is the enhancement possibility [7]. There are various types of cameras which can be used to capture raw files. Similarly, in change detection these techniques can be utilized to get the detection and identification of the various changes occurred. Because of the expansion in urban areas that is acceleration of urbanization, the most important is to detect various changes in the atmosphere. Change detection will compare the satellite images at various time intervals. The urban sprawl detection as in (Symbiosis university, Nagpur, Maharashtra-440008) involves the following steps: 1) Selection of proper area for the purpose of study of urban change detection. 2) Selection of proper resolution satellite yearly raster images for the analysis. 3) Pre and Post Processing of raster images. 4) Mapping of the images and calculating the area of the images. 5) Yearly detection of change in images and its spatial analysis and get the results.

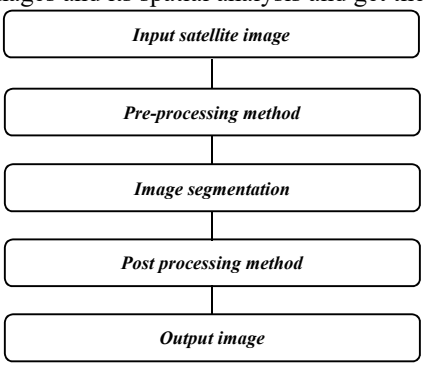

Fig. 1. Flow chart of Image processing methods

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IoT based Advance Pill Reminder System for Distinct Patients

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Abstract— When it comes to loved ones, humans strive to keep them fit and healthy at all times. But what if they forget to take their medicine and become ill as a result? Hence, many patients require medication at the health care center, and it is difficult for us to remind each patient to take medicine at a specific time. Traditional way requires lot of human effort to remind the patient to take medicine. But in this digital era, humans make use of machines to do certain works. Pill remainder has a wide range of uses, including use by patients at home, doctors in hospitals, and a variety of other settings. This paper presents a working of advance pill remainder setup, which can remove asymmetry in taking medicine dosages and remind the patient to take medicine at prescribed time and particular number of dosages. In this approach, the users are switching from human memory to automated supervision.

Keywords— Pill-dispenser, ESP-8266, IR Sensor, Arduino Mega Microcontroller, Buzzer, LED.

I. INTRODUCTION

According to Census 2011, in india elderly people are approximately 10% of the total population. For better livelihood elderly people are highly depends upon technology and machines. Elderly people are likely to forget to take medicines on time due to their mobility. The main aim of the paper is to design the IOT based system for distinct patients which includes elderly people, Alzheimer patients to ease the life of the patients. The proposed system uses the IOT dependent system for Medicine Reminder. Bio sensors are used for monitoring different health parameters like temperature and heartbeat [1]. Pill remainder system for people suffering from dementia is proposed in this paper. AWS database is used for uploading data on the server [2]. The proposed system is based on the voice based medicine remainder system. The proposed system provided color based service selection process [3]. The model is useful to the elderly people for memorizing to munch their medicines without aid from anyone around them. In this era, Healthcare monitoring facilities requires a large amount of human effort and money [4-5]. Different sensors are used for capturing data related with human body, the data is stored in database for observing captured range of ECG and BP [6]. But if human forget about taking medicine, then it will generate irregularities, and this irregularity often leads to negligence and critical situations [7]. People are unaware about the damage imposed on human body by not taking medicine at the right time, leaving it midway or delaying intake, or even taking wrong dosages at wrong time [8]. Efficiency can be improved with the help automation technology. With the help of technology human errors can be avoided [9-11]. But taking medicine at right time is still not synchronized by modern technology. There are various programming languages are available for interfacing microcontroller, Wifi Module to the IOT system. Raspberry Pi uses python programming; it is very powerful programming language [12]. Android architecture consists of application layer, application framework, linux kernel, android runtime. It is well known operating system can be used for IOT device [13]. Zigbee is very important protocol in network application. It supports various network topologies like star tree and mesh network [14-15].

II. ADVANCE PILL REMAINDER

Figure 1 shows the block diagram of proposed system, it consist of Wifi module, ATMEGA, Sensors, LED, LCD, connectors and Buzzer. The Working consists of two parts, Application based and hardware based. In this the application part have the flexibility and option in which doctor schedules the dosage of medicine and have access to individual patient's name and details along with his

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Study on ARM9 – Linux Kernel

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ABSTRACT

The Linux Kernel is supported by ARM9. It is preferable to load the Root File System (RFS) using Network File System on a development system (NFS). Several pieces of software are involved to boot a linux kernel on SAM9 products. First is the ROM code which is in charge to check if a valid application is present on supported media (FLASH, DATAFLASH, NANDFLASH, and SDCARD). The linux boot procedure for SAM is subdivided into various steps, as shown below. The linux boot procedure is shown in Fig. 1.

1. Boot Program - Check if a valid application is present in FLASH and if it is the case download it into internal SRAM.
2. AT91Bootstrap - In charge of hardware configuration, download U-Boot binary from FLASH to SDRAM, start the bootloader
3. U-Boot - The bootloader, in charge of download kernel binaries from FLASH, network, USB key, etc. Start the kernel.
4. Linux kernel - The operating system kernel.
5. Root File system - Contains applications which are executed on the target, using the OS kernel services.

Keywords: Linux kernel; Network File System (NFS); Root File System (RFS); U-boot.

1. INTRODUCTION

The Linux Kernel is supported by ARM9 [1-7]. The firmware for the ARM9 processor was written in the Embedded C programming language [6-14]. As a result, the first and most important duty is to instal Embedded Linux with the GCC compiler on the ARM9 processor.

Several pieces of software are involved to boot a linux kernel on SAM9 products. First is the ROM code which is in charge to check if a valid application is present on supported media (FLASH, DATAFLASH, NANDFLASH, and SDCARD). The boot sequence of linux for SAM is done in several steps as given below in Fig. 1.

The actual linux boot up procedure can be understood from following steps

1. Processor comes out of reset and branches to the ROM startup code.
2. The ROM startup code initializes the CPU and memory controller, performing only minimal initialization of on-chip devices, such as the console serial port to provide boot diagnostic messages. It also sets up the memory map for the kernel to use in a format that is consistent across platforms, and then jumps to the boot loader.
3. The boot loader decompresses the kernel into RAM, and jumps to it.

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Self-Organized Deep Learning: A Novel Step to Fight Against Severe Acute Respiratory Syndrome

Shubhangi Rathkanthiwar

1 Introduction

The COVID-19 pandemic poses major challenges particularly in densely populated countries like India, which tackles with existing problems such as mediocre health infrastructure, poverty, and illiteracy. These issues are significantly hampering the processes of detection, testing, isolation, and quarantine, which are quite essential for decelerating the proliferation of COVID-19. Patients diagnosed "positive" with this virus pose a foremost threat of infection spread to every person coming directly or indirectly in their proximity such as doctors, nurses, and family members, despite an appropriate use of personal protective equipment (PPE). Through the proposed project, we wish to arrange an equipment which will be not only helpful for elucidation for Corona patients, but will also be an end-to-end medico engineering solution for saving every Corona warriors, involved in providing courageous and chivalrous field services.

Overall Theme

The proposed work in this project, "COROBOT," revolves around developing a cost-effective Robot and associated kit(s) to provide a "contactless" alternative to regular services to patients diagnosed with COVID-19. The main motivation behind this project is the point-of-use provision of necessities to patients while ensuring the suppression of risks associated with person-to-person physical interaction. Our

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Combating Fake News with Computational Intelligence Techniques pp 327–343

Framework for Fake News Classification Using Vectorization and Machine Learning

Yogita Dubey, Pushkar Wankhede, Amey Borkar, Tanvi Borkar & Prachi Palsodkar

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Abstract

Fake news are widely offered in digital media to raise the visitors hit and in an offbeat, it acts on users emotions. The foremost ordinary example of such fake news throughout this pandemic, are the various remedies to cure covid. As a result of which individuals are unable to acknowledge any kind of genuine news. People try and attempt numerous things which will never help in curing this contagious disease. Moreover, it might lead to some other major health issues. In this paper, a framework is provided for the classification of news as fake vs real. Text data is pre-processed using

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Implementation of A Semi-Automatic Approach to CAN Protocol Testing for Industry 4.0 Applications

From the book Advances in Industry 4.0

Sandeep Kakde, Pavitha U S, Veena G N and Vinod H C

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Abstract

In this work, unit testing is done for CAN protocol between two systems in power train i.e., dosing control unit and selective catalytic reduction, by using polyspace and RTRT Tools. In the first phase of the testing, static unit test can be done by using polyspace tool. Polyspace tool can be used to debug the bugs that may occur during run time at early stages. Polyspace provides more tool errors. This drawback can be overcome in S- Function. Functional unit testing of power train system can be done with the help of S Function. For all the auto coded modules, the S-function Unit testing process has been widely accepted and it has been observed significant benefits in the areas of quality as well as the efficiency in the Unit testing stage. The runtime errors can be identified

Proceedings of Second Doctoral Symposium on Computational Intelligence pp 535–544

Packet Scheduling Algorithm to improvise the Packet Delivery Ratio in Mobile Ad hoc Networks

Suresh Kurumbanshi, Shubhangi Rathkanthiwar & Shashikant Patil

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Abstract

Due to recent advances in wireless communications technologies and its changing demand in mobile ad hoc networks, it is needed to design energy efficient network. These networks are autonomous and continuously monitored using various sensors creating IOT hub. Due to network scalability and irregular connectivity, it may face issues of limited battery power and sharing bandwidth among users. Improving packet delivery of mobile networks and with less power is always a challenging task. This paper suggests novel packet scheduling algorithm to improvise the packet delivery of network. In this

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Smart Washroom Cleaning System Using Hub Technology

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***Abstract*— The paper on smart washroom system is based on an innovative concept using hub technology to maintain cleanliness and hygiene of the toilet. The entire public toilet in government organizations, banks, institutes, etc. Should be clean, hygienic, and odorless.The prime minister of India NarendraModi following the path of Mahatma Gandhi Swacha Bharat Abhiyan on 2nd Oct 2015 to keep the surroundings clean and aware people of the cleanliness. Keeping the toilet uncontaminated is one of the priority factors and objectives of this paper, under the Swacha Bharat scheme. In the future, this paper will be used everywhere, where requires using digital technology. This system creates awareness among the people about toilet management. This paper is based on ATMEGA-328p, IR sensor, RF module, odor sensor, GSM module.**

Keywords*— *IR-InfraredRay, RF-RadioFrequency,GSM-Global System Module.

I. INTRODUCTION

A. Overview

Advances are unquestionably being made in the cutting-edge world, but our nation's cleanliness is being jeopardized. The major goal of this article is to provide clean and sanitary restrooms. The majority of infectious diseases are spread in public places. As a result, public restroom hygiene must be maintained. This is challenging work because public locations are used by a big number of people, and it is nearly impossible to know whether the washroom is clean even after periodic inspections.

Existing washroom cleaning procedures are traditional, which means that an audit is performed regularly and the washroom is cleaned if it is discovered to be dirty. This strategy, however, is not a viable option. Our research attempts to solve this challenge by developing a sensor-based module with many sensors. The data collected by these sensors is fed into a processor, which compares it to predetermined levels of gases such as ammonia, methane, and carbon monoxide. Given the numerous gases present inside a dirty washroom, the system might benefit from extra sensor inputs. An alarm is delivered to the maintenance crew when the value of a combination of gases exceeds a certain threshold. Thus this system will be able to bring in accountability and also provide better sanitation facilities to the common man. This paper can ensure the responsibilities of the sweeper.

Finally, this concept is one of the stepping stones to the "clean and disease-free India". Therefore, we are trying to introduce a new system "smart washroom cleaning system using hub technology". This system is based on the hub technology concept using a different sensor like odor sensor, IR sensor, RF module, GSM module. Using this we are stepping forward to keep the toilets clean and create awareness of cleanliness among the people.

B. Motivation and Problem Formulation

The public toilets are not clean and hygienic in our country. In India, the public healthcare sector is owned by the government and is highly subsidized, but the quality of care, personnel, and facilities are far from satisfactory. The sweepers are not performing their duty on time. The public washroom is not clean so they arise many diseases, as they are kept by the people so this area to be clean so that In India due to lack of education people do not have enough knowledge of maintenance and using the toilet. The public washroom remains perceptually dirty because the user doesn't flush water after using the toilet.

People do not show the same level of concern when it comes to keeping the public sanitation system clean has the show towards the ones at their home. One of the reasons for this is that people do not bother to clean up after they use the toilet. And it may increase the bacteria level high. This project helps to clean the toilet to avoid many diseases.

II. RELATED WORK

All public restrooms should be clean and sanitary. Our government has implemented the "Swatch Bharat" scheme in our country (Clean India). One of the Clean India scheme's goals is to keep toilets free of contamination. This report may be useful in promoting the Clean India initiative. It has the potential to play a significant role in the Clean India initiative in the future. They are primarily concerned with recognizing the dirt in the toilets under the current system. In our proposed approach, we've decided to maintain the restrooms clean by watching the sweeper's activity. It is capable of avoiding a variety of syndromes. It has the potential to raise public awareness regarding toilet management. Therefore, our development is to use safe and

Advances in Civil Engineering and Infrastructural Development pp 427–436

Impact of Micronutrients on Bioenergy Production with Addition of Animal Dung—A Pilot-Scale Study

Harshal M. Warade ✉, Ramesh A. Daryapurkar & Prashant B. Nagarnaik

Conference paper | First Online: 14 November 2020

Part of the Lecture Notes in Civil Engineering book series (LNCE,volume 87)

Abstract

Day by day energy issues are concentrating focus of the world's most of the nations due to limited production in crude oil [1, 2]. Bioenergy in the form of biogas is a suitable option for fulfilling this energy crises in rural areas because of the easy availability of raw substrates [3]. The focus of the current experimental study is to access in the generation of biogas and improve its production by adding some micronutrients along with its combination. Floating drum digester which has fixed in brick masonry chamber having a size of 2 m^3 in volume was used for the study. 20 kg cow

Proceedings of the Indian Geotechnical Conference 2019 pp 169–179

Analysis of Physical Modeling of Cast-In-Situ Concrete Piled Raft

J. M. Raut ✉, S. R. Khadeshwar & S. P. Bajad

Conference paper | First Online: 30 April 2021

Part of the Lecture Notes in Civil Engineering book series (LNCE,volume 133)

Abstract

Nowadays, there is competition for constructing high rise buildings, and the reason may be due to decreasing availability of land due rapid industrialization and urbanization. This has increased heavy load, complicated stress conditions, and having limitation of bearing capacity of soil. This results in settlement of high rise buildings. This leads to use of piled raft foundation. But the load-bearing capacity of piles is not considered, they are used as settlement reducers only, and load is carried by raft only. In another design method, axial capacity of the piles to carry the structural load and bearing capacity of raft is neglected. In both the design approach, piled

Proceedings of the Indian Geotechnical Conference 2019 pp 483–492

Shear Strength Behavior of an Unsaturated Clayey Soil

P. B. Pande ✉, S. R. Khandeshwar & S. P. Bajad

Conference paper | First Online: 04 May 2021

Part of the Lecture Notes in Civil Engineering book series (LNCE,volume 134)

Abstract

Recently, the study of shear strength of unsaturated soil is gaining more interest in research and practice. In this study, the triaxial shear test and filter paper method were undertaken to study the shear strength behavior of unsaturated soil. The clayey soil from central India was tested to understand the unsaturated shear strength behavior. The shear strength behavior was analyzed by plotting relationship between shear strength (τ) versus matric suction ($u_a - u_w$). The failure envelope resulting from relationship between the shear strength and matric suction shows nonlinear behavior and provides the shear strength parameter with respect to suction ($\emptyset^b$). In this

Advances in Civil Engineering and Infrastructural Development pp 579–590

Review of Experimental Techniques for Evaluating Unsaturated Shear Strength of Soil

P. B. Pande ✉, S. R. Khandeshwar & S. P. Bajad

Conference paper | First Online: 14 November 2020

Part of the Lecture Notes in Civil Engineering book series (LNCE,volume 87)

Abstract

Shear strength is the noteworthy engineering property of soil governing various geotechnical terminologies. Conventional shear strength apparatus and procedures are merely suitable for testing saturated or dry soil. Researchers and practitioners brought the usage of unsaturated shear strength in the respective arenas. Numerous experimental procedures are developed in last few decades to evaluate the shear strength parameters including suction of an unsaturated soil. Most of these methods are complicated, time consuming and expensive. In this concern, the present paper reviews various equipment and experimental

Advances in Civil Engineering and Infrastructural Development pp 3–13

Analysis of Tall Building Using IS 16700-2017 and ASCE 7-10

Deepika Nair ✉, S. P. Raut & S. V. Denge

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Part of the Lecture Notes in Civil Engineering book series (LNCE,volume 87)

Abstract

With the increase in population, the lack of space in cities becomes the main issue. Due to this limitation in space, the constructions of tall or high-rise buildings have become the necessity of time. The design criteria for high-rise buildings are very complex in comparison with low- and mid-rise buildings. When a tall building is considered, it is exposed to static as well as dynamic loading. The life of a tall building is affected by various parameters such as bending, shear, torsion and drifts, and these effects have to be considered while analyzing and designing it. Each country develops its own codes and standards for analysis and design. Till date, the high-rise constructions in India

Advances in Civil Engineering and Infrastructural Development pp 43–49

Utilization of Cupola Slag as a Sustainable Construction Material

S. S. Meshram ✉ & S. P. Raut

Conference paper | First Online: 14 November 2020

Part of the Lecture Notes in Civil Engineering book series (LNCE,volume 87)

Abstract

The present paper reviews the experimental characterization of cupola slag as a pozzolanic binder. Chemical composition of cupola slag was investigated using XRF scan. From the chemical composition, it can be indicated that the constituents of cupola slag is comparable to the other cementitious materials. Its use in production of building blocks is advantageous. The present paper explores various optimum percentage replacement level of cupola slag in the concrete and mortar.

Keywords

Cupola slag (CS) **Characterization**

Advances in Civil Engineering and Infrastructural Development pp 709-717

Performance Evaluation of Rubberized Concrete with the Use of Steel Fibers

Dhiraj Agrawal ✉, U. P. Waghe & S. P. Raut

Conference paper | First Online: 14 November 2020

Part of the Lecture Notes in Civil Engineering book series (LNCE,volume 87)

Abstract

The worldwide use of concrete is second only to the water, as the demand of concrete increases; the requirement of its constituents also increases. Most of the developing countries like India are facing acute shortage of coarse and fine aggregates as they are natural resources to be used in concrete. To fulfill the demand of these materials, there is need to invent an alternative for coarse and fine aggregates but while inventing the alternative, it should be kept in mind that the alternatives must be from industrial or agricultural waste available at a very cheaper rate or available for free. Due to the evolution in automobile industries, there is remarkable increase in the production of waste tires

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Comparative study of synthesis method on dielectric properties of ceramics of binary composition 0.6PMN–0.4PZN

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ABSTRACT

It is demonstrated that the dielectric properties of ceramics in the 0.6PMN–0.4PZN system have been studied as a function of different synthesis method at various temperatures. A detail and systematic study of phase, grain size and dielectric properties has been carried out by using X-ray diffraction, SEM techniques and dielectric measurement. Our analysis revealed that the optimum results were obtained for ceramics synthesized by columbite method as compared to combustion. The maximum dielectric constant was found to be 25,300 with Tc 46 °C at 100 Hz by columbite method whereas 17,449 with Tc 43 °C at 100 Hz by combustion method. The article concludes with the brief discussion of promising method with acceptable relaxor behavior.

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KEYWORDS
Comparative; crystallographic; perovskites; micro structure; dielectric properties

Introduction

With the fast development of the power electronics, dielectric materials with high energy storage density, low loss and good temperature stability are strongly desire for the potential applications in capacitors [1].

Lead based pervoskite ferroelectric relaxors like lead magnesium niobate $Pb(Mg_{1/3}Nb_{2/3})O_3$ (PMN) and lead zinc niobate $Pb(Zn_{1/3}Nb_{2/3})O_3$(PZN) are attractive candidates for applications such as multilayer ceramic capacitors (MLC), actuators and medical ultrasonic transducers due to its high dielectric constant, broad dielectric maxima, high electrostrictive strain response and relative low firing temperature[2–4].

Current study was focused on dielectric characterization of ceramics of binary compositions 0.6PMN–0.4PZN synthesized by columbite (M-I) and combustion method (M-II). Both methods claimed pervoskite phase formation from X-ray diffraction (XRD) studies but dielectric behavior varies considerably from method to method and under such condition microstructure examination of ceramics proves useful. The objective of this work was to study the effect of synthesis process on dielectric properties of PMN–PZN and to get dense ceramic with single phase perovskite at lower sintering temperature exhibiting high value of relative permittivity and low loss with *Tc* near RT most suitable for MLC and electrostrictive applications.

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FTIR spectral analysis of glycine doped ammonium dihydrogen phosphate (ADP) crystal

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Abstract. Ammonium Dihydrogen Phosphate crystals doped with Glycine (GADP) has been grown by slow evaporation method, Rotation method and Sankaranarayanan - Ramasamy (SR) methods with different molar concentration. The Fourier Transform Infra-Red (FTIR) studies have been investigated on the as grown GADP crystals. The FTIR spectrum shows the interaction between ADP and the dopant by the additional peaks which corresponds to the functional groups of Glycine. The standard spectrum statistics of FTIR confirms the presence of all the functional groups. The spectrum for ADP crystals doped with Glycine grown by Rotation and SR methods have similar peaks with slight variation as that of conventional slow evaporation method grown Glycine doped ADP crystals.

1. Introduction

Crystal growth is an elementary component of material science and engineering. The immense majority of work done on crystal growth has been concerned with practical methods rather than with hypothetical investigation. Advancement in the growth of crystal is extremely needed for the production of higher efficiency PV cells for surrogate energy. Crystals of an appropriate dimension and precision are essential for initial data acquirement and for devices used for practical purpose such as IC's and sensors etc. Adding tiny formerly prepared crystals offer nucleating sites to the prepared solutions. Single seed crystal would results in the crystal of larger size [1-2]. Depending on the phase conversion method, techniques of crystal growth can be classified as growth from solid, vapour, melt and solution [3]. The various methods of solution growth are studied by many researchers [4]. As the crystal growth is conceded at the room temperature, the structural impurities in the crystals grown by solution method are quite less [5].

Ammonium Dihydrogen Phosphate crystals have been extensively used as the 2nd, 3rd and 4th harmonic generators for different laser applications which require short pulses of laser. ADP crystals have found many applications in Nonlinear optics, electro-optics, and transducer devices. It is also used as Monochromator in X-ray fluorescence investigation. Numerous researchers have studied properties of pure and doped Ammonium dihydrogen phosphate crystals [6-7]. Amino acids with various molar concentrations have been used as an additive to grow ADP crystals [8]. Glycine (NH_2CH_2COOH) is considered to be the simplest amino acid among the 20 protein amino acids. In this research module; we have used amino acid Glycine as an additive in ADP in different molar

Effect of lanthanum dopant on dielectric dispersion of Lead Germanate ($Pb_5Ge_3O_{11}$) single crystals.

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Abstract: Dielectric dispersion and loss dispersion for pure and lanthanum doped lead germanate ($Pb_5Ge_3O_{11}$) single crystals were studied in the frequency region 100 Hz to 100 KHz. The measurements were taken at room temperature, 100 ^{0}C and 200 ^{0}C. The observed dielectric and loss dispersion is discussed.

Keywords: Dielectric dispersion, doping effect

1 Introduction

Dispersion is expressed as a variation of dielectric parameters with frequency. The mechanism responsible for these variations can be characterized as a relaxation. The electronic, ionic, dipolar, and space charge related polarization are the four significant modes of relaxation observed in dielectric and ferroelectric materials.

Ferroelectric lead germinate ($Pb_5Ge_3O_{11}$) has attracted a number of investigators due to its applications for devices. These crystals show the reversibility of spontaneous polarization and nonlinear optical properties. They are uniaxial ferroelectric which undergoes a second-order phase transition at 177^{0}C, at which crystal symmetry changes from hexagonal, $P\bar{6}$ to trigonal, $P3$ **[1-5]**. The precise amount of additives can influence appreciably the growth and dielectric properties of $Pb_5Ge_3O_{11}$ **[6-8]**.

The study of dielectric dispersion in lead germanate material has been attempted by various investigators. L.E.Cross et al**[9]** have linked the observed dielectric spectra of pure lead germanate single crystal over frequency range 10KHz to 1MHz with Maxwell Wagner mechanism. The authors believe that the relaxation may be linked with the wall motion and rearrangement of trapped charges associated with the wall, for high and intermediate frequency. V.V. Dem'yanove et al **[10]** suggested that the low frequency dispersion in lead germanate crystals is caused by interaction among the dynamic polarization and conduction band electrons in the frequency range 10^2 to 10^6 Hz. The second dispersion between 10^6Hz-10^9Hz was possibly due to the motion of the domain wall while the third dispersion between10^9Hz-10^{11}Hz was of relaxation type. However, M. Polamska et al **[11]** recommended that the same may be due to the presence of lattice defects contributing to the polarization of the crystals. J.H. Kim et al**[12]** reported the presence of two dispersion mechanisms in lead germanate, one is caused by the hopping process associated with polarons, and the other is concerned with the intrinsic polarization of the ferroelectric material. The thickness dependence dielectric constant at frequencies 1,10 and 100KHz was also reported by A. Mansingh et al **[13]**. The author explained observed results by considering homogeneous surface layer formation due to a potential barrier at the metal-insulator junction.

Y Goto et al**[14]** measured the complex dielectric constant of single crystals of ferroelectric $Pb_5Ge_3O_{11}$ as a function of temperature in a frequency range below KHz order. He observed the dependence of dielectric dispersion on sample thickness and non-formation of circular arc by the conventional cole-cloe plot. The author attributed this to the Maxwell-Wagner relaxation. The capacitance $C(\omega)$ and

Santilli's isofields first-kind based key exchange protocol

Santilli's isofields first-kind based key exchange protocol

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Abstract. The key exchange protocol ($\mathcal{kep}$) is used to barter whatsoever keys or related information are required, so that no one can replicate it. Conventionally either a reliable courier, diplomatic bags, or some other protected network are needed. The present work put forward, a new technique for designing a $\mathcal{kep}$ build on Santilli's isofields of the first kind is to use rings isopolynomials with elements called isonumbers.

Keywords. Isounit, Isonumbers, Isopolynomials, Isofields, and Diffie-Hellman Problem.

1. Introduction

The $\mathcal{kep}$ is a key instituting process where similar private key is persistent by either two or more than two users, where every users are connected or used as a component of data contributed by, in a perfect world such that none can foreordain the subsequent value [1, 2]. The symmetric key cryptography based protocols consist of two communicating users, who uses a commonly approved algorithm and a secret key which is identified only to these users. A few defined ways can be used by the Secret $\mathcal{kep}$ such as, out-of-band correspondence, for example, by telephone, via email, physical entry and a trustworthy third party key distribution center etc. The greater part required for these process require earlier secret key formation used by the protocol and the independent users.

Diffie-Hellman's [3] $\mathcal{kep}$ is the pioneer of practically use asymmetric cryptographic structure where two users who have never encountered are authorized, to establish a typical secrete key over an unprotected network. The $\mathcal{kep}$ based on the number theory are used commonly at present. The theoretical value relies upon the structure of abelian groups. The discrete logarithm problem ($\mathcal{DLP}$) [4, 5] as well as the elliptic curve $\mathcal{DLP}$ [6, 7], are the prime issues for which the public key cryptosystems is constructed. In cryptography the efficiently computable groups where $\mathcal{DLP}$complex plays are a vital role [8]. Most of the recommended protocols are associated to arithmetic operations on commutative algebraic structures and certain efficient attacks are constructed on the commutative property of these structures and are well recognized. Different executions of the Diffie-Hellman protocol in matrix rings, for diverse variety of matrices, are presented in [9 10].

Meshram C. [11] offered certain different cryptographic techniques based on double $\mathcal{DLP}$ and specific implication on cryptography protocols in [12, 13, 14, 15]. Meshram A. [16, 17, 18] suggested some different cryptographic techniques based on suzuki 2-group and dihedral group which are secure in CPA, IND-CPA, IND-CCA2. Recently, Meshram A. [19] proposed key exchange protocol based on isomathematics.

2. Motivations and Organization

The present endeavor focuses on a novel method for constructing an $\mathcal{kep}$ established on the Santilli's isofields of the first kind to utilized rings isopolynomials with isonumbers coefficient. This method is much easy to apply the $\mathcal{kep}$.

The paper is organized as follow. We discussed the respective background in Section 3. Santilli's isofields of the first kind based $\mathcal{kep}$ is offered in Section 4. Paper is concluded in Section 5.

3. Background

The section explains, definition such as the Santilli's isofields, Symmetrical Decomposition Problem (SDP) over ring $\widehat{\mathcal{F}}$, Diffie-Hellman Problem (DHP) over ring $\widehat{\mathcal{F}}$.

3.1. Santilli's isofields first kind [20]

The $\widehat{\mathcal{F}} = \widehat{\mathcal{F}}(\hat{z}, +, \hat{\times})$ first kind of Santilli's isofields are the rings with isonumbers $\hat{z} = z\hat{\mathcal{I}}$, $z \in \mathcal{F}, \hat{\mathcal{I}} = \frac{1}{\widehat{\mathcal{F}}} \notin \mathcal{F}$ and $\hat{z}$ is the multiplication on $\mathcal{F}$ with $\hat{z} + \hat{y} = (z + y)\hat{\mathcal{I}}$ an isosum, with additive unit $0 = 0\hat{\mathcal{I}} = 0$, $\hat{z} + 0 = 0 + \hat{z} = \hat{z}$ and isoproduct $\hat{z} \hat{\times} \hat{y} = \hat{z}\widehat{\mathcal{T}}\hat{y} = z\hat{\mathcal{I}}\widehat{\mathcal{T}}y\hat{\mathcal{I}} = (zy)\hat{\mathcal{I}}$, where, the left and right new unit $\hat{\mathcal{I}}$, $\hat{\mathcal{I}} \hat{\times} \hat{z} = \hat{z} \hat{\times} \hat{\mathcal{I}} = \hat{z}$ is called isounit and $\widehat{\mathcal{T}}\hat{\mathcal{I}} = 1, \widehat{\mathcal{T}}$ is called inverse of isounit $\hat{\mathcal{I}} \neq 1$.

Let us consider isopolynomials with isonumbers coefficient. Initially, the notion of scale isoproduct over $\widehat{\mathcal{F}}$ is already existing.

- If $\hat{e} \in \mathcal{Z} > 0$,$\hat{r} \in \widehat{\mathcal{F}}$, then $(\hat{e})\hat{r} \triangleq \underbrace{\{\hat{r} + \cdots + \hat{r}\}}_{\hat{e}\ \text{times}}$
- If $\hat{e} \in \mathcal{Z} < 0$, then $(\hat{e})\hat{r} \triangleq (-\hat{e})(-\hat{r}) = \underbrace{(-\hat{r}) + \cdots + (-\hat{r})}_{-\hat{e}\ \text{times}}$
- If $\hat{e} = 0$, then $(\hat{e})\hat{r} = 0$

Remark-I. For every $\hat{v}, \hat{u}, \hat{a}, \hat{b} \in \mathcal{Z}$ and $\hat{r} \in \widehat{\mathcal{F}}$,we get $(\hat{v})\hat{r}^{\hat{a}} * (\hat{u})\hat{r}^{\hat{b}} = (\hat{v}\hat{u})\hat{r}^{\hat{a}+\hat{b}} = (\hat{u})\hat{r}^{\hat{b}} * (\hat{v})\hat{r}^{\hat{a}}$.

We can conclude the above statement, by the definition of scale multiplication, the distributivity of multiplication with respect to addition, and commutativity of addition.

Remark-II. For $\hat{r} \neq \hat{\lambda}$, we get $(\hat{v})\hat{r} * (\hat{u})\hat{\lambda} \neq (\hat{u})\hat{\lambda} * (\hat{v})\hat{r}$.

We continue further to define ring isopolynomials with positive isointegral coefficient. Let $\hat{h}(\hat{s}) = \hat{v}_0 + \hat{v}_1\hat{s} + \cdots + \hat{v}_{\hat{b}}\hat{s}_{\hat{b}} \in \mathcal{Z}^+[\hat{s}]$ is an isopolynomial with positive isointegral coefficient. For isonumber $\hat{r}$ in $\widehat{\mathcal{F}}$ and get $\hat{h}(\hat{r}) = \sum_{j=0}^{\hat{b}}(\hat{v}_j)\hat{r}^j = (\hat{v}_0) + (\hat{v}_1)\hat{r} + \cdots + (\hat{v}_{\hat{b}})\hat{r}^{\hat{b}} \in \widehat{\mathcal{F}}$. Additionally, if $\hat{r} \in \widehat{\mathcal{F}}$, then $\hat{h}(\hat{r})$ can be isopolynomial about variable $\hat{r}$. The set of such kinds of polynomials, encompassing all the $\hat{h}(\hat{r}) \in \mathcal{Z}^+[\hat{r}]$, which can be looked upon as the extension of $\mathcal{Z}^+$ with $\hat{r}$, referred by $\mathcal{Z}^+[\hat{r}]$.

Assume that $\hat{h}(\hat{r}) = \sum_{j=0}^{\hat{b}}(\hat{v}_j)\hat{r}^j \in \mathcal{Z}^+[\hat{r}]$, $\hat{f}(\hat{r}) = \sum_{k=0}^{\hat{a}}(\hat{u}_j)\hat{r}^j \in \mathcal{Z}^+[\hat{r}]$ and $\hat{b} \geq \hat{a}$, then $\left(\sum_{j=0}^{\hat{b}}(\hat{v}_j)\hat{r}^j\right) + \left(\sum_{k=0}^{\hat{a}}(\hat{u}_k)\hat{r}^k\right) = \left(\sum_{j=0}^{\hat{a}}(\hat{v}_j + \hat{u}_j)\hat{r}^j\right) + \left(\sum_{j=\hat{a}+1}^{\hat{b}}(\hat{v}_j)\hat{r}^j\right)$, using Remark-I as well as the distributivity, for $\hat{\rho}_j = \sum_{k=0}^{j}\hat{v}_j\hat{u}_{j-k} = \sum_{k+e=j}\hat{v}_j\hat{u}_e$,we have $\left(\sum_{j=0}^{\hat{a}+1}(\hat{\rho}_j)\hat{r}^j\right) = \left(\sum_{j=0}^{\hat{b}}(\hat{v}_j)\hat{r}^j\right) * \left(\sum_{k=0}^{\hat{a}}(\hat{u}_k)\hat{r}^k\right)$. So, we complete the following Remark-III conferring to Remark-I.

Remark-III. For every $\hat{h}(\hat{r}), \hat{f}(\hat{r}) \in \mathcal{Z}^+[\hat{r}]$, we get $\hat{h}(\hat{r}) * \hat{f}(\hat{r}) = \hat{f}(\hat{r}) * \hat{h}(\hat{r})$.

In general, if $\hat{r} \neq \hat{\lambda}$, then $\hat{h}(\hat{r}) * \hat{f}(\hat{\lambda}) \neq \hat{f}(\hat{\lambda}) * \hat{h}(\hat{r})$.Consider ring isopolynomial with isonumber coefficient $(\hat{\mathcal{F}}, +, *)$. In case of any randomly select isonumber $\hat{g} \in \hat{\mathcal{F}}$, we define a set $\widehat{\mathcal{W}}\hat{g} \subseteq \hat{\mathcal{F}}$ by $\widehat{\mathcal{W}}\hat{g} \triangleq \{\hat{h}(\hat{g}) : \hat{h}(\hat{r}) \in \mathcal{Z}^+[\hat{r}]\}$.

3.2 SDP over Ring $\hat{\mathcal{F}}$ with isopolynomial

For given $(\hat{t}, \hat{r}, \hat{s}) \in \hat{\mathcal{F}}^3$and $\hat{a}, \hat{b} \in \mathcal{Z}$, find $\widehat{w} \in \widehat{\mathcal{W}}\hat{g}$ such that $\hat{s} = \widehat{w}^{\hat{a}}\hat{r}\widehat{w}^{\hat{b}}$.

3.3 DHP over Ring $\hat{\mathcal{F}}$ with isopolynomia

Compute $\hat{r}^{\widehat{w}_1\widehat{w}_2}$ (or $\hat{r}^{\widehat{w}_2\widehat{w}_1}$) for given $\hat{r}, \hat{r}^{\widehat{w}_1}$ and $\hat{r}^{\widehat{w}_2}$, where $\hat{r} \in \hat{\mathcal{F}}, \widehat{w}_1, \widehat{w}_2 \in \widehat{\mathcal{W}}\hat{g}$.

4. Santilli's Isofields First-kind based $\hat{k}\hat{e}\hat{p}$

At this instant, let us consider the ring isopolynomial with the isonumber coefficient as an primary work and vital infrastructure to create a $\hat{k}\hat{e}\hat{p}$, where two users, say Mamta and Minal, who agree to share a secret session key via a public, insecure unreliable network.
The procedure is described as stated below:

i. Mamta refers two arbitrary small, positive isointegers $\hat{a}, \hat{b} \in \mathcal{Z}^+$ and two arbitrary elements
$\hat{v}, \hat{u} \in \hat{\mathcal{F}}$ to Minal.
ii. Mamta choose a randomly isopolynomial $\hat{h}(\hat{r}) \in \mathcal{Z}^+[\hat{r}]$ such that $\hat{h}(\hat{v}) \neq \mathbf{0}$ and then takes $\hat{h}(\hat{v})$ as her secret key.
iii. Minal choose a randomly isopolynomial $\hat{f}(\hat{r}) \in \mathcal{Z}^+[\hat{r}]$ such that$\hat{f}(\hat{v}) \neq 0$ and then takes $\hat{f}(\hat{t})$ as her secret key.
iv. Mamta computes $\mathcal{M}_{\mathcal{A}} = \hat{h}(\hat{v})^{\hat{a}} * \hat{v} * \hat{h}(\hat{v})^{\hat{b}}$ and refers $\mathcal{M}_{\mathcal{A}}$ to Minal.
v. Minal computes $\mathcal{M}_{\mathcal{L}} = \hat{f}(\hat{v})^{\hat{a}} * \hat{u} * \hat{f}(\hat{v})^{\hat{b}}$ and refers $\mathcal{M}_{\mathcal{L}}$ to Mamta.
vi. Mamta computes $\hat{\mathcal{K}}_{\text{Mamta}} = \hat{h}(\hat{v})^{\hat{a}} * \mathcal{M}_{\mathcal{L}} * \hat{h}(\hat{v})^{\hat{b}}$ as the shared session key.
vii. Minal computes $\hat{\mathcal{K}}_{\text{Minal}} = \hat{f}(\hat{v})^{\hat{a}} * \mathcal{M}_{\mathcal{A}} * \hat{f}(\hat{v})^{\hat{b}}$ as the shared session key.

The illustration of the protocol is shown in the following table.

Table4.1. Santilli's Isofields First-kind based $\hat{k}\hat{e}\hat{p}$

Pass	Mamta Minal
	Choose at randomly $\hat{a}, \quad \hat{b} \in \mathcal{Z}^+$ Choose at randomly $\hat{v}, \hat{u} \in \hat{\mathcal{F}}$ Choose at randomly $\hat{h}(\hat{r}) \in \mathcal{Z}^+[\hat{r}]$
I	$\hat{a}, \hat{b}, \hat{v}, \hat{u}, \hat{h}(\hat{v})^{\hat{a}}\hat{u}\hat{h}(\hat{v})^{\hat{b}} \rightarrow$
	Slects at arbitrary $\hat{f}(\hat{r}) \in \mathcal{Z}^+[\hat{r}]$
II	$\leftarrow \hat{f}(\hat{v})^{\hat{a}}\hat{u}\hat{f}(\hat{v})^{\hat{b}}$
	$\hat{\mathcal{K}}_{\text{Mamta}} = \hat{h}(\hat{v})^{\hat{a}}\hat{f}(\hat{v})^{\hat{a}}\hat{u}\hat{f}(\hat{v})^{\hat{b}}\hat{h}(\hat{v})^{\hat{b}}$ $= \hat{f}(\hat{v})^{\hat{a}}\hat{h}(\hat{v})^{\hat{a}}\hat{u}\hat{h}(\hat{v})^{\hat{b}}\hat{f}(\hat{v})^{\hat{b}} = \hat{\mathcal{K}}_{\text{Minal}}$

4.1 Examples

Santilli's Isofields First-kind based $\hbar e \wp$ using Matrix Rings.

Example-I. Let an integer $\mathcal{N} = 17 * 19$, isounit $\hat{I} = \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$ and inverse of isounit $\hat{T} = \begin{bmatrix} -4 & 3 \\ 3.5 & -2.5 \end{bmatrix}$.

Suppose that Mamta chooses $\hat{a} = \hat{2}, \hat{b} = \hat{3}$,

$\hat{v} = \begin{bmatrix} 3 & 5 \\ 7 & 8 \end{bmatrix}, \hat{u} = \begin{bmatrix} 2 & 4 \\ 6 & 1 \end{bmatrix}$, and $\hat{h}(\hat{r}) = \hat{3}\hat{r}^{\hat{3}} + \hat{2}\hat{r}^{\hat{2}} + \hat{r} + \hat{2}$.

She computes

$$\hat{h}(\hat{v}) = \hat{3}\begin{bmatrix} 3 & 5 \\ 7 & 8 \end{bmatrix}^{\hat{3}} + \hat{2}\begin{bmatrix} 3 & 5 \\ 7 & 8 \end{bmatrix}^{\hat{2}} + \begin{bmatrix} 3 & 5 \\ 7 & 8 \end{bmatrix} + \hat{2}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 352 & 157 \\ 347 & 509 \end{bmatrix} mod 323 = \begin{bmatrix} 29 & 157 \\ 24 & 186 \end{bmatrix}$$

And

$$\mathcal{M}_{\mathcal{A}} = \hat{h}(\hat{v})^{\hat{a}} * \hat{u} * \hat{h}(\hat{v})^{\hat{b}}$$

$$\mathcal{M}_{\mathcal{A}} = \begin{bmatrix} 29 & 157 \\ 24 & 186 \end{bmatrix}^{\hat{2}} * \begin{bmatrix} 2 & 4 \\ 6 & 1 \end{bmatrix} * \begin{bmatrix} 29 & 157 \\ 24 & 186 \end{bmatrix}^{\hat{3}} = \begin{bmatrix} 20 & 236 \\ 30 & 105 \end{bmatrix}$$

Then, she refers $\hat{a}, \hat{b}, \hat{v}, \hat{u}$ and $\mathcal{M}_{\mathcal{A}}$ to Minal.

Now, suppose that Minal, after receiving $\hat{a}, \hat{b}, \hat{v}, \hat{u}$ and $\mathcal{M}_{\mathcal{A}}$ from Mamta, choose a different isopolynomial $\hat{f}(\hat{r}) = \hat{2}\hat{r}^{\hat{2}} + \hat{r} + \hat{2}$ and compute

$$\hat{f}(\hat{v}) = \hat{2}\begin{bmatrix} 3 & 5 \\ 7 & 8 \end{bmatrix}^{\hat{2}} + \begin{bmatrix} 3 & 5 \\ 7 & 8 \end{bmatrix} + \hat{2}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 93 & 115 \\ 161 & 208 \end{bmatrix}$$

And

$$\mathcal{M}_{\mathcal{L}} = \hat{f}(\hat{v})^{\hat{a}} * \hat{u} * \hat{f}(\hat{v})^{\hat{b}}$$

$$\mathcal{M}_{\mathcal{L}} = \begin{bmatrix} 93 & 115 \\ 161 & 208 \end{bmatrix}^{\hat{2}} * \begin{bmatrix} 2 & 4 \\ 6 & 1 \end{bmatrix} * \begin{bmatrix} 93 & 115 \\ 161 & 208 \end{bmatrix}^{\hat{3}} = \begin{bmatrix} 210 & 310 \\ 124 & 188 \end{bmatrix}$$

Then, she refers $\mathcal{M}_{\mathcal{L}}$ to Mamta.

At the end, Mamta derived the session key as

$$\hat{\mathcal{K}}_{\text{Mamta}} = \hat{h}(\hat{v})^{\hat{a}} * \mathcal{M}_{\mathcal{L}} * \hat{h}(\hat{v})^{\hat{b}}$$

$$\hat{\mathcal{K}}_{\text{Mamta}} = \begin{bmatrix} 29 & 157 \\ 24 & 186 \end{bmatrix}^{\hat{2}} * \begin{bmatrix} 210 & 310 \\ 124 & 188 \end{bmatrix} * \begin{bmatrix} 29 & 157 \\ 24 & 186 \end{bmatrix}^{\hat{3}} = \begin{bmatrix} 138 & 240 \\ 110 & 295 \end{bmatrix}$$

While Minal derives the session key as

$$\hat{\mathcal{K}}_{\text{Minal}} = \hat{f}(\hat{v})^{\hat{a}} * \mathcal{M}_{\mathcal{A}} * \hat{f}(\hat{v})^{\hat{b}}$$

$$\hat{\mathcal{K}}_{\text{Minal}} = \begin{bmatrix} 93 & 115 \\ 161 & 208 \end{bmatrix}^{\hat{2}} * \begin{bmatrix} 20 & 236 \\ 30 & 105 \end{bmatrix} * \begin{bmatrix} 93 & 115 \\ 161 & 208 \end{bmatrix}^{\hat{3}} = \begin{bmatrix} 138 & 240 \\ 110 & 295 \end{bmatrix}$$

Seemingly, $\hat{\mathcal{K}}_{\text{Mamta}} = \hat{\mathcal{K}}_{\text{Minal}}$ holds.

Example-II. Let an integer $\mathcal{N} = 17 * 19$, isounit $\hat{I} = \begin{bmatrix} 1 & 7 & 5 \\ 8 & 6 & 2 \\ 3 & 5 & 9 \end{bmatrix}$ and inverse of isounit

$$\hat{T} = \begin{bmatrix} \frac{-1}{7} & \frac{19}{154} & \frac{4}{77} \\ \frac{3}{14} & \frac{3}{154} & \frac{-19}{154} \\ \frac{-1}{14} & \frac{-4}{77} & \frac{25}{154} \end{bmatrix}.$$

Suppose that Mamta chooses $\hat{a} = \hat{2}, \hat{b} = \hat{3}$,

$\hat{v} = \begin{bmatrix} 5 & 6 & 3 \\ 2 & 5 & 9 \\ 7 & 1 & 8 \end{bmatrix}, \hat{u} = \begin{bmatrix} 1 & 6 & 9 \\ 7 & 9 & 5 \\ 2 & 4 & 3 \end{bmatrix}$, and $\hat{h}(\hat{r}) = \hat{3}\hat{r}^3 + \hat{2}\hat{r}^2 + \hat{r} + \hat{2}$.

She computes;

$$\hat{h}(\hat{v}) = \hat{3}\begin{bmatrix} 5 & 6 & 3 \\ 2 & 5 & 9 \\ 7 & 1 & 8 \end{bmatrix}^{\hat{3}} + \hat{2}\begin{bmatrix} 1 & 6 & 9 \\ 7 & 9 & 5 \\ 2 & 4 & 3 \end{bmatrix}^{\hat{2}} + \begin{bmatrix} 5 & 6 & 3 \\ 2 & 5 & 9 \\ 7 & 1 & 8 \end{bmatrix} + \hat{2}\begin{bmatrix} 5 & 6 & 3 \\ 2 & 5 & 9 \\ 7 & 1 & 8 \end{bmatrix}$$

$$\hat{h}(\hat{v}) = \begin{bmatrix} 36578 & 61046 & 63334 \\ 41198 & 71962 & 73626 \\ 41428 & 68656 & 68428 \end{bmatrix} mod 323 = \begin{bmatrix} 79 & 322 & 26 \\ 177 & 256 & 305 \\ 84 & 180 & 275 \end{bmatrix}$$

And

$\mathcal{M}_{\mathcal{A}} = \hat{h}(\hat{v})^{\hat{a}} * \hat{u} * \hat{h}(\hat{v})^{\hat{b}}$

$$\mathcal{M}_{\mathcal{A}} = \begin{bmatrix} 79 & 322 & 26 \\ 177 & 256 & 305 \\ 84 & 180 & 275 \end{bmatrix}^{\hat{2}} * \begin{bmatrix} 1 & 6 & 9 \\ 7 & 9 & 5 \\ 2 & 4 & 3 \end{bmatrix} * \begin{bmatrix} 79 & 322 & 26 \\ 177 & 256 & 305 \\ 84 & 180 & 275 \end{bmatrix}^{\hat{3}} = \begin{bmatrix} 165 & 38 & 279 \\ 304 & 194 & 67 \\ 159 & 249 & 218 \end{bmatrix}$$

Then, she refers $\hat{a}, \hat{b}, \hat{v}, \hat{u}$ and $\mathcal{M}_{\mathcal{A}}$ to Minal.

Now, suppose that Minal, after receiving $\hat{a}, \hat{b}, \hat{v}, \hat{u}$ and $\mathcal{M}_{\mathcal{A}}$ from Mamta, choose a different isopolynomial $\hat{f}(\hat{r}) = \hat{2}\hat{r}^2 + \hat{r} + \hat{2}$ and compute

$$\hat{f}(\hat{v}) = \hat{2}\begin{bmatrix} 5 & 6 & 3 \\ 2 & 5 & 9 \\ 7 & 1 & 8 \end{bmatrix}^{\hat{2}} + \begin{bmatrix} 5 & 6 & 3 \\ 2 & 5 & 9 \\ 7 & 1 & 8 \end{bmatrix} + \hat{2}\begin{bmatrix} 5 & 6 & 3 \\ 2 & 5 & 9 \\ 7 & 1 & 8 \end{bmatrix} = \begin{bmatrix} 275 & 173 & 27 \\ 286 & 309 & 189 \\ 94 & 175 & 16 \end{bmatrix}$$

And

$\mathcal{M}_{\mathcal{L}} = \hat{f}(\hat{v})^{\hat{a}} * \hat{u} * \hat{f}(\hat{v})^{\hat{b}}$

$$\mathcal{M}_{\mathcal{L}} = \begin{bmatrix} 275 & 173 & 27 \\ 286 & 309 & 189 \\ 94 & 175 & 16 \end{bmatrix}^{\hat{2}} * \begin{bmatrix} 1 & 6 & 9 \\ 7 & 9 & 5 \\ 2 & 4 & 3 \end{bmatrix} * \begin{bmatrix} 275 & 173 & 27 \\ 286 & 309 & 189 \\ 94 & 175 & 16 \end{bmatrix}^{\hat{3}} = \begin{bmatrix} 53 & 267 & 173 \\ 264 & 187 & 27 \\ 37 & 251 & 82 \end{bmatrix}$$

Then, she refers $\mathcal{M}_{\mathcal{L}}$ to Mamta.

At the end, Mamta derived the session key as

$\hat{\mathcal{K}}_{\text{Mamta}} = \hat{h}(\hat{v})^{\hat{a}} * \mathcal{M}_{\mathcal{L}} * \hat{h}(\hat{v})^{\hat{b}}$

$$\hat{\mathcal{K}}_{\text{Mamta}} = \begin{bmatrix} 79 & 322 & 26 \\ 177 & 256 & 305 \\ 84 & 180 & 275 \end{bmatrix}^{\hat{2}} * \begin{bmatrix} 53 & 267 & 173 \\ 264 & 187 & 27 \\ 37 & 251 & 82 \end{bmatrix} * \begin{bmatrix} 79 & 322 & 26 \\ 177 & 256 & 305 \\ 84 & 180 & 275 \end{bmatrix}^{\hat{3}} = \begin{bmatrix} 138 & 218 & 167 \\ 294 & 127 & 282 \\ 317 & 29 & 153 \end{bmatrix}$$

While Minal derives the session key as

$\hat{\mathcal{K}}_{\text{Minal}} = \hat{f}(\hat{v})^{\hat{a}} * \mathcal{M}_{\mathcal{A}} * \hat{f}(\hat{v})^{\hat{b}}$

$$\hat{\mathcal{K}}_{\text{Minal}} = \begin{bmatrix} 275 & 173 & 27 \\ 286 & 309 & 189 \\ 94 & 175 & 16 \end{bmatrix}^{\hat{2}} * \begin{bmatrix} 165 & 38 & 279 \\ 304 & 194 & 67 \\ 159 & 249 & 218 \end{bmatrix} * \begin{bmatrix} 275 & 173 & 27 \\ 286 & 309 & 189 \\ 94 & 175 & 16 \end{bmatrix}^{\hat{3}} = \begin{bmatrix} 138 & 218 & 167 \\ 294 & 127 & 282 \\ 317 & 29 & 153 \end{bmatrix}$$

Seemingly, $\hat{\mathcal{K}}_{\text{Mamta}} = \hat{\mathcal{K}}_{\text{Minal}}$ holds.

5. Conclusion

Lately certain promising $\mathscr{key}$ have been created on non-commutative groups like; braid groups, Thompson's groups, etc. In present endeavor we have suggested the new $\mathscr{key}$ which is based on Santilli's isofields of the first kind is to use rings isopolynomials. It promotes further study due to isomathematical structure such as permutable permutation of the ring isopolynomials with the isonumber coefficient.

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Quadruple fixed point result in m-metric space

Quadruple fixed point result in m-metric space

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Abstract: The Banach Contraction theorem is the basis of the theory of fixed points. Many scholars have been working in different directions on the Banach Theorem. Further theorems on coupled, tripled and quadruple fixed points are established. A quadruple fixed point result was developed in this paper for partial order M- metric space using a monotone property. This theorem is the extension and alteration of literary outcomes. An illustration to verify the outcome has been given.
Keywords: Fixed Point, Partial order set, M-metric space, monotone property, Quadruple fixed point.

Mathematics Subject Classification: 46T99, 54H25, 47H10, 54E50

1. Introduction

Numerous investigators [1, 7, 8, 9, 11, 12, 14, 17, 18] have expanded the Banach Contraction Theorem.

Gao and Laxmikantham [10] initiated the notion of a coupled fixed point. Using mixed monotone properties, Bhaskar et al [6] built coupled fixed point theorems. This theory was extended to a triple fixed point by Berinde and Borcut [5]. In partial order metric spaces, Karapinar [13] has demonstrated quadruple fixed point effects.

The M-metric space definition was taken up by Asadi et a l[2] . The authors [3, 4, 15, 16] proved fixed point theorems in M-metric space under various constraints. A coupled fixed point in M-metric space has been proven by H. Monfared et al [15].

In this paper, we have defined the quadruple fixed point result in partial order M-metric space for a new kind of condition by using mixed monotone properties. This affects the changes to the results above. An example has been given to check the result.

2. Preliminaries

The following definitions need to understand this paper.

2.1. M- metric space [2]

Assume a non -empty set S. The function $m : S \times S \to R^+$ is known as M- metric when the constrains below are true-

(M1) $m(s,s) = m(j,j) = m(s,j) \Leftrightarrow s = j$

(M2) $m_{sj} \le m(s,j)$ where $m_{sj} = \min\{m(s,s), m(j,j)\}$

(M3) $m(s,j) = m(j,s)$

(M4) $\{m(s,j) - m_{sj}\} \le \{m(s,u) - m_{su}\} + \{m(u,j) - m_{uj}\}$

The pair (S,m) is said to be M-metric space.

2.2 Convergent sequence

Assume (S,m) is M- metric space. The sequence $\{s_n\}$ in S is known as convergent sequence when $\exists n_0 \in N$ such that $\forall n \ge n_0$, for some $s \in S$.

$s_n \to s \Leftrightarrow m(s_n, s) = m_{s_n s} \to 0$ as $n \to \infty$

2.3 Cauchy Sequence

Assume (S,m) is M- metric space.. The sequence $\{s_n\}$ in S is known as Cauchy sequence when $\exists n_0 \in N$ such that, $\forall m, n \ge n_0$.

$\lim_{m,n\to\infty}\{m(s_n, s_m) - m_{s_n s_m}\} < \infty$ and $\lim_{m,n\to\infty}\{M_{s_n s_m} - m_{s_n s_m}\} < \infty$

where $M_{st} = \max\{m(s,s), m(t,t)\}$.

2.4 Quadruple Fixed Point

Assume S is non-empty set, function $f : S \times S \times S \times S \to S$. An element (s,j,u,e) is said quadruple fixed point of f when $f(s,j,u,e) = s$, $f(j,u,e,s) = j$, $f(u,e,s,j) = u$, $f(e,s,j,u) = e$.

2.5 Mixed Monotone Property

Assume $(S,\le)$ be a partial order set and a function $f : S \times S \times S \times S \to S$. Then f has the mixed monotone property when $f(s,j,u,e)$ is monotone non decreasing in s and u, also monotone non-increasing in j and e i.e. for $s, j, u, e \in S$,

$$s_1, s_2 \in S, s_1 \le s_2 \Rightarrow f(s_1, j, u, e) \le f(s_2, j, u, e).$$

$$j_1, j_2 \in S, j_1 \le j_2 \Rightarrow f(s, j_2, u, e) \le f(s, j_1, u, e).$$

$$u_1, u_2 \in S, u_1 \le u_2 \Rightarrow f(s, j, u_1, e) \le f(s, j, u_2, e).$$

$$e_1, e_2 \in S, e_1 \le e_2 \Rightarrow f(s, j, u, e_2) \le f(s, j, u, e_1).$$

2.6: ς function

Let $\varsigma : R^+ \to R^+$ be such that $\varsigma(x) \to 0$ if and only if $x \to 0$, ς^{-1} is non decreasing and one to one and $\varsigma(a_1 + a_2) \le \varsigma(a_1) + \varsigma(a_2)$, for $a_1, a_2 \in R^+$. We represent the collection of these function by Ψ.

3. Main theorem

3.1. Theorem: Assume $(S,m,\leq)$, a partial order complete M –metric space. Consider a function $\xi:(0,\infty)\to(0,\infty)$ with $\xi(0)=0, \xi(x)<x$, $\lim_{r\to t^+}\xi(r)<x$, $\forall x>0$, also $f:S\times S\times S\times S\to S$ has mixed monotone property and

$$\varsigma\left(m(f(s,j,u,e),f(p,q,g,h)\right)\leq\xi\left(\frac{\varsigma\{m(s,p)\}+\varsigma\{m(j,q)\}+\varsigma\{m(u,g)\}+\varsigma\{m(e,h)\}}{4}\right) \quad (1)$$

$s,j,u,e,p,q,g,h\in S$, $s\geq p, j\leq q, u\geq g, e\leq h$. Other conditions are

(I) f is continuous.

(II)If there exists $s_0,j_0,u_0,e_0\in S$ such that

$s_0\leq f(s_0,j_0,u_0,e_0), t_0\geq f(j_0,u_0,e_0,s_0), z_0\leq f(u_0,e_0,s_0,j_0), w_0\geq f(e_0,s_0,j_0,u_0)$.

Then there exists a quadruple fixed point of f.

Proof: Consider $(s_0,j_0,u_0,e_0)\in S$ such that

$s_0\leq f(s_0,j_0,u_0,e_0)=s_1,\ j_0\geq f(j_0,u_0,e_0,s_0)=j_1,\ u_0\leq f(u_0,e_0,s_0,j_0)=u_1,$

$e_0\geq f(e_0,s_0,j_0,u_0)=e_1$.

Thus $s_0\leq s_1,\ j_0\geq j_1,\ u_0\leq u_1,\ e_0\geq e_1$.

Again $s_2=f(s_1,j_1,u_1,e_1), y_2=f(j_1,u_1,e_1,s_1), u_2=f(u_1,e_1,s_1,j_1), e_2=f(e_1,s_1,j_1,u_1)$.

$\because f$ has the mixed monotone property $s_0\leq s_1\leq s_2, j_0\geq j_1\geq j_2, u_0\leq u_1\leq u_2, e_0\geq e_1\geq e_2$

If we follow the same process, we will be able to create the sequences $\{s_n\},\{j_n\},\{u_n\},\{e_n\}$ in S such that

$$s_{n+1}=f(s_n,j_n,u_n,e_n), j_{n+1}=f(j_n,u_n,e_n,s_n), u_{n+1}=f(u_n,e_n,s_n,j_n), v_{n+1}=f(e_n,s_n,j_n,u_n) \quad (2)$$

$\therefore$ f satisfy mixed monotone property $s_n\leq s_{n+1}, j_n\geq j_{n+1}, u_n\leq u_{n+1}, e_n\geq e_{n+1}$

$$s_{n+1}=f(s_n,j_n,u_n,e_n)\leq f(s_{n+1},j_n,u_n,e_n), f(j_{n+1},u_n,e_n,s_n)\leq f(j_n,u_n,e_n,s_n)=j_{n+1}, \quad (3)$$

$$u_{n+1}=f(u_n,e_n,s_n,e_n)\leq f(u_{n+1},e_n,s_n,j_n), f(e_{n+1},s_n,j_n,u_n)\leq f(e_n,s_n,j_n,u_n)=e_{n+1} \quad (4)$$

$$\begin{aligned} s_{n+2}=f(s_{n+1},j_{n+1},u_{n+1},e_{n+1}) &\geq f(s_{n+1},j_n,u_n,e_n), f(j_{n+1},u_n,e_n,s_n) \\ &\geq f(j_{n+1},u_{n+1},e_{n+1},s_{n+1})=j_{n+2}, \end{aligned} \quad (5)$$

$$\begin{aligned} u_{n+2}=f(u_{n+1},e_{n+1},s_{n+1},j_{n+1}) &\geq f(u_{n+1},e_n,s_n,j_n), f(e_{n+1},s_n,j_n,u_n) \\ &\leq f(e_{n+1},s_{n+1},j_{n+1},u_{n+1})=e_{n+2} \end{aligned} \quad (6)$$

From (3), (4), (5) and (6)

$s_{n+1}\leq s_{n+2}, j_{n+1}\geq j_{n+2}, u_{n+1}\leq u_{n+2}, e_{n+1}\geq e_{n+2}$

Consider $\alpha_n=\varsigma[m(s_n,s_{n+1})]+\varsigma[m(j_n,j_{n+1})]+\varsigma[m(u_n,u_{n+1})]+\varsigma[m(e_n,e_{n+1})]$

Since $s_{n-1}\leq s_n, j_{n-1}\geq j_n, u_{n-1}\leq u_n, e_{n-1}\geq e_n$.

$$\varsigma\{m(s_n, s_{n+1})\} = \varsigma\{m(f(s_{n-1}, j_{n-1}, u_{n-1}, e_{n-1}), f(s_n, j_n, u_n, e_n)\}$$
$$\leq \xi\left(\frac{\varsigma\{m(s_{n-1}, s_n)\} + \varsigma\{m(j_{n-1}, j_n)\} + \varsigma\{m(u_{n-1}, u_n)\} + \varsigma\{m(e_{n-1}, e_n\}}{4}\right)$$
$$= \xi\left(\frac{\alpha_{n-1}}{4}\right) \quad (7)$$

Similarly

$$\varsigma\{m(j_{n+1}, j_n)\} = \varsigma\{m(f(j_n, u_n, e_n, s_n), f(j_{n-1}, u_{n-1}, e_{n-1}, s_{n-1}))\}$$
$$\leq \xi\left(\frac{\varsigma\{m(j_{n-1}, j_n)\} + +\varsigma\{m(u_{n-1}, u_n)\} + \varsigma\{m(e_{n-1}, e_n)\} + \varsigma\{m(s_{n-1}, s_n)\}}{4}\right)$$
$$= \xi\left(\frac{\alpha_{n-1}}{4}\right) \quad (8)$$

$$\varsigma\{m(u_n, u_{n+1})\} = \varsigma\{m(f(u_{n-1}, e_{n-1}, s_{n-1}, j_{n-1}), f(u_n, e_n, s_n, j_n)\}$$
$$\leq \xi\left(\frac{\varsigma\{m(u_{n-1}, u_n)\} + \varsigma\{m(e_{n-1}, e_n\} + \varsigma\{m(s_{n-1}, s_n)\} + \varsigma\{m(j_{n-1}, j_n)\}}{4}\right)$$
$$= \xi\left(\frac{\alpha_{n-1}}{4}\right) \quad (9)$$

$$\varsigma\{m(e_{n+1}, e_n)\} = \varsigma\{m(f(e_n, s_n, j_n, u_n), f(e_{n-1}, s_{n-1}, j_{n-1}, u_{n-1}))\}$$
$$\leq \xi\left(\frac{\varsigma\{m(e_{n-1}, e_n)\} + \varsigma\{m(s_{n-1}, s_n)\} + \varsigma\{m(j_{n-1}, j_n)\} + \varsigma\{m(u_{n-1}, u_n)\}}{4}\right)$$
$$= \xi\left(\frac{\alpha_{n-1}}{4}\right) \quad (10)$$

Adding (7),(8),(9) and (10), we have $\alpha_n \leq 4\xi(\frac{\alpha_{n-1}}{4})$ (11)

Since $\xi(x) < x \; for \; x > 0$ and $\xi(0)=0$. So α_n is monotone decreasing function.

Therefore for some $\alpha \geq 0, \lim_{n\to\infty} \alpha_n = \alpha$. We have to show that $\alpha = 0$. Consider $\alpha > 0$. Taking limit $n \to \infty$ both sides of (11), we have

$$\alpha = \lim_{n\to\infty} \alpha_n \leq 4 \lim_{n\to\infty} \xi(\frac{\alpha_{n-1}}{4}) = 4 \lim_{\alpha_{n-1}\to\alpha} \xi(\frac{\alpha_{n-1}}{4}) < 4\frac{\alpha}{4} = \alpha$$

Thus, $\alpha = 0$ that is

$$\lim_{n\to\infty}[\varsigma(m(s_n, s_{n+1})) + \varsigma(m(j_n, j_{n+1})) + \varsigma(m(u_n, u_{n+1})) + \varsigma(m(e_n, e_{n+1}))] = 0 \quad (12)$$

Then $m(s_n, s_{n+1}) \to 0, m(j_n, j_{n+1}) \to 0, m(u_n, u_{n+1}) \to 0, m(e_n, e_{n+1}) \to 0$ (13)

Also we have $0 \le m_{s_n s_{n+1}} \le m(s_n, s_{n+1}) \Rightarrow \lim_{n\to\infty} m_{s_n s_{n+1}} = 0$.

And $m_{s_n s_{n+1}} = \min\{m(s_n, s_n), m(s_{n+1}, s_{n+1})\} \Rightarrow \lim_{n\to\infty} m(s_n, s_n) = 0$.

However, $m_{s_n s_m} = \min\{m(s_n, s_n), m(s_m, s_m)\} \Rightarrow \lim_{n,m\to\infty} m(s_n, s_m) = 0$.

Thus, $m(s_n, s_n), m(j_n, j_n), m(u_n, u_n), m(e_n, e_n)$ approaches towards 0. (14)

Let $M(s, j) = \{m(s, j) - m_{sj}\} \forall s, j \in S$.

We have to show $\lim_{n,m\to\infty}\{m(s_n, s_m) - m_{s_n s_m}\} = 0$

$\lim_{n,m\to\infty} m(s_n, s_m) = 0 = \lim_{n,m\to\infty} m(j_n, j_m) = \lim_{n,m\to\infty} m(u_n, u_m) = \lim_{n,m\to\infty} m(e_n, e_m)$.

Consider that it is not true, then there exists an $\varepsilon_0 > 0$ and subsequences of integers $\{c(k)\}$ and $\{b(k)\}$.

With $\{b(k)\} > \{c(k)\} \ge k$

$$r_k = \varsigma\{M(s_{c(k)}, s_{b(k)})\} + \varsigma\{M(j_{c(k)}, j_{b(k)})\} + \varsigma\{M(u_{c(k)}, u_{b(k)})\} + \varsigma\{M(e_{c(k)}, e_{b(k)})\} \ge \varepsilon_0 \quad (15)$$

For $k \ge 1$ and $\varsigma \in \Psi$, assume

$$r_{k-1} = \varsigma\{M(s_{c(k)}, s_{b(k)-1})\} + \varsigma\{M(j_{c(k)}, j_{b(k)-1})\} + \varsigma\{M(u_{c(k)}, u_{b(k)-1})\} + \varsigma\{M(e_{c(k)}, e_{b(k)-1})\} \le \varepsilon_0 \quad (16)$$

From triangular inequality and sub additivity

$$\begin{aligned}\varepsilon_0 \le r_k \le{}& \varsigma\{M(s_{c(k)}, s_{b(k)-1})\} + \varsigma\{M(s_{b(k)-1}, s_{b(k)})\} + \varsigma\{M(j_{c(k)}, j_{b(k)-1})\} + \varsigma\{M(j_{b(k)-1}, j_{b(k)})\} \\ &+ \varsigma\{M(u_{c(k)}, u_{b(k)-1})\} + \varsigma\{M(u_{b(k)-1}, u_{b(k)})\} + \varsigma\{M(e_{c(k)}, e_{b(k)-1})\} + \varsigma\{M(e_{b(k)-1}, e_{b(k)})\} \\ &+ \varsigma\{M(s_{b(k)-1}, s_{b(k)-1})\} + \varsigma\{M(j_{b(k)-1}, j_{b(k)-1})\} + \varsigma\{M(u_{b(k)-1}, u_{b(k)-1})\} + \varsigma\{M(e_{b(k)-1}, e_{b(k)-1})\} \\ &< \varepsilon_0 + \varsigma\{M(s_{b(k)-1}, s_{b(k)})\} + \varsigma\{M(j_{b(k)-1}, j_{b(k)})\} + \varsigma\{M(u_{b(k)-1}, u_{b(k)})\} + \varsigma\{M(e_{b(k)-1}, e_{b(k)})\} \\ &+ \varsigma\{M(s_{b(k)-1}, s_{b(k)-1})\} + \varsigma\{M(j_{b(k)-1}, j_{b(k)-1})\} + \varsigma\{M(u_{b(k)-1}, u_{b(k)-1})\} + \varsigma\{M(e_{b(k)-1}, e_{b(k)-1})\}\end{aligned}$$

$\therefore Lim_{k\to\infty} r_k = \varepsilon_0$, using (13),(14)

If for some $n_0 \in N$ and all $k \ge n_0, r_k = 0$, we have $\varepsilon_0 = 0$.

Suppose $r_k > 0$ for infinitely k. Now sub additivity of ς gives

$$r_k = \varsigma\{M(s_{c(k)}, s_{b(k)})\} + \varsigma\{M(j_{c(k)}, j_{b(k)})\} + \varsigma\{M(u_{c(k)}, u_{b(k)})\} + \varsigma\{M(e_{c(k)}, e_{b(k)})\}$$

$$\begin{aligned} &\le \varsigma\{M(s_{c(k)}, s_{c(k)+1})\} + \varsigma\{M(s_{c(k)+1}, s_{b(k)+1})\} + \varsigma\{M(s_{b(k)+1}, s_{b(k)})\} \\ &+ \varsigma\{M(j_{c(k)}, j_{c(k)+1})\} + \varsigma\{M(j_{c(k)+1}, j_{b(k)+1})\} + \varsigma\{M(j_{b(k)+1}, j_{b(k)})\} \\ &+ \varsigma\{M(u_{c(k)}, u_{c(k)+1})\} + \varsigma\{M(u_{c(k)+1}, u_{b(k)+1})\} + \varsigma\{M(u_{b(k)+1}, u_{b(k)})\} \\ &+ \varsigma\{M(e_{c(k)}, e_{c(k)+1})\} + \varsigma\{M(e_{c(k)+1}, e_{b(k)+1})\} + \varsigma\{M(e_{b(k)+1}, e_{b(k)})\} \end{aligned}$$

Let
$$\begin{aligned} \mathrm{A}_k \quad &= \varsigma(M(s_{c(k)}, s_{c(k)+1})) + \varsigma(M(s_{b(k)+1}, s_{b(k)})) + \varsigma(M(j_{c(k)}, j_{c(k)+1})) + \varsigma(M(j_{b(k)+1}, j_{b(k)})) \\ &+ \varsigma(M(u_{c(k)}, u_{c(k)+1})) + \varsigma(M(u_{b(k)+1}, u_{b(k)})) + \varsigma(M(e_{c(k)}, e_{c(k)+1})) + \varsigma(M(e_{b(k)+1}, e_{b(k)})) \end{aligned}$$

Then $Lim_{k\to\infty} A_k = 0$

So
$$\mathrm{r}_k \le A_k + \varsigma\{M(s_{c(k)+1}, s_{b(k)+1})\} + \varsigma\{M(j_{c(k)+1}, j_{b(k)+1})\} + \varsigma\{M(u_{c(k)+1}, u_{b(k)+1})\} + \varsigma\{M(e_{c(k)+1}, e_{b(k)+1})\} \quad (17)$$

Since we have

$$s_{c(k)} \le s_{b(k)}, j_{c(k)} \ge j_{b(k)}, u_{c(k)} \le u_{b(k)}, e_{c(k)} \ge e_{b(k)}$$

$$\varsigma\{m(s_{c(k)+1}, s_{b(k)+1})\} = \varsigma\{m(f(s_{c(k)}, j_{c(k)}, u_{c(k)}, e_{c(k)})), m(f(s_{b(k)}, j_{b(k)}, u_{b(k)}, e_{b(k)}))\}$$

$$\le \xi\{\frac{\varsigma(m(s_{c(k)}, s_{b(k)})) + \varsigma(m(j_{c(k)}, j_{b(k)})) + \varsigma(m(u_{c(k)}, u_{b(k)})) + \varsigma(m(e_{c(k)}, e_{b(k)}))}{4}\}$$

$$= \xi\{\frac{r_k + \varsigma(m_{s_{b(k)}s_{b(k)}}) + \varsigma(m_{j_{b(k)}j_{b(k)}}) + \varsigma(m_{u_{b(k)}u_{b(k)}}) + \varsigma(m_{e_{b(k)}e_{b(k)}})}{4}\}$$

Similarly

$$\varsigma(m(j_{b(k)+1}, j_{b(k)+1}) \le \xi\{\frac{r_k + \varsigma(m_{s_{b(k)}s_{b(k)}}) + \varsigma(m_{j_{b(k)}j_{b(k)}}) + \varsigma(m_{u_{b(k)}u_{b(k)}}) + \varsigma(m_{e_{b(k)}e_{b(k)}})}{4}\}$$

$$\varsigma(m(u_{b(k)+1}, u_{b(k)+1}) \le \xi\{\frac{r_k + \varsigma(m_{s_{b(k)}s_{b(k)}}) + \varsigma(m_{j_{b(k)}j_{b(k)}}) + \varsigma(m_{u_{b(k)}u_{b(k)}}) + \varsigma(m_{e_{b(k)}e_{b(k)}})}{4}\}$$

$$\varsigma(m(e_{b(k)+1},e_{b(k)+1}) \le \xi\{\frac{r_k+\varsigma(m_{s_{b(k)}s_{b(k)}})+\varsigma(m_{j_{b(k)}j_{b(k)}})+\varsigma(m_{u_{b(k)}u_{b(k)}})+\varsigma(m_{e_{b(k)}e_{b(k)}})}{4}\}$$

From (17)
$$\mathrm{r}_k \le \mathrm{A}_k+4\xi\{\frac{r_k+\varsigma(m_{s_{b(k)}s_{b(k)}})+\varsigma(m_{j_{b(k)}j_{b(k)}})+\varsigma(m_{u_{b(k)}u_{b(k)}})+\varsigma(m_{e_{b(k)}e_{b(k)}})}{4}\} \tag{18}$$

Let $k \to \infty$ in (18),

$$\varepsilon_0 \le 4\lim_{k\to\infty}\xi\{\frac{r_k}{4}\} = 4\lim_{k\to\infty}\xi\{\frac{r_k}{4}\} < \frac{4\varepsilon_0}{4} = \varepsilon_0$$

a contradiction. Therefore $\{s_n\},\{j_n\},\{u_n\},\{e_n\}$ are M Cauchy sequences.

Let $s,j,u,e \in S$ .Then

$$\lim_{n\to\infty} s_n = s, \lim_{n\to\infty} j_n = j, \lim_{n\to\infty} u_n = u, \lim_{n\to\infty} e_n = e.$$

f is continuous and

$$s_{n+1} = f(s_n,j_n,u_n,e_n), t_{n+1} = f(j_n,u_n,e_n,s_n), u_{n+1} = f(u_n,e_n,s_n,j_n), v_{n+1} = f(e_n,s_n,j_n,u_n).$$

Taking limit $n\to\infty$to both sides,

$$\lim_{n\to\infty} s_{n+1} = \lim_{n\to\infty} f(s_n,j_n,u_n,e_n) \Rightarrow s = f(s,j,u,e) .$$

$$\lim_{n\to\infty} j_{n+1} = \lim_{n\to\infty} f(j_n,u_n,e_n,s_n) \Rightarrow j = f(j,u,e,s).$$

$$\lim_{n\to\infty} u_{n+1} = \lim_{n\to\infty} f(u_n,e_n,s_n,j_n) \Rightarrow z = f(u,e,s,j).$$

$$\lim_{n\to\infty} e_{n+1} = \lim_{n\to\infty} f(e_n,s_n,j_n,u_n) \Rightarrow s = f(e,s,j,u).$$

Thus f has quadruple fixed point theorem.

3.1.1 Corollary

Consider $(S,m,\le)$ is partial order complete M –metric space. Suppose $f: S\times S\times S\times S \to S$ has mixed monotone property and

$$\varsigma\Big(m(f(s,j,u,e),f(p,q,g,h)\Big) \le k\left(\frac{\varsigma\{m(s,p)\}+\varsigma\{m(j,q)\}+\varsigma\{m(u,g)\}+\varsigma\{m(e,h)\}}{4}\right)$$

where $0 \le k \le 1,\ s,j,u,e,p,q,g,h \in S,\ s \ge p,\ j \le q, u \ge g, e \le h$. Other conditions are

(i) f is continuous.

(ii) When $\exists s_0,j_0,u_0,e_0 \in S$ such that

$s_0 \le f\left(s_0,j_0,u_0,e_0\right), t_0 \ge f\left(j_0,u_0,e_0,s_0\right), u_0 \le f\left(u_0,e_0,s_0,j_0\right), v_0 \ge f\left(e_0,s_0,j_0,u_0\right).$

Then f has a quadruple fixed point.

Proof: Consider $\xi = k$ in theorem 3.1.

3.1.2 Corollary

Assume $(S, m, \leq)$, a partially ordered complete M –metric space. Suppose $f : S \times S \times S \times S \to S$ has mixed monotone property and

$$m(f(s,j,u,e), f(p,q,g,h)) \leq k\left(\frac{m(s,p)+m(j,q)+m(u,g)+m(e,h)}{4}\right)$$

where $0 \leq k \leq 1$, $s, j, u, e, p, q, g, h \in S$, $s \geq p$, $j \leq q$, $u \geq g$, $e \leq h$. Other conditions are

(i) f Continuous.

(ii) If $\exists s_0, j_0, u_0, e_0 \in S$ such that

$s_0 \leq f(s_0, j_0, u_0, e_0), j_0 \geq f(j_0, u_0, e_0, s_0), u_0 \leq f(u_0, e_0, s_0, j_0), v_0 \geq f(e_0, s_0, j_0, u_0)$.

Then f has a quadruple fixed point.

Proof: Put $\varsigma(x) = x$ in corollary 3.1.1.

Example: Consider $m(s,j) = \frac{s+j}{2}, f(s,j,u,e) = \frac{s+j+u+e}{8}, \xi(x) = \frac{x}{3}, \varsigma(x) = \frac{x}{4}$

L.H.S.= $\varsigma\left(m(f(s,j,u,e), f(p,q,g,h)\right) = \varsigma\left(m(\frac{s+j+u+e}{8}, \frac{p+q+g+h}{8})\right)$

$$= \varsigma\left(\frac{s+j+u+e+p+q+g+h}{16}\right)$$

$$= \frac{s+j+u+e+p+q+g+h}{64}$$

R.H.S.= $\xi\left(\frac{\varsigma\{m(s,p)\}+\varsigma\{m(j,q)\}+\varsigma\{m(u,g)\}+\varsigma\{m(e,h)\}}{4}\right)$

$$= \xi\left(\frac{s+p+j+q+u+g+e+h}{8}\right)$$

$$= \frac{s+p+j+q+u+g+e+h}{24}$$

Every condition mentioned in theorem 3.1 is fulfilled. Thus (0, 0, 0, 0) is quadruple fixed point.

4. Conclusion

A quadruple fixed point theorem has been proven in partial order M-metric space by using mixed monotone property with example.

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Electrostatic Potential Distribution by Numerical Method Alternating Direction Implicit Method

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Abstract: **Charge free electrostatic potential has been calculated from Laplace equation with specific boundaries. Laplace equation is second-order partial differential equation (PDE) widely useful in physics because its solutions occur in problems of electrical, magnetic, and gravitational potentials, of steady-state temperatures, of hydrodynamics and of stress distribution. Solution of Partial Differential Equations (PDEs) is virtually impossible to obtain analytical solution. So, numerical methods are used to approximate the solution of such type of partial differential equation. The Alternating Direction Implicit (ADI) method has been used to solve the two-dimensional Laplace equations on regular (square and rectangular) region with Dirchlet boundary conditions. ADI method is an iterative and unconditionally stable method which is a popular method for solving the large matrix equations that arise in system theory and control theory. The obtained numerical results are compared with analytical solution as well as finite difference method. The results have been shown the better accuracy of ADI method than the finite difference method. The study objective is to check the accuracy of ADI method for the numerical solutions of two-dimensional Laplace equations for calculating potential distribution.**

Keywords— Alternating Direction Implicit method, Dirichlet boundary condition, Laplace equation, Potential distribution

I. Introduction

Electrostatic potential is the amount of work needed to move a unit of electric charge from a reference point to a specific point in an electric field without producing an acceleration. The calculation of Electrostatic potential is very important in various electricity-concerned technologies, in particular, for analyzing discharge phenomenon and designing high voltage equipment's. Electric potential is related to the charge density by Poisson's equation and in a charge-free region of space i.e as charge density becomes negligible, this becomes Laplace equation. We wish to determine electric potential of this problem in partial differential equations; the equation is always associated with a particular type of boundary conditions. In this article, Dirichlet boundary conditions are considered. Clive [7], Cooper [8], Adak [1-5], provides a development of finite difference methods and modern introduction to the theory of partial differential equation along with a brief coverage of numerical methods. Approximate solution of two-dimension Laplace equation with Dirichlet conditions is discussed by Patil and Prasad [16], Morales et al. [14], Li et al [13]. Dhumaland kiwne [10], Ubaidullah and Muhammad [17]. Two-dimensional Poisson equation with Dirichlet boundary condition is presented by Benyam and Purnachandra [6], Pandey and Jaboob [15]. Eyaya F. A. [11], Fernando [12] solved the elliptic partial differential equation by using finite volume method. Dambroshe [9], develop numerical algorithms to approximate solutions of Poisson's equation in three dimensional rectangular domains.

From the literature survey one can observe that maximum problems of Laplace/Poisson equation with Dirichlet boundary condition are solved with finite difference explicit method. The main objective of this study, Dirichlet initial-boundary (well-posed) problems are solved with square and rectangular (regular) domain by using Alternating Direction Implicit method which is iterative and unconditionally stable.

II. Problem Formulation

The Laplace equation with two spatial dimensions is given by

$$\frac{\partial^2 T}{\partial x^2}+\frac{\partial^2 T}{\partial y^2}=0 \qquad 0\le x\le a, 0\le y\le b \qquad (1)$$

where $T(x,y)$ is the steady state temperature distribution in the square domain.

with the Dirchlet boundary condition $T(x,y)=f(x,y)$ on S in square rectangular domain.

Equation (1) has been considered with Dirichlet boundary condition in a regular (rectangular/square) domain.

III. Formulation Of Laplace Equation By (ADI) Method

We consider Laplace's equation in two dimensions, viz.,

$$\frac{\partial^2 T}{\partial x^2}+\frac{\partial^2 T}{\partial y^2}=0 \qquad (2)$$

Using centre difference approximation for 2nd order derivative in equation (2) , we obtain

$$\frac{T_{i-1,j}-2T_{i,j}+T_{i+1,j}}{h^2}+\frac{T_{i,j-1}-2T_{i,j}+T_{i,j+1}}{k^2}=0 \qquad (3)$$

If mesh size along x and y direction is same, that means $h=k$, then equation (3) becomes

$$T_{i+1,j}+T_{i-1,j}+T_{i,j+1}+T_{i,j-1}-4\ T_{i,j}=0 \qquad (4)$$

which is called standard five point formula shown in Fig. 1.

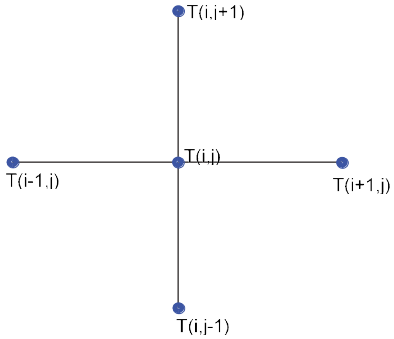

Fig.1 Temperature at any point average of surrounding points

We rearrange Equation (4) in either of two ways:

$$T_{i-1,j} - 4\ T_{i,j} + T_{i+1,j} = -T_{i,j-1} - T_{i,j+1} \quad (5)$$

or

$$T_{i,j-1} - 4\ T_{i,j} + T_{i,j+1} = -T_{i-1,j} - T_{i+1,j} \quad (6)$$

Equations (5) and (6) are called Alternative Direction Implicit method (ADI).

The ADI is an iterative method and equations (5) and (6) are used as iteration formulae

$$T_{i-1,j}^{n+1} - 4T_{i,j}^{n+1} + T_{i+1,j}^{n+1} = -T_{i,j-1}^{n} - T_{i,j+1}^{n} \quad (7)$$

and

$$T_{i,j-1}^{n+2} - 4T_{i,j}^{n+2} + T_{i,j+1}^{n+2} = -T_{i-1,j}^{n+1} - T_{i+1,j}^{n+1} \quad (8)$$

Equation (7) is used to compute function values at all internal mesh points along rows and equation (8) those along columns. For $j = 1,2,3, \ldots, n-1$. Equation (7) yields a tridiagonal system of equation and can easily be solved. Similarly, for $i = 1,2,3, \ldots, n-1$, equation (8) also yields a tridiagonal system of equations.

In the ADI method, formulae (7) and (8) are used alternately. For example, for the first row $j = 1$, and equation (7) gives

$$T_{i-1,1}^{n+1} - 4T_{i,1}^{n+1} + T_{i+1,1}^{n+1} = -T_{i,0}^{n} - T_{i,2}^{n} \quad (9)$$

Together with the boundary conditions, equation (9) represents a tridiagonal system of equations and are easily solved for $u_{i,1}^{n+1}$. We next put $j = 2$ and obtain the values of $u_{i,2}^{n+1}$ on the second row. The process is repeated for all the rows, viz up to $j = n-1$. we next alternate the direction, i.e. we use equation (8) to compute $u_{i,j}^{n+2}$. It is easy to see that at every stage we have solved a tridiagonal system of equation.

Here our problem is to find numerical value of a function $T(x,y)$ at the interior nodes points of the region provided that the Laplace equation and the boundary condition given in equations (2) is satisfied.
The stopping criterion for the iteration is

$$\varepsilon_{ij} = \left| \frac{T_{i,j\ present} - T_{i,j\ previous}}{T_{i,j\ present}} \right| < 10^{-n}$$

Exact solution
Separation of variables is used to reduce partial differential equation to ordinary differential equations. In the method of separation variables, the solution of Laplace equation is considered as a product of two individual functions as

$$T(x,y) = X(x)Y(y)\ .$$

Laplace equation has been satisfied by above solution. Then equation (2) reduced to

$$\frac{X''}{X} = -\frac{Y''}{Y} = -p^2 \quad \text{(P is positive constant)}$$

Therefore the exact solution of Laplace equation is

$$T(x,y) = (A\cos \mathrm{px} + \mathrm{B}\sin \mathrm{px})(\mathrm{C}\cos \mathrm{hpy} + \mathrm{D}\sin \mathrm{hpy})$$

Using Dirichlet Boundary condition defined in Fig. 2, we finally obtain exact solution of Laplace equation

$$T(x,y) = \frac{T_0}{\sin h\frac{\pi b}{a}} \sin\frac{\pi x}{a} \sin h\frac{\pi b}{a} \quad (10)$$

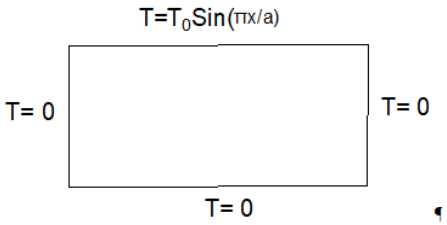

Fig. 2 Dirichlet Boundary conditions are specified in a rectangular domain.

IV. Numerical Solution By Using ADI Method

Problem 1: (Rectangular domain)
Consider Laplace equation
$\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0,\ 0 \le x \le 6,\ 0 \le y \le 3$, for calculating potential along the boundaries $T(0,y) = T(6,y) = 0$, $T(x,0) = 0$ and $T(x,3) = x(6-x)$ using ADI method.

Solution: Here $h = 1$, 10 interior points (unknown) in rectangular domain shown in Fig. 3

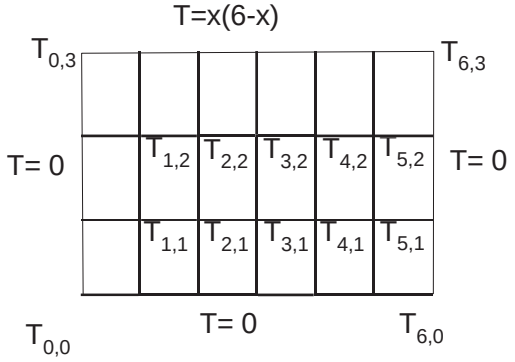

Figure 3 Grid points with boundary condition in a rectangular domain for problem 1

To apply formulae given in equations (7) and (8), we relabeled the internal mesh points, as in Fig. 3. To start the iterations, we set $n = 0$ (1st iteration, let $m = 1$) for the first row, $j = 1$ for $m = 1$, then, equation (7) gives

$$T_{i-1,1}^{(1)} - 4T_{i,1}^{(1)} + T_{i+1,1}^{(1)} = -T_{i,0}^{(0)} - T_{i,2}^{(0)}$$

With $i = 1, 2, 3, 4, 5$ this gives five simultaneous equations

$$T_{0,1}^{(1)} - 4T_{1,1}^{(1)} + T_{2,1}^{(1)} = -T_{1,0}^{(0)} - T_{1,2}^{(0)}$$
$$T_{1,1}^{(1)} - 4T_{2,1}^{(1)} + T_{3,1}^{(1)} = -T_{2,0}^{(0)} - T_{2,2}^{(0)}$$
$$T_{2,1}^{(1)} - 4T_{3,1}^{(1)} + T_{4,1}^{(1)} = -T_{3,0}^{(0)} - T_{3,2}^{(0)}$$
$$T_{3,1}^{(1)} - 4T_{4,1}^{(1)} + T_{5,1}^{(1)} = -T_{4,0}^{(0)} - T_{4,2}^{(0)}$$
$$T_{4,1}^{(1)} - 4T_{5,1}^{(1)} + T_{6,1}^{(1)} = -T_{5,0}^{(0)} - T_{5,2}^{(0)}$$

Substituting the boundary values in above simultaneous equation, we obtain tridiagonal matrix form

$$\begin{pmatrix} -4 & 1 & 0 & 0 & 0 \\ 1 & -4 & 1 & 0 & 0 \\ 0 & 1 & -4 & 1 & 0 \\ 0 & 0 & 1 & -4 & 0 \\ 0 & 0 & 0 & 1 & -4 \end{pmatrix} \begin{pmatrix} T_{1,1} \\ T_{2,1} \\ T_{3,1} \\ T_{4,1} \\ T_{5,1} \end{pmatrix} = \begin{pmatrix} T_{1,2}^0 \\ T_{2,2}^0 \\ T_{3,2}^0 \\ T_{4,2}^0 \\ T_{5,2}^0 \end{pmatrix}$$

$$\begin{pmatrix} -4 & 1 & 0 & 0 & 0 \\ 1 & -4 & 1 & 0 & 0 \\ 0 & 1 & -4 & 1 & 0 \\ 0 & 0 & 1 & -4 & 0 \\ 0 & 0 & 0 & 1 & -4 \end{pmatrix} \begin{pmatrix} T_{1,1} \\ T_{2,1} \\ T_{3,1} \\ T_{4,1} \\ T_{5,1} \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

$T_{1,1} = 0, T_{2,1} = 0,\ T_{3,1} = 0, T_{4,1} = 0, T_{5,1} = 0$ (along first row).

Again, we set $n = 0$, for the second row, $j = 2$. then, equation (7) gives with $i = 1, 2, 3, 4, 5$ this gives five simultaneous equations

$$T_{0,2}^{(1)} - 4T_{1,2}^{(1)} + T_{2,2}^{(1)} = -T_{1,1}^{(0)} - T_{1,3}^{(0)}$$
$$T_{1,2}^{(1)} - 4T_{2,2}^{(1)} + T_{3,2}^{(1)} = -T_{2,1}^{(0)} - T_{2,3}^{(0)}$$
$$T_{2,2}^{(1)} - 4T_{3,2}^{(1)} + T_{4,2}^{(1)} = -T_{3,1}^{(0)} - T_{3,3}^{(0)}$$
$$T_{3,2}^{(1)} - 4T_{4,2}^{(1)} + T_{5,2}^{(1)} = -T_{4,1}^{(0)} - T_{4,3}^{(0)}$$
$$T_{4,2}^{(1)} - 4T_{5,2}^{(1)} + T_{6,2}^{(1)} = -T_{5,1}^{(0)} - T_{5,3}^{(0)}$$

Substituting the boundary values in above simultaneous equation, we obtain tridiagonal matrix form

$$\begin{pmatrix} -4 & 1 & 0 & 0 & 0 \\ 1 & -4 & 1 & 0 & 0 \\ 0 & 1 & -4 & 1 & 0 \\ 0 & 0 & 1 & -4 & 0 \\ 0 & 0 & 0 & 1 & -4 \end{pmatrix} \begin{pmatrix} T_{1,2} \\ T_{2,2} \\ T_{3,2} \\ T_{4,2} \\ T_{5,2} \end{pmatrix} = \begin{pmatrix} T_{1,3}^0 \\ T_{2,3}^0 \\ T_{3,3}^0 \\ T_{4,3}^0 \\ T_{5,3}^0 \end{pmatrix}$$

$$\begin{pmatrix} -4 & 1 & 0 & 0 & 0 \\ 1 & -4 & 1 & 0 & 0 \\ 0 & 1 & -4 & 1 & 0 \\ 0 & 0 & 1 & -4 & 0 \\ 0 & 0 & 0 & 1 & -4 \end{pmatrix} \begin{pmatrix} T_{1,2} \\ T_{2,2} \\ T_{3,2} \\ T_{4,2} \\ T_{5,2} \end{pmatrix} = \begin{pmatrix} 5 \\ 8 \\ 9 \\ 8 \\ 5 \end{pmatrix}$$

$T_{1,2} = -2.1346, T_{2,2} = -3.5385,\ T_{3,2} = -4.01923,\ T_{4,2} = -3.5385,\ T_{5,2} = -2.1346$ (along second row).

Having completed the computations on two rows, we now alternate the direction and compute the function values on the columns, starting with the first one. For this, we use equation (8) with $n = 0$. Setting $i = 1$ for $m = 2$ equation (8) becomes

$$T_{1,j-1}^{(2)} - 4T_{1,j}^{(2)} + T_{1,j+1}^{(2)} = -T_{0,j}^{(1)} - T_{2,j}^{(1)}$$

Putting $j = 1$ and $j = 2$ in the above (for column wise calculation), we obtain the equations

$$T_{1,0}^{(2)} - 4T_{1,1}^{(2)} + T_{1,2}^{(2)} = -T_{0,1}^{(1)} - T_{2,1}^{(1)}$$

And

$$T_{1,1}^{(2)} - 4T_{1,2}^{(2)} + T_{1,3}^{(2)} = -T_{0,2}^{(1)} - T_{2,2}^{(1)}$$

Substituting the boundary values we obtain,

$$-4T_{1,1}^{(2)} + T_{1,2}^{(2)} = 0$$
$$T_{1,1}^{(2)} - 4T_{1,2}^{(2)} + 5 = -3.5385$$

Solving these equations we get,

$T_{1,1}^{(2)} = 0.5692$ and $T_{1,2}^{(2)} = 2.2769$

Similarly, along second column, $T_{2,1}^{(2)} = 0.94358$ and $T_{2,2}^{(2)} = 3.7743$

Along third column, $T_{3,1}^{(2)} = 1.07179$ and $T_{3,2}^{(2)} = 4.2871$

Along fourth column, $T_{4,1}^{(2)} = 0.94846$ and $T_{4,2}^{(2)} = 3.79384$

Along fifth column, $T_{5,1}^{(2)} = 0.5692$ and $T_{5,2}^{(2)} = 2.2769$

The iteration are continued to improve the function values obtained first on the rows, then on the column, and so on for $m = 3, 4, 5, \ldots\ldots\ldots 20$.

Table 1 ADI Iterative Process for Laplace Equation with Dirichlet Boundary Condition in a Rectangular Domain

Iterations	$T_{1,1}$	$T_{2,1}$	$T_{3,1}$	$T_{4,1}$	$T_{5,1}$	$T_{1,2}$	$T_{2,2}$	$T_{3,2}$	$T_{4,2}$	$T_{5,2}$
1	0	0	0	0	0	2.135	3.538	4.019	3.538	2.1346
2	0.5692	0.9436	1.0718	0.9485	0.5692	2.277	3.774	4.287	3.794	2.2769
3	0.9858	1.6663	1.9049	1.666	0.9858	2.3810	3.9550	4.4955	3.9550	2.3810
4	1.0413	1.7626	2.0160	1.7626	1.0413	2.4990	4.1598	4.7315	4.1598	2.49909
5	1.0838	1.8361	2.1009	1.8361	1.0838	2.5893	4.3160	4.9119	4.3160	2.58933
6	1.1107	1.8827	2.1547	1.8827	1.1107	2.6067	4.3460	4.9467	4.3460	2.60667
7	1.1312	1.9182	2.1958	1.9182	1.1312	2.6199	4.3689	4.9731	4.3689	2.61991
8	1.1361	1.9267	2.2056	1.9267	1.1361	2.6263	4.3799	4.9859	4.3799	2.6263
9	1.1399	1.9332	2.2131	1.9332	1.1399	2.6311	4.3884	4.9956	4.3884	2.63112
10	1.1414	1.9359	2.2161	1.9359	1.1414	2.6324	4.3906	4.9982	4.3906	2.63244
11	1.1426	1.9379	2.2185	1.9379	1.1426	2.6335	4.3924	5.0002	4.3924	2.63345
12	1.1429	1.9385	2.2192	1.9385	1.1429	2.6338	4.3931	5.0010	4.3931	2.6338
13	1.1432	1.9390	2.2197	1.9390	1.1432	2.6341	4.3936	5.0015	4.3936	2.63412
14	1.1433	1.9392	2.2199	1.9391	1.1433	2.6342	4.3937	5.0018	4.3937	2.63422
15	1.1433	1.9392	2.2199	1.9391	1.1433	2.6342	4.3937	5.0018	4.3937	2.63422

In this problem the obtained results are also verified using a MATLAB program, where we do iterations up to m = 20, the results were found to converge at m = 14 shown in Table1.

For different values of m that means at different step of iteration numerical results are showing in table 2.
Using separation of variables method we obtain the exact solution of the Laplace equation with Dirichlet condition (problem 1) that is final solution to the stress distribution is

given by $T(x,y) = \frac{288}{\pi^3 \sin h\frac{\pi}{2}} \sin\frac{\pi x}{6} \sin h\ \frac{\pi y}{6}$

This equation will give the exact solution at each interior point of rectangular domain defined as figure 2. Comparison of numerical results with exact results and error are calculated which is mentioned in table 3.

Table 2 Results For $m = 1,\ m = 6,\ m = 12,\ m = 18$

T_{ij}	$m = 1$	$m = 6$	$m = 12$	$m = 18$
$T_{1,1}$	0.569230769230769	1.131233209751189	1.143210658193686	1.143430732982000
$T_{1,2}$	2.276923076923077	2.619910216858782	2.634127703562456	2.634339795545806
$T_{2,1}$	0.943589743589743	1.918259631432139	1.939006506840285	1.939387685905424
$T_{2,2}$	3.774358974358974	4.368938529229834	4.393565738809385	4.393933091355381
$T_{3,1}$	1.071794871794872	2.195799752835711	2.219754649720705	2.220194799297335
$T_{3,2}$	4.287179487179486	4.973153767050899	5.001588740458245	5.002012924424946
$T_{4,1}$	0.943589743589743	1.918259631432139	1.939006506840285	1.939387685905424
$T_{4,2}$	3.774358974358974	4.368938529229835	4.393565738809385	4.393933091355382
$T_{5,1}$	0.569230769230769	1.131233209751189	1.143210658193686	1.143430732982001
$T_{5,2}$	2.276923076923077	2.619910216858783	2.634127703562456	2.634339795545807

TABLE 3 Comparison With Exact Solution And Numerical Solution

Nodes	Numerical solution	Exact solution	Error
$T_{1,1}$	1.143379020165685	1.105615868934514	0.037763151231171
$T_{2,1}$	1.939298116524216	1.914982858648991	0.024315257875225
$T_{3,1}$	2.220091373664702	2.211231737869028	0.008859635795675

Nodes	Numerical solution	Exact solution	Error
$T_{4,1}$	1.939298116524217	1.914982858648991	0.024315257875226
$T_{5,1}$	1.143379020165685	1.105615868934514	0.037763151231171
$T_{1,2}$	2.634286896104412	2.521331164298694	0.112955731805719
$T_{2,2}$	4.393841466672947	4.367073679272131	0.026767787400816
$T_{3,2}$	5.001907125542158	5.042662328597388	0.040755203055230
$T_{4,2}$	4.393841466672947	4.367073679272131	0.026767787400815
$T_{5,2}$	2.634286896104413	2.521331164298694	0.112955731805719

Problem 2 (Square Domain)

Steady state potential distribution problem which satisfies Laplace equation $\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0,\ 0 \le x, y \le 4$, on a square frame along the boundaries $T(0,y) = T(4,y) = 0, T(x,0) = 0$ and $T(x,4) = sin\frac{\pi x}{4}$ using ADI method.

Solution: Here $h = 1$, 9 interior points (unknown) in square domain shown in Fig.4.

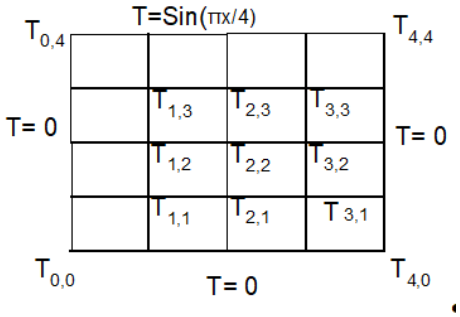

Fig. 4 Grid Points with boundary condition in square domain for Problem 2

Table 4 Potential Distribution In Square Domain With Dirichlet Boundary Condition.

Iterations	$T_{1,1}$	$T_{2,1}$	$T_{3,1}$	$T_{1,2}$	$T_{2,2}$	$T_{3,2}$	$T_{1,3}$	$T_{2,3}$	$T_{3,3}$
1	0	0	0	0	0	0	0.2734	0.3867	0.2734
2	0.0195	0.0276	0.0195	0.07813	0.11049	0.07813	0.29299	0.41435	0.2929
3	0.0302	0.0427	0.0302	0.1209	0.1709	0.1209	0.3037	0.4294	0.3037
4	0.04395	0.06216	0.04395	0.13307	0.1882	0.1331	0.3174	0.4489	0.3174
5	0.05146	0.07278	0.05146	0.1397	0.1976	0.1397	0.3249	0.4595	0.3249
6	0.05444	0.07699	0.05444	0.14499	0.20505	0.14499	0.3279	0.4637	0.3279
7	0.05607	0.0793	0.05607	0.14786	0.2091	0.14786	0.3295	0.4660	0.3295
8	0.05712	0.0808	0.05712	0.1492	0.2110	0.1492	0.3306	0.4675	0.3306
9	0.05770	0.08160	0.05770	0.1499	0.2120	0.1499	0.3312	0.46833	0.3312
10	0.05799	0.0820	0.05799	0.15037	0.21266	0.15037	0.3314	0.46874	0.3314
11	0.05815	0.08224	0.05815	0.15061	0.21299	0.15061	0.3316	0.46897	0.3316
12	0.05824	0.08237	0.05824	0.1507	0.21317	0.1507	0.3317	0.46910	0.3317

TABLE 5 RESULTS FOR $m = 1,\ m = 6,\ m = 12,\ m = 18$

T_{ij}	$m = 1$	$m = 6$	$m = 12$	$m = 18$
$T_{1,1}$	0.019532791452787	0.056073938281418	0.058294078760887	0.058351398799545
$T_{1,2}$	0.078131165811147	0.147864608296504	0.150804465783487	0.150886111344653
$T_{1,3}$	0.292991871791800	0.329533018620431	0.331753159099900	0.331810479138558
$T_{2,1}$	0.027623538583536	0.079300524013253	0.082440276789692	0.082521339565757
$T_{2,2}$	0.110494154334145	0.209112134447902	0.213269720777437	0.213385185037345
$T_{2,3}$	0.414353078753043	0.466030064182760	0.469169816959198	0.469250879735264
$T_{3,1}$	0.019532791452787	0.056073938281418	0.058294078760887	0.058351398799545
$T_{3,2}$	0.078131165811147	0.147864608296504	0.150804465783487	0.150886111344653
$T_{3,3}$	0.292991871791800	0.329533018620432	0.331753159099900	0.331810479138558

Using equations (7) and (8) we obtain the approximate solution at each node. ADI iterative process for numerical solution is shown in Table 4.

Fifteen iterations are necessary to reach a solution of Laplace equation with Dirichlet condition in square domain. The obtained results are also verified using a MATLAB program,

where we do iterations up to $m = 20$ (21 iteration). For different values of m that means at different step of iteration numerical results are showing in table 5.

Using separation of variables method (equation 3.9) we obtain the exact solution of the Laplace equation with Dirichlet condition (problem 2) that is final solution to the stress distribution is

$$T(x,y) = \frac{1}{\sin h\,\pi}\sin\frac{\pi x}{4}\sin h\,\frac{\pi y}{4}$$

This equation will give the exact solution at each interior point of square domain defined as figure 3. Comparison of numerical results with exact results and error are calculated which is mentioned in table 6.

Table 6 Comparison With Exact Solution And Numerical Solution

Nodes	Numerical solution	Exact solution	Error
$T_{1,1}$	0.058347696958599	0.053187028340074	0.005160668618525
$T_{2,1}$	0.150880862597841	0.140904042339132	0.009976820258709
$T_{3,1}$	0.331806777297613	0.320098522049453	0.011708255248159
$T_{1,2}$	0.082516104372086	0.075217816820855	0.007298287551232
$T_{2,2}$	0.213377762188418	0.199268407669193	0.014109354519224
$T_{3,2}$	0.469245644541593	0.452687671177920	0.016557973363673
$T_{1,3}$	0.058347696958599	0.053187028340074	0.005160668618525
$T_{2,3}$	0.150880862597841	0.140904042339132	0.009976820258709
$T_{3,3}$	0.331806777297613	0.320098522049454	0.011708255248159

V. Conclusion

This study focused in various domains to obtain solutions numerically by using Alternative Direction Implicit (ADI) method to solve Laplace equations with Dirichlet boundary conditions for stress analysis of elastic membrane. The table results showed the good agreement of exact and numerical solution obtained by ADI. The results of table showed that for the prediction of steady state stress distribution and temperature distribution in regular rectangular, square domain.

ADI method is superior in both competence and accuracy as unconditionally stable. The numerical results from the tables showed that the method is accurate and is desirable for use in the solution of elliptic as well as parabolic partial differential equation. The accuracy of most numerical technique for solving mathematical problems improve as the mesh size is refined. It is recommended, therefore, that the mesh lengths used in this study be reduced to smaller sizes. This will lead to better accuracy, however at a higher cost of computation. This technique can be successfully implemented for temperature and stress distribution in more complicated geometries in future work.

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An Effective Fair Off-Line Electronic Cash Protocol using Extended Chaotic Maps with Anonymity Revoking Trustee

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***Abstract*—Along with the proliferation of cyberspace and the beginning of electronic trade, many electronic cash protocols were suggested. Electronic cash allows digital coins to be exchanged with value guaranteed by the signature of the financial institution and the hidden identity of the client. A client can withdraw money from the financial institution in an electronic cash protocol and then anonymously and unlinkably spend each coin. The present article suggests a practical, fair offline electronic cash protocol using extended chaotic maps capable of coin locating and seller locating. Under certain conditions, the protocol's anonymity perchance was revoked from an offline trusted third party. The trustworthy third party verifies the financial institution's e-coin signature in our protocol and then logs the location of data that isn't part of the normal electronic cash protocol.**

Keywords—cryptography, electronic cash protocol, extended chaotic maps, revokable anonymity, blind signatures.

I. INTRODUCTION

In 1982, the concept of electronic cash protocol was presented by Chaum [5], based on the approach of blind signatures to ensure the secretness of the client. This absolute privacy of electronic cash protocol might be utilized for extort or launder cash by offenders while not disclosing their identities presented by Von Solms and Naccache [22]. Brickell [2] and Stadler [23] introduced the framework of fair electronic cash protocol, which provides a reconciliation among the requirement of the secrecy security concerning the client and successfully restricts the exploit by offenders. Brickell [2] extended off-line cash in billfold with onlooker protocol of Brands [1] fair electronic cash protocol where a trustee has to participate in the operations.

A fair offline electronic cash protocol needs more communication among the financial institution, the client, and the sellers offered by Frankel, Tsiounis, and Yung [6]. Electronic payment protocol by revocable anonymity has been suggested in [3], [7], [8], [21]. Meshram et al. [9-16] suggested novel and profitable identity-based encryption (IBE) techniques and ID-based structures based on discrete logarithm, generalized discrete logarithm, and factoring. Meshram et al. [17-19] presented an expansion of the IBE technique utilizing partial discrete logarithm (PDL) that is semantically secure against chosen ciphertext attack in a random oracle model and also presented efficient online/offline identity-based short signature protocol utilizing PDL for remote sensor systems. Recently, Meshram et al. [24-28] suggested a secure online/offline subtree-based and ID-based short signature mechanism, ID-based cryptographic transformation technique, under human-centered IoT environments based on chaotic maps, extended chaotic maps, Chebyshev chaotic maps, and fractional chaotic maps.

As outlined above, we presented effective, fair off-line electronic cash protocol utilizing extended chaotic maps with anonymity revoking trustees. The suggested techniques have the under-mentioned advantage.

The technique is reasonably suitable to the client who is worried about an attack on confidentiality. Every independent client is permissible to withdraw an average fund like ₹ 500 casually per day from a financial institution or automated teller machine. Presented technique convenient from corruption prohibition and the point of view of regulations implementation. Thus if regulations implementation becomes the trustees' confirmation, then there is a need to decide where a client has used their trustee location electronic cash. Every independent client is permitted to withdraw as many monies as they have in the form of trustee finding electronic cash from any region. The

approach we presented requires two trustees, one who is a standard trustee and the other who is required for the location to function. The client transfers the trustees' mutual data to identify the client's trustee locatable coins. Thus trustee-based location has no necessity for intervening obstructive hardware. The client demanding to compose a buying without the right change while preserving client anonymity address by suggested technique. Our technique is autonomous of trustee-based locating and the context of an altogether anonymous. The technique preserves the client's adverse fake charges of spending electronic funds.

The rest of this article is coordinated as follows. background and material are given in Section 2. Our practical, fair off-line electronic cash protocol based on extended chaotic maps is suggested in Section 3. Security examination of the scheme is discussed in Section 4. Finally, Section 5 concludes the article.

II. Background and Material

In this segment, we give a description of Chebyshev polynomials and extended chaotic maps and their relevant mathematical aspects.

A. Chebyshev chaotic polynomials

We examine the operatory of Chebyshev sequential polynomials (CSP) (see [29]). CSP $\mathcal{T}_{ŋ}(y)$ is a ŋ -degree polynomial in the y variant. Let $y \in [-1,1]$ be the arrangement, and ŋ be an integer. CSP reported the following in general:

$$\mathcal{T}_{ŋ}(y) = cos\left(ŋ \times cos^{-1}(y)\right),$$
$$\mathcal{T}_0(y) = 1,$$
$$\mathcal{T}_1(y) = y,$$
$$\mathcal{T}_{ŋ}(y) = 2y\mathcal{T}_{ŋ-1}(y) - \mathcal{T}_{ŋ-2}(y);\ ŋ \geq 2$$

Under this circumstance, the functional $cos^{-1}(y)$ and $\cos(y)$ represented as $cos^{-1}: [-1,1] \to [0,\pi]$ and $\cos: R \to [-1,1]$. A few cases of Chebyshev polynomials for ŋ = 1, 2,3,4,5 are shown in Figure 1.

CSP [24, 26, 27, 28, 30] has two primary properties: chaotic and semi-group properties.

(1) The chaotic properties: The CSP map is demarcated as $\mathcal{T}_{ŋ}: [-1,1] \to [-1,1]$ with degree $ŋ > 1$, is a chaotic map associated with the (invariant density) functional $f^*(y) = \frac{1}{\left(\pi\sqrt{1-y^2}\right)}$ for the positive Lyapunov exponent $\lambda = \ln ŋ > 0$.

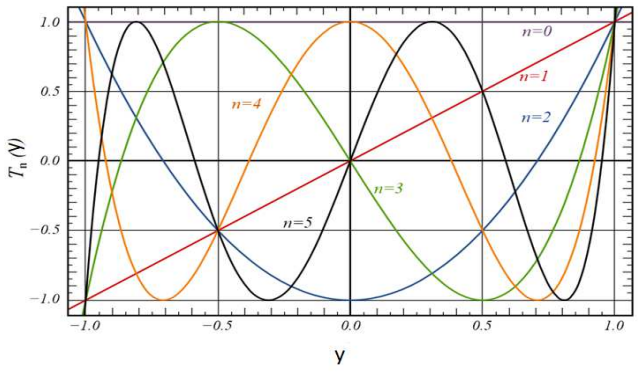

Figure 1. Chebyshev polynomials

(2) The possessions of what is referred to as a semi-group satisfy the following conditions:

$$\mathcal{T}_a(\mathcal{T}_c(y)) = \cos\left(a\cos^{-1}\left(\cos\left(c\cos^{-1}(y)\right)\right)\right)$$
$$= \cos\left(ac\cos^{-1}(y)\right)$$
$$= \mathcal{T}_{ca}(y)$$
$$= \mathcal{T}_c(\mathcal{T}_a(y)),$$

where $y \in [-1,1]$ and a and c are positive integers.

Chebyshev polynomials (CP) have two assessments that consider handling in polynomial time:

(1) Given two elements y and v, the discrete log's (DL) task is to invent an integer a with the end goal $\mathcal{T}_a(y) = v$.

(2) Because of three elements y, $\mathcal{T}_a(y)$, and $\mathcal{T}_c(y)$, the Diffie-Hellman problem (DHP) task is to measure the $\mathcal{T}_{ac}(y)$ element.

B. Extended Chaotic Maps

Zhang [30] demonstrated that the semi-group property retains the interval $(-\infty, +\infty)$, which may be used to improve the property as tracks:

$$\mathcal{T}_{ŋ}(y) = 2y\mathcal{T}_{ŋ-1}(y) - \mathcal{T}_{ŋ-2}(y);\ n \geq 2$$

where $y \in (-\infty, +\infty)$ and q_1 is a large and safe prime. Thus, the property follows:

$$\mathcal{T}_a(\mathcal{T}_c(y))(mod q_1) = \mathcal{T}_{ca}(y)(mod q_1)$$
$$= \mathcal{T}_c(\mathcal{T}_a(y))(mod q_1)$$

and the semi-group property is also preserved.

III. Proposed Fair Off-Line Electronic Cash Protocol

In this segment, we offered a fair offline electronic cash protocol. It has the successive six components

3.1. System parameters

An element $g \in Z_{q_1}^*$ with maximal order $ord(G)$, and a huge prime q_1 are system parameters.

The trusted third party:

The following steps are performed by trusted third party

a. Pick up an arbitrary element $u_e \in Z_{q_1}^*$.

b. Compute $v_e = \mathcal{T}_{u_e}(g)(mod\ q_1)$.

c. $Here, v_e$ is public key and u_e is relating secrete key.

The Financial institution:

The financial institution performs the following steps

a. Pick of an arbitrary element $u_w \in Z_{q_1}^*$.

b. Compute $v_w = \mathcal{T}_{u_w}(g)(mod\ q_1)$

c. $Here, v_w$ is public key and u_w is relating secrete key.

The Client:

The client performs the following steps

a. Pick up of an arbitrary element $u_\ell \in Z_{q_1}^*$.

b. Compute of $v_\ell = \mathcal{T}_{u_\ell}(g)(mod\ q_1)$

c. $Here, v_\ell$ is public key and u_ℓ is relating secrete key

3.2. The Withdrawal Procedure

The client withdrawal electronic cash from the financial institution in the withdrawal procedure

a. For $k \in Z_{q_1}^*$, the financial institution receives signature (b, d) by the client, where $b = \mathcal{E}_c T_k(g) (mod\ q_1)$, $d = u_\ell\, b + k (mod\ q_1)$ a signature scheme of Nyberg-Rueppel [20] signed the requisite electronic cash $\mathcal{E}_c = \mathcal{H}(\text{withdrawal require } \|ID\| time)$ with identity ID of the client.
b. The financial institution verifies $\mathcal{E}_c = T_{-d}(g) T_b(v_\ell) b (mod\ q_1)$. Signs the e-coin for random $\bar{k} \in Z_{q_1}^*$ and calculates $\bar{b} = \mathcal{E}_c T_{\bar{k}}(g) (mod\ q_1)$ utilizing blind Camenisch and Piveteau signature [4] and sends to the client and stores connected by the client's identity.
c. For $\chi, \psi \in Z_{q_1}^*$ with established coin $\mathcal{C}$, the scheme calculates $b_w = \mathcal{C} T_{\chi - \psi}(g) b (mod\ q_1)$ and blinds the e-coin by calculating $\mathcal{C}' = b\psi^{-1} (mod\ q_1)$ and sends to the financial institution by clients.
d. The financial institution calculates $\bar{d} = \mathcal{C}' u_w + \bar{k} (mod\ q_1)$ and sends to the client.
e. The pair (b_w, d_w) is an authentic e-coin signature issued by the financial institution where $d_w = \bar{d}\psi + \chi (mod\ q_1)$ that is processed by the client.

The client has to complete the mentioned sub procedure with the trusted third party (TTP):

a. The TTP receives $(\mathcal{C}, \bar{b}, b_w, d_w)$ by the client
b. The TTP confirms the signature of the blinded coin: $T_{-d_w}(g) T_{b_w}(v_w) b_w = \mathcal{C} (mod\ q_1)$
c. Then it computes $b_e = \mathcal{C} T_{k_e}(g) (mod\ q_1)$, $d_e = u_e b_e + k_e (mod q_1)$ for a random element $k_e \in Z_{q_1}^*$ and refers to the pair (b_e, d_e) to the client.

Thus $(\mathcal{C}, b_w, d_w, b_e, d_e)$ denote e-cash

3.3. The Payment Procedure

The client pays the electronic coin to the sellers in the payment procedure

a. The client refers to the tuple $(\mathcal{C}, \bar{b}, b_w, d_w)$ to the sellers.
b. The sellers confirm the validity of the signature (b_w, d_w) through checking
$$T_{-d_w}(g) T_{b_w}(v_w)\, b_w = \mathcal{C} (mod\ q_1) \quad \text{(i)}$$
c. The sellers confirm the validity of the signature (b_e, d_e) through checking
$$T_{-d_e}(g) T_{b_e}(v_e)\, b_e = \mathcal{C} (mod\ q_1) \quad \text{(ii)}$$

The sellers will receive the coin from the client if the equalities (i) and (ii) hold

3.4. The Deposit Procedure

Seller deposits his electronic coins to the financial institution in deposits procedure

a. The seller refers to the e-cash tuple $(\mathcal{C}, b_w, d_w, b_e, d_e)$ to the financial institution.
b. The financial institution confirms the validity of the e-coin utilizing similar processes as the seller.
c. The financial institution gets the coin and credits the e-cash to the client's account if the coin was not previously credited and the vendor relates the products to the client. The financial institution requires the trusted third party to revoke the corrupt client's identity if the coin was previously deposited.

3.5. The Client Locating Procedure

The TTP and the financial institution includes in the client locating procedure the followings:

a. The TTP receives the e-coin tuple $(\mathcal{C}, b_w, d_w, b_e, d_e)$ by the financial institution.
b. The TTP confirms the validity of the e-coin utilizing similar processes as the seller and then refers $\bar{b}$ to the financial institution.
c. The financial institution can find the related client from its database.

3.6. The Coin Locating Procedure

The TTP and the financial institution includes in the coin location procedure.
Blackmailing can be avoided in this procedure.

a. The client refers his identity ID, to the financial institution.
b. The TTP receives $\bar{b}$ from the financial institution.
c. The TTP searches the matching coin $\mathcal{C}$ and then refers to the financial institution.
d. The financial institution can decline the coin $\mathcal{C}$.

IV. Security Examination

In this section, we describe the security of the presented fair offline electronic cash protocol.

Theorem 4.1. If the blind signature protocol is safe against forgery, so the presented e-cash procedure is secure against forgery of the coin.

Proof. If a corrupt client attempts to make an authenticated e-coin, the financial institution must produce an authenticated blind signature (b_w, d_w). Since it is impossible to solve an extended chaotic map (i.e., from the financial institution's public key, $T_{u_w}(g) (mod\ q_1)$, the client cannot calculate the financial institution's secret key, u_w), we can conclude that the coin's forgeability is impeded.

Theorem 4.2. The presented fair offline electronic cash protocol can safeguard the confidentiality of the client and anonymize the procedure.

Proof. Because the Nyberg-Rueppel blind signature (b_w, d_w) cannot confirm the coin $\mathcal{C}$, and the financial institution cannot link the blind coin to the client's recognition, the financial institution is unable to locate honest clients, which requires the assistance of a trusted third

party. Furthermore, under the payment protocol, the sellers can only check the client's e-coin and identification.

Theorem 4.3. In certain exceptional cases, the client's anonymity can be eliminated with the alliance between the financial institution and the TTP.

Proof. In the withdrawal protocol, the TTP records each pair $(\mathcal{C}, \bar{\mathcal{b}})$ and $\bar{\mathcal{b}}$ is linked to the client's identity. They can check the location of data in their database and deliver it to the financial institution.

V. Conclusion

This paper proposed an effective, fair offline electronic cash protocol using extended chaotic maps with trustees revoking anonymity. The trusted third party confirms the financial institution's signature of the e-coin in the suggested protocol. It then documents the location of data that is distinct from standard electronic cash protocol. Through the alliance of the financial institution and the trusted third party, property and coin location can remove client anonymity. Our protocol's security is based on the issue of the extended chaotic maps. Future work would focus on an efficient provably secure fair off-line electronic cash protocol using fractional chaotic maps with anonymity revoking trustee.

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Numerical Solution of Fourth-Order Boundary Value Problems for Euler-Bernoulli Beam Equation using FDM

Numerical Solution of Fourth-Order Boundary Value Problems for Euler–Bernoulli Beam Equation using FDM

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Abstract. Euler–Bernoulli beam equation is widely used in engineering, especially civil and mechanical engineering to determine the deflection or strength of bending beam. In physical science and engineering, to predict the deflection for beam problem, bending moment, soil settlement and modeling of viscoelastic flows, fourth- order ordinary differential equation (ODE) is widely used. The analytical solution of most of the higher order ordinary differential equations with complicated boundary condition that occur in any engineering problems is not easy way. Therefore, numerical technique based on finite difference method (FDM) is comparatively easy and important for solving the boundary value problems (BVP). In this study four boundary conditions (Neumann condition) are considered for solving BVP. Absolute error calculation, numerical stability and convergence are discussed. Two examples are considered to illustrate the finite difference method for solving fourth order BVP. The numerical results are rapidly converged with exact results. The results shows that the FDM is appropriate and reliable for such type of problems. Thus present study will enhance the mathematical understanding of engineering students along with an application in different field.

1. Introduction

In several branches of science and engineering, fourth order boundary value problems arise specially in elastic stability beam theory. BVP is involving ordinary differential equations with satisfying perticular conditions. Analytically particular class of differential equations can be solved. Those problems which consists of higher order differential equation and complicated boundary conditions can only be solved by numerical methods to obtain closed solution. In literature, Balagurusamy [5], Hildebrand [6], Jain [8], Kelesoglu [9], Levy [11], Sastry [13, 14], Scheid [15] developed the finite difference methods for solving the initial-boundary value problems. Second order and third order BVP with ODE for Dirichlel boundary condition are solved by Hossain [7], Lakshmi [10], Muhammad [12], Siddiqi [16] and Xu [17]. Adak [1-4] studied finite difference methods for solving partial differential equation along with convergence of numerical techniques.

From the previous research work, it is found that in most of the cases, the BVP of second order differential equation with Dirichlet boundary condition was investigated. Therefore, in this study, fourth

order differential equation for beam-theory (bending equation) has been considered and solved using FDM.

2. Problem identification

In the beam theory, deflection of beam is determined by Euler Bernoulli's equation i.e. the fourth order ordinary differential equation. Euler beam equation arises from the combination of four following equations of beam theory which are kinematic, constitutive, force result and equilibrium. That means,
Kinematic → constitutive → force resultant →equilibrium = Beam equation.
Where,

kinematics $\aleph = -\theta = -\frac{dw}{dx}$ (1)

Constitutive $\sigma(x,y) = E\,\varepsilon(x,y)$ (2)

Resultant $M(x) = \iint y\sigma(x,y)\,dy\,dz$ (3)

Equilibrium $\frac{dM}{dx} = V \qquad \frac{dV}{dx} = -p$ (4)

where, $V(x) = \iint \sigma_{xy}\,dy\,dz$

Combining the two equilibrium equations (4), we obtain

$\frac{d^2M}{dx^2} = -p$ (5)

Now, In equation (5), moment M is replaced by equation (3) given by

$\frac{d^2}{dx^2}\left(\iint y\sigma dy\,dz\right) = -p$ (6)

To eliminate σ from equation (6), use constitutive relation (2) and then use kinematics (1) to replace ε in the normal displacement (w), thus obtained,

$\frac{d^2}{dx^2}(E\iint y\varepsilon dy\,dz) = -p \qquad \frac{d^2}{dx^2}\left(E\frac{d\aleph}{dx}\iint y^2 dy\,dz\right) = -p$

$\frac{d^2}{dx^2}\left(E\frac{d^2w}{dx^2}\iint y^2 dy\,dz\right) = -p$ (7)

Putting, moment of inertia $I = \iint y^2\,dy\,dz$ in equation (7), obtain

Euler Bernoulli equation $\frac{d^2}{dx^2}\left(EI\frac{d^2w}{dx^2}\right) = p$ (8)

Here, EI represents bending moment which is constant, then equation (8) becomes

$EI\frac{d^4w}{dx^4} = p$

In elastic theory beam problem, bending equation consists of fourth order ODE with specific four boundary conditions (Neumann condition) to simulate the practical problem. Considering the linear fourth order ODE as given by

$y'^{v} + f(x)y'' + g(x)y' + h(x)y = r(x), \quad a < x < b$ (9)

with boundary conditions $y(a) = \alpha_1,\ y'(a) = \alpha_2, y(b) = \beta_1,\ y'(b) = \beta_2,$

3. Finite difference method for BVP

The concept of finite difference method based on replacement of derivatives by finite difference approximation in the differential equation as well as in the boundary conditions. Simplifying the finite difference approximations in differential equation and subsequent resulting provide linear system of equations which are solved by a standard procedure.
The interval [a, b] or [x_0, x_n] is divided into n number of equal subintervals of width h to solve the BVP defined by (9), so that $x_i = x_0 + ih,\ \ i = 1, 2, 3, \ldots\ldots n.$
The corresponding value of y at these points are denoted by
$y(x_i) = y_i = y(x_0 + ih)$, i = 0, 1, 2, ……n.
Using Taylor's expansion, values of $y'(x)$, $y''(x)$ and $y^{iv}(x)$ at the point $x = x_i$ can be written as

$y_i' = \frac{y_{i+1}-y_{i-1}}{2h} + O(h^2)$
$y_i'' = \frac{y_{i-1}-2y_i+y_{i+1}}{h^2} + O(h^2)$
$y_i'^v = \frac{y_{i-2}-4y_{i-1}+6y_i-4y_{i+1}+y_{i+2}}{h^4} + O(h^4)$
Satisfying the differential equation at the point $x = x_i$, we get
$y'^v + f(x)y'' + g(x)y' + h(x)y = r(x)$
Substituting the expressions for $y_i'^v$ and y_i'', $y'(x)$, obtain
$\frac{y_{i-2}-4y_{i-1}+6y_i-4y_{i+1}+y_{i+2}}{h^4} + f_i\frac{y_{i-1}-2y_i+y_{i+1}}{h^2} + g_i\frac{y_{i+1}-y_{i-1}}{2h} + h_i y_i = r_i$, i = 1, 2, …..n
where $y(a) = \alpha_1,\ y'(a) = \frac{y_{i+1}-y_{i-1}}{2h} = \alpha_2,$
$y(b) = \beta_1,\ y'(b) = \frac{y_{i+1}-y_{i-1}}{2h} = \beta_2,$

3.1 *Error Calculation*
Exact solution is calculated through C.F (Complementary function) and P.I. (Particular Integral). Then
Absolute Error = | Exact solution – Numerical Solution |
Relative Error = $\frac{|\ Exact\ solution - Numerical\ Solution\ |}{Exact\ solution}$
Percentage Error = $\frac{|\ Exact\ solution - Numerical\ Solution\ |}{Exact\ solution} \times 100.$

3.2 *Numerical Stability*
If the difference between the numerical solution and the exact solution remains bounded as the number of steps tends to infinity, numerical scheme is called stability.

3.3 *Numerical Convergence*
In the iterative numerical technique, if each successive iteration results are progressively closer to the true solution, it is known as **convergence**. A numerical method is not always guaranteed to produce converging results. Convergence is subject to satisfying certain conditions. If these conditions are not matched, it is known as **divergence**.

3.4 *Numerical Consistency*
A numerical scheme is said to be consistent if the finite difference representation converges to the differential equation. We are trying to solve as the space step tends to very small value.
We have explained the method with three types of boundary conditions. In several practical problems, derivative boundary conditions may be prescribed, and this requires a modification in the procedures which are described above. The following examples illustrate the application of finite-difference method.

4. Test problems and verification

Example1
Consider the fourth order linear nonhomogeneous ODE with four conditions defined by
$y'^v - 16y = x,\ \ 0 \le x \le 1$, for $y(x_i),\ x_i = 0.25, 0.5, 0.75$, with boundary conditions
$y(0) = 0, y''(0) = 0$ and $y(1) = 0, y'(1) = 0.$

Solution: To use finite difference method
Here interval is $0 \le x \le 1$, ie, [0, 1]. Mesh size $h = 0.25$ along length is considered.
Length is discretized into four points which are given by $x_0 = 0, x_1 = x_0 + h = 0.25,$
$x_2 = x_0 + 2h = 0.5, x_3 = x_0 + 3h = 0.75, x_4 = x_0 + 4h = 1.$
Boundary conditions are given by $y(0) = 0, y''(1) = 0$ and $y(1) = 0, y'(1) = 0.$
To find $y_1,\ y_2,\ y_3.$
The given differential equation is approximated as
$\frac{y_{i-2}-4y_{i-1}+6y_i-4y_{i+1}+y_{i+2}}{h^4} - 16y_i = x_i$

- $y_{i-2} - 4y_{i-1} + \frac{95}{16}y_i - 4y_{i+1} + y_{i+2} = \frac{1}{256}x_i$ (10)

Boundary conditions (B.C.S) are given by

$y_0 = y(0) = 0$ (11)

and

$y''(0) = y_0'' = \left[\frac{y_{i-1}-2y_i+y_{i+1}}{h^2}\right]_{i=0} = 0$

- $y_{-1} - 2y_0 + y_1 = 0$
- $y_{-1} = -y_1$ (12)

$y(1) = y_4 = 0$ (13)

$y'(1) = y_4' = \left[\frac{y_{i+1}-y_{i-1}}{2h}\right]_{i=4} = 0$

- $y_5 = y_3$ (14)

Putting $i = 1, 2, 3$ in equation (10), using conditions (11), (12), (13), (14), equation (10) reduce to following linear simultaneous equations

$\frac{79}{16}y_1 - 4y_2 + y_3 = \frac{1}{1024}$ (15)

$-4y_1 + \frac{95}{16}y_2 - 4y_3 = \frac{1}{512}$ (16)

$y_1 - 4y_2 + \frac{111}{16}y_3 = \frac{3}{1024}$ (17)

Solving equations (15, (16) and (17), required solution of BVP is

$y_1 = y(0.25) = 0.00255, \quad y_2 = y(0.5) = 0.0034 \quad y_1 = y(0.75) = 0.00202$

Example 2

Consider the fourth order linear non-homogeneous boundary value problem with boundary conditions defined by $y'^v = x$, $0 \le x \le 1$, for $y(x_i)$, $x_i = 0.25, 0.5, 0.75$,

$y(0) = 0, y''(0) = 0$ and $y(1) = 0, y'(1) = 0$

Solution:

Here interval is $0 \le x \le 1$, ie, [0, 1].

Points are given by $x_0 = 0$, $x_1 = x_0 + h = 0.25$, $x_2 = x_0 + 2h = 0.5$, $x_3 = x_0 + 3h = 0.75$, $x_4 = x_0 + 4h = 1$.

Therefore, $h = 0.25$

Boundary conditions are given by $y(0) = 0, y''(1) = 0$ and $y(1) = 0, y'(1) = 0$.

To find y_1, y_2, y_3.

The given differential equation is approximated as

$\frac{y_{i-2}-4y_{i-1}+6y_i-4y_{i+1}+y_{i+2}}{h^4} = x_i$

$y_{i-2} - 4y_{i-1} + 6y_i - 4y_{i+1} + y_{i+2} = \frac{1}{256}x_i$ (18)

Using B.C.S

$y_0 = y(0) = 0$ (19)

$y''(0) = y_0'' = \left[\frac{y_{i-1}-2y_i+y_{i+1}}{h^2}\right]_{i=0} = 0$

- $y_{-1} - 2y_0 + y_1 = 0$
- $y_{-1} = -y_1$ (20)

$y(1) = y_4 = 0$ (21)

$y'(1) = y_4' = \left[\frac{y_{i+1}-y_{i-1}}{2h}\right]_{i=4} = 0$

- $y_5 = y_3$ (22)

Putting $i = 1, 2, 3$ in Eq. (18), using conditions (19), (20), (21), (22), the following system of linear equations are obtained.

$5y_1 - 4y_2 + y_3 = \frac{1}{1024}$ (23)

$-4y_1 + 6y_2 - 4y_3 = \frac{1}{512}$ (24)

$y_1 - 4y_2 + 7y_3 = \frac{3}{1024}$ (25)

Solving equations (23), (24) and (25), desired numerical solutions of BVP are

$y_1 = y(0.25) = 0.0023, \quad y_2 = y(0.5) = 0.0031 \quad y_1 = y(0.75) = 0.00186$

5. Result Discussion

In this Study approximate numerical solution of fourth order ordinary boundary value problem which is arising from beam theory has been performed using FDM. Non homogeneous problems are handled and results are given in table 1 and table 2. If mesh size is reduced then error should be reduced as shown in Table 3.

Table 1. Comparison results for mesh size $h = 0.25$ in example 2.

x	Analytical solution	Numerical solution (FDM)	Error
0	0	0	0
0.25	0.00183	0.0023	0.000469
0.5	0.002343	0.0031	0.000756
0.75	0.001196	0.00186	0.00066
1	0	0	0

Table 2. Comparison results for mesh size $h = 0.25$ in example1.

x	Analytical solution	Numerical solution (FDM)	Error
0	0	0	0
0.25	0.00195	0.00255	0.0006
0.5	0.002445	0.0034	0.00095
0.75	0.001187	0.00202	0.00083
1	0	0	0

Table 3. Comparison results for mesh size $h = 0.125$ in example 2.

x	Analytical solution	Numerical solution (FDM)	Error
0	0	0	0
0.125	0.001009	0.0013169	0.0003079
0.25	0.00183	0.0021236	0.0002936
0.375	0.002307	0.0028536	0.000546
0.5	0.002343	0.002689	0.000346
0.625	0.00193	0.002095	0.000165
0.75	0.001196	0.001534	0.000338
0.875	0.000400	0.000435	0.0001227
1	0	0	0

6. Conclusion

In this study, it is cleared that FDM can be applied to determine the solution of fourth order linear homogeneous and nonhomogeneous boundary value problems which arise in civil and mechanical engineering from the beam bending theory. Numerical solution converges rapidly to the exact solution.

Results also show that if the mesh size is reduced finite difference method will give the better accuracy. Hence, this technique can be successfully applied in more complicated geometries in future work. In addition, for the calculation of FDM, software like Mathematica, Matlab, Maple can be used for larger domain.

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Color Intensity: A Study of RPPG Algorithm for Heart Rate Estimation

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***Abstract*— With the growing advancements and development in the field of digital image processing and computer vision, an individual's heart pulse can be extracted from the human skin surfaces. This method is termed as remote photoplethysmography (rPPG). The method can be applied from the video recorded from the consumer-based mobile camera also. In this paper, the work presented has mainly twofold goals. Firstly to develop a fruitful yet simple rPPG algorithm that should be simple for any individual to understand and implement that will increase the understanding of the rPPG subject. Secondly, to compare the algorithm designed for the RGB color model with the state-of-art rPPG algorithms developed and presented in the literature. And finally, we present the comparative analysis of rPPG algorithms reported in the literature with our proposed rPPG algorithm which is simple and has demonstrated comparably high performance for the green channel as compared to other algorithms.**

Keywords— Remote photoplethysmography, heart rate estimation, blind source separation, biomedical signal processing, vital sign monitoring, non-contact.

I. INTRODUCTION

The traditional method for measuring heart rate of an individual is through invasive method. There are electrocardiograms and photoplethysmograms based on electrodes and phototransistors to monitor heart rate. Estimation of heart rate is important field of biomedicine and is done by physician in presence. Therefore, an individual has to be dependent on the physician to monitor his health.

In past years, much attention is gained by contactless devices for physiological measurement. It is similar to situation where a person can infer physical state from camera clip. Cameras have been one of the proven and the reliable device to measure large set of physiological parameters like heart rate, blood volume, pulse rate, pulse rate variability etc., [1]. Ballistocardiography and photoplethysmography are two concepts that are used on facial videos to monitor heart rate. There has been fast growth in contactless monitoring and the heart beats can be extracted with the timing from camera recording of individual skin. This method is termed as remote photoplethysmography.

The rPPG has been derived from the processing of remotely captured video from digital device as digital camera, webcam or mobile phones[2] with conventional color model (red green blue). Monochromatic cameras[3]and near infrared sensors[4] are also used in capturing videos by researchers. Five band camera was used by Mcduffet.al., which demonstrated good results for cyan, orange and green bands[5]. Different types of video encoding like mp4, avietc. also impact PPG measurement i.e.,produce low signal to noise ratio[6].Apart from type of video encoding, there are many other challenges which are faced in estimating vital signs such as motion, illumination, light tolerance and image optimization reviewed by us in [7].

The imaging photoplethysmography (iPPG) was demonstrated by Verkruysseet.al.,where the pulse rate was extracted from the facial region affected by port wine dye [8]. Different rPPG methods are described in related work section.

In this research we describe a study based on color intensity to monitor the heart rate by extracting pulse count for the video clip provided in UBFC dataset. Our first goal is to process the video in most basic way to extract the physiological signal exhibiting heart rate of participant. The algorithm is presented in layman terms such that it can be implemented by researchers outside technical areas. Our second goal was to test the rPPG algorithm developed for RGB color model with the other standard rPPG algorithms developed by researchers and check its performance. We have therefore performed several basic analyses that describe the information about the algorithms comparative accuracy.

The organization of the paper is as follows: Section 2 focuses on related work presented by researchers for rPPG techniques and algorithms for heart rate extraction. Section 3 focuses on our manual ROI selection and proposed color intensity algorithm for heart rate estimation. Section 4explains the UBFC dataset used, results and comparative analyses on experimentations performed. The conclusion from the experimentation is described in section 5 in the paper.

II. RELATED WORK

Ballistocardiography(BCG) and photoplethysmography (PPG) are the two main rPPG techniques available in literature. BCG observes small body motions appearing during cardiac contractions [9]. The researchers demonstrated BCG on sitting participants to minimize unwanted movements. The movements during systole are not visible with naked eyes therefore Wu et.al., demonstrated Eulerian magnification for extracting heart rate [10].

Photoplethysmography measures light absorption in skin tissues and observe blood volume variations occurring during systole activity [1]. The blood volume increases during systole and decreases during diastole. The fluctuations are periodic and it occurs during each heartbeat. These variations produce the color variation in human skin made by the pulsatile arteries which can be monitored digitally to extract the heart rate of an individual[3]. There exist different physiological parameters such as breathing rate [4][11], blood oxygen level SpO2[12][13][14], heart rate

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A comparative study of energy and task efficient load balancing algorithms in cloud computing

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Abstract. The future growth of the Internet of Services has fundamentally changed the emergence of cloud computing. Cloud data centres serve multiple tenant demands for cloud applications that discharge vast amounts of electricity, leading to high operating costs and environmental diffusion of carbon dioxide (CO2). To fix this is the need for preservation to enable potential use by building a new structure and measuring the effect in a cloud data centre. Consequently, the use of pruned electricity reduces the cost of processing power. In order to meet energy-efficient data centres in the cloud, adjusting to optimal load balancing processing a good way for energy savings. To minimise the large energy use of cloud data centres herds, this focuses on increasing efficacy by breaking the workload evenly. In this paper, we plan to provide a comprehensive comparative analysis in cloud computing of current load balancing algorithms.
Index Terms— Cloud computing, Load balancing, Energy efficiency, Green computing

1. Introduction

Cloud Computing is an emerging modern platform for broad based technologies, for example: Computing and data from computers and PCs have been transferred into larger desktops have been reinventing their customers' studios on top of PCs Large businesses are interested in cloud computing in order to expand their technologies, its reachability and the economy associated with applications. Cloud computing distinguishes ISO as a business model (IaaS), Application as a Service (PaaS), Software as a Service (SaaS), and Protection as a Service (SEaaS) into the device models. These four shared in a single online portal which is powered by a virtual computer (VMs). VM's build the imagination of a dedicated computer for laptops. As a result of the improvement also improves according to the cost specifications, the host produces Vms. load exceeds the threshold values given to each system output is altered. Thus, reaching the power of datacentres is a difficulty. So, in such an environment, data centres were found to absorb 0.5percent of the global demand for electricity in 2018. A annual improvement trend in data centres Last year, data centres' general capacity utilization has exponentially. Cloud storage eliminates consumption of energy due to the usage of the VM and its proper relocation during the load balance. Via high power demand the data centres deliver large amounts of carbon dioxide (C02). Think it again is another key concept. It includes power equation counselling methods to minimize turbines for cloud computing [3]. Other innovations such as the improvement of software applications, the virtualization of computing resources

CHAPTER

10

Local plastic surgery-based face recognition using convolutional neural networks

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10.1 Introduction

Nowadays, face recognition has become a generally used application in different areas of social networks, for example, Facebook, Instagram, and Twitter, to name a few. Different utilizations of face recognition are authentication, login systems, day care, crime-controlling bodies, commercial areas, and so forth. Moreover, face recognition is also been used as a biometric identification technology. As per a recent survey, the performance of face recognition is influenced by aging, pose variation, facial expression, occlusion, cosmetics, and illumination variations. This makes face recognition a most challenging and ongoing research field of computer vision. On the other hand, in addition to all these factors, an emergent issue is facial plastic surgery, which occurs as a result of medical surgical procedures. In general, there are two forms of facial plastic surgery: global plastic surgery and local plastic surgery. Global plastic surgery changes the complete facial structure. This kind of surgery is mostly suggested in cases where functional losses have to be cured, such as major accidents, acid attacks, or chemical assaults. In global plastic surgery, people undergo various other types of surgeries such as rhytidectomy (face lift), liposhaving, skin resurfacing, dermabrasion, etc.

Aside from global plastic surgery, local plastic surgery just changes a portion of the facial features rather than complete facial image reconstruction. Examples include evacuating birth inconsistencies or irregularities that have shaped the face throughout the years, fixing imperfections from some wounds on the face, and so forth. Rhinoplasty, blepharoplasty, forehead surgery, cheek implants, otoplasty, lip augmentation, and craniofacial changes are various kinds of local facial

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Improved Control Strategy for Harmonic Mitigation in Multilevel Inverter

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Abstract- **In multilevel inverters, obtaining solution to the selective harmonic elimination equation is really difficult and time consuming. Secondly, finding global optimum solution is also challenging. In this paper, new improved proposed optimization algorithm is presented. As Compared to other optimization algorithms, it will enhance the computational speed and chances for finding global solution will be more. Also it will escape the solution from stucking into local optima. This proposed algorithm mainly targets at adaptive adjustment control of pheromone and updation of active evaporation factor. In this, pheromone deposition factor and ant's movement is improved and making it convenient for solving large scale problems. Hence this proposed algorithm is applied for solving nonlinear transcendental equation which not only provides the optimized solution for switching angles but it will reduce the lower order harmonics and THD also. The various simulated and experimental results shown in the paper proves the effectiveness of proposed algorithm for finding the global optimum solution with high convergence speed.**

Keywords- Adaptive control pheromone; Ant colony optimization; Active evaporation factor; Selective harmonic elimination; Multilevel Inverter; Total harmonic distortion.

I. INTRODUCTION

The ACO algorithm with its several advantages is widely used in solving many combinatorial optimization problems. It has positive feedback for obtaining rapid solution, dynamic applications, metahuristics search characteristics, robustness, Inherent parallelism implementation etc. Hence gradually it becomes the emerging field in solving optimization algorithms [1]-[3]. First it was used in problem of quadratic assignment [4], problem of job scheduling [5], to solve traveling salesman problem [6] and so on. Inspite of many advantages, it has shortcomings too i.e., maximum searching time, very slow speed of convergence, premature convergence for complex problems and so on. Many researchers proposed improved ACO algorithms to overcome these shortages. ACO with active pheromone updation and cell scheduling is proposed by Leng et al. for flexible manufacturing process to reduce cost and time [7]. Yang and Lai proposed improved ACO for p//T (p//T-ACO) for solving practical large scale problems [8]. Xu et al. suggested chaotic map for hybrid algorithm for enhancement of basic the ACO algorithm and to solve VRP problems [9]. Combination of ant colony algorithm with particle swarm algorithm is applied to solve traveling salesman problem (TSP) by Walid et al.[10]. Extended ant colony algorithm to implement regulation policy for controlling each type of ant during search process is presented by Escario et al.[11]. New GACO ant colony algorithm to compute Unified Device Architecture is presented by Li and Jin [12]. This paper presents, improved new ant colony optimization (NEWACO) algorithm which is an efficient and intelligent algorithm applied to solve nonlinear selective harmonic elimination equations which are transcendental in nature to obtain the optimized solution for switching angles in single phase H-Bridge 7 level multilevel inverter. With these solutions, Total Harmonic Distortion (THD) will also reduce to a great extent which proves the effectiveness of proposed algorithm.

II. Formulation of SHE Equations

Fig.1 shows bipolar output voltage waveform in inverters. From Fourier series, the output voltage equation can be obtained and is by equation (1). This equation is a nonlinear transcendental equation which contains trigonometric terms given by

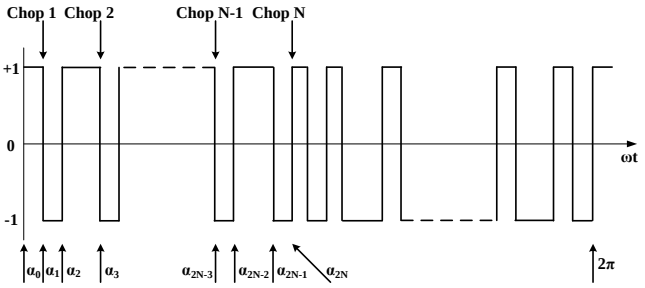

Fig. 1 Bipolar Output voltage waveform

$$V_{2k+1} = \frac{4V_{dc}}{(2k+1)\pi} \sum_{i=0}^{N} \cos(2k+1)\alpha_i \qquad (1)$$

Where, V = Inverter output voltage

V_{dc} = Input voltage magnitude

α = Switching angles

N = Harmonic equations

k = Number of switching angles (from 0 to N-1)

Total number of harmonic equations (N) can be given by

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Application of Linear Programming for Overcurrent Protection

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***Abstract* - Power system without proper protective scheme is similar to an unstable system, it is more prone to fault and unwanted tripping. In major distribution system overcurrent protection is used for protection. Hence a proper coordination should be done for overcurrent protection scheme. A protective scheme should operate as fast as possible, but when it operates a lesser area must be isolated, so that less blackout should occur. The two main parameter of overcurrent protection scheme are Time setting and current setting. The setting of relay should be such that, the desired operation should occur. This paper discusses the different Linear programming techniques implemented on a proposed system. Dual Simplex method is faster as compared to other methods of Linear programming.**

Keywords -Overcurrent Protection, TMS, Plug setting, Linear Programming

I. INTRODUCTION

Power systems consist of various element such as generators, transformers, transmission and distribution lines, loads and compensating devices. Every part as its role in power system. This interconnection of the power system forms a grid. As every element has its own role, at the same time they have their limitations. The power or the current flowing in the system can be categorized as normal (healthy) and abnormal (Unhealthy /faulty) conditions. In case of normal system current depends on the various parameters such as starting instant and conditions, types of loads, line charging components etc., on the other hand for the unhealthy system the most the significant parameter that decides the current flowing in the system is the nature, type and location of the fault occurring in the system.

Every system is designed to carry a definite amount of current. Under normal conditions system is designed to carry the normal current for an infinite (maximum) time, but under faulty the system can carry the current for a definite time interval only Beyond which the system generates it consequences in the whole system. To avoid such consequences it becomes the part and parcel of system-designer to design a system of zero fault tolerance or accept the possibility of fault occurrence and should provide a mechanism to separate the defective part from the system. Such a phenomenon of practice is called as the protection of the system. Table 1[1] below shows the Fault statistics occurring on different power system elements.

TABLE I. FAULT STATISTICS

System components	Possibility of accountabilities (%)
Transmission & Distribution Lines	50
Switchgear	12
Measurement and Protective equipment's	12
Transformers	10
Cables	9
Alternators	7
Total	**100**

Table 1 gives a clear picture of fault statistics, looking at the statistics the most faults occurring in the system are on overhead lines which is a combination of transmission and distribution lines. Among which distribution line are more prone to fault. The transmission lines are physically isolated from the generators and distribution lines by means of transformers. Transformers are the used to step down and step up the voltage levels. If either side of transformer consists of delta type of winding, then the zero sequence and 3rd order harmonics are isolated from the rest of the system. Also, zero sequence currents exist only in case of ground fault, so delta connection can provide isolation for the same.

In case of shunt fault, the major parameter which changes abruptly is the current and voltages. Current at the fault location increases suddenly whereas voltage at that location drops more, depending on the fault impedances [2]. Table II shows the equipment's and the protection used [1].

TABLE II. POWER SYSTEM PROTECTION

Apparatus \ Type of Primary Protection	Non-directional Overcurrent	Directional Overcurrent	Differential	Distance
Generator		√	√	√
Transformer			√	
Transmission Line	√	√		√
Distribution Line	√	√		
Loads	√			

However, in recent advances shows the use of differential protection to transmission line too [3]. As major of the equipment's (% wise) uses overcurrent protection schemes. This paper focuses on the overcurrent protection scheme of distribution line protection. The major factors which influences the overcurrent protection scheme are the type of system i.e. radial and ring main system[4] on which the major factors of the overcurrent protection are based are Plug setting (PS) and Time Multiplier setting (TMS) or Time Dial setting (TDS). [4] While designing the overcurrent protection scheme, above parameters should be taken into

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Solar Photovoltaic (SPV) Power Plant Connected Agricultural Feeder Performance Analysis

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***Abstract*— Solar photovoltaic (SPV) installations are growing in the distribution network due to the continuously decreasing prices of solar photovoltaic panels. Installing the SPV Plant on the distribution feeder supplying to the agricultural pumps is a challenging task due to the peculiar nature of the agricultural feeder load curve. Power availability from SPV depends on the availability of solar radiation. Supply of power and demand creates potential challenges in the low voltage (LV) distribution system. This paper presents a case study of a 2 MW SPV connected to an agricultural feeder in India. Performance analysis is carried out using field measurement data. Key parameters such as PV Penetration percentage and Capacity Utilization Factor are calculated for analysis. Parameters such as percentage Grid Dependency of the load and percentage PV Contribution are introduced in this paper which relates to the SPV system behavior more aptly. It is recommended that the Time of Day (ToD) metering with a lowest cost during the solar generation hours will make agricultural consumers shift their demand matching with solar generation hours. Extensive analysis of agricultural feeder connected SPV power plant indicates that the power supply has improved for the feeder during winter and summer months.**

Keywords*— *Agricultural Feeder (AG Feeder), Gaothan Feeders, Low Voltage (LV) Distribution System, percentage PV contribution, PV Penetration, Renewable Energy System (RES), Solar Photovoltaic (SPV) Plant.

I. INTRODUCTION

In India, to promote the agricultural sector, the Ministry of New and Renewable Energy Sources (MNRE) has started the Pradhan Mantri Kisan Urja Suraksha evem Utthan Mahabhiyam (PM-KUSUM) for the development of farmers and strengthening the rural distribution network. This scheme has an objective to promote the usage of solar pumps and the usage of grid-connected solar power in the agricultural sector of India. The Renewable Energy System (RES) penetration in the low voltage (LV) distribution network has positive impacts like reducing the energy losses of distribution feeders, feeding peak energy demands, and providing voltage support to distribution feeders. However, the exponential increase in RES installations over a widespread area of LV distribution may have negative impacts such as power quality issues, stability, and protection challenges.

Recently Government of India (GoI) policy initiatives have significantly improved the number of grid-connected solar PV systems in LV distribution systems in India. Thus, it is of vital importance to realize the technical influences of high penetration levels of solar PV systems on the operating performance of these networks. To recognize the possible challenges and effects of integration of distributed generation in LV distribution systems, a significant number of research papers have already been published. Some of the researchers in their literature have analyzed the power quality impacts on LV distribution networks with high penetration levels of solar PV by considering some real-time case studies.

The paper mainly focuses on the Solar Photovoltaic (SPV) connected AG feeder performance analysis based on the selected site credentials. At the site, feeders are separated to provide supply of electricity to agricultural and non-agricultural consumers. This feeder separation makes a provision to offer planned power supply to AG feeder. AG feeder connected to SPV plant reduces the dependency of AG feeder on Grid supply during day time as most of the power is provided by the SPV plant. Considering this aspect, it is decided to do the performance analysis of the 2 MW SPV system. For proper analysis new terms such as '% Grid Dependency' and '% PV Contribution' are introduced in this paper. System performance has also been checked via % PV Penetration and % CUF factors.

The significance of the grid-connected PV system concerning the erratic nature of renewable generation, and the categorization of PV generation concerning grid code compliance, also the performance analysis of solar photovoltaic (SPV) system installed at Sagardeep Island in the West Bengal state of India is reported in [1] – [2].

The methodology for determining the maximum photovoltaic penetration level in the grid which can provide a traditional capacity penetration level and the major factors obstructing the growth of renewable energy in India are reported in [3] – [5].

Voltage quality issues caused due to PV systems integration and their operating characteristics have been analyzed in [6] – [8]. The study has been carried out on the real grid-connected PV system located at the University of Queensland (UQ), St. Lucia campus. The collected data has

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Grid Supported Solar Water Pump System

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Abstract: **The irrigation sector worldwide depends on the water pump. Most of the water pumps are operated from electricity or diesel. This dependency can be reduced by opting for solar energy for such a water pump system. But solar energy depends on environmental conditions results in the reliability of the power supply to the motor. To reduce such problem of the standalone solar water pump system, this paper proposed a grid supported solar water pump which will ensure the reliability of power supply to the water pump along with the power quality issue of grid side. The system consists of a PV array, a DC-DC converter acts as a boost converter, a PFC DC-DC converter acts as a boost converter, Rectifier, Induction motor along with the centrifugal pump, and finally three-phase VSI inverter. For maximum power tracking from the solar PV array, Perturb and observation method is used in the system. PI controller is used to maintained DC link voltage across three-phase VSI. Finally, voltage and frequency are used in the v/f method to operate the induction motor at the desired speed. The current working system is simulated with MATLAB / SIMULINK software and its results proves that system work very well under drastic change environmental condition.**

Keywords: PV system, Grid supply, Solar water pump, P&O MPPT, Three Phase VSI

I. Introduction

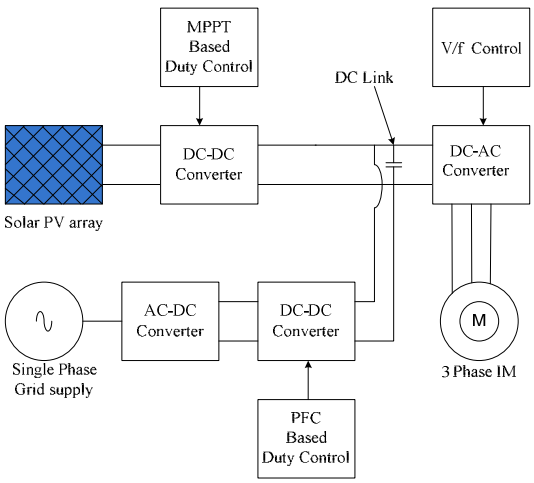
Fossil fuel-based energy generation creates a lot of environmental problems which may be critical for our people. The solution to such a problem can be clear with the help of renewable energy. This renewable energy is clean, that's why it's gaining popularity in the energy generation sector. Solar photovoltaic-based energy generation is one of the parts of renewable energy [1]. Out of many energy sectors, electricity is one of the important forms of energy and much more utilized worldwide. The agriculture sector is one of the essential parts of our country. This sector mostly depends on water pumps due to the limited canal system. Whereas water pumps can be operated through electricity or diesel-based pumped. But this both forms of energy are non-renewable-based energy which creates an environmental problem along with a cost burden. This problem can be solved by a solar photovoltaic-based water pump system [2-3]. However, this system is sensitive to environmental conditions also at night time energy generation not possible which leads to an interrupted power supply. Such a system can be improved by supporting grid supply [4]. Implementation of such a hybrid system may improve the reliability of the power to the water pump system.

Solar power generation mostly depends on solar irradiance and temperature. This system has varying P-V curve and I-V curve, to improve the utilization of PV array and it is necessary to operate at its maximum power point of P-V curve. This also helps to improve the efficiency of the system. There are so many algorithms are available like the P&O method, incremental conductance method, artificial neural network, fuzzy logic, and other algorithms [5]. Out of the above MPPT techniques, perturb and observe (P&O) technique has good results and is simple. In this technique, a small deviation is introduced to, cause the change in power of the PV module. The PV output power is measured at regular intervals and compared with the previous power. The pump flow rate of water pumps mostly depends on the value of the solar irradiance, area of the PV array, and types of the motor pump. The DC machines are more preferred than the AC machines due to their easy operation and more compatibility with the solar system but they suffer due to its breakdown and maintenance requirement at regular period because of commutator and brushes inside the machines. Whereas the AC machines mainly the induction motor (IM) have their advantages like simple and rugged in construction, being robust and can operate in any environmental condition, cheaper due to the absence of brushes, commutators, and slip rings [6].

To interface a solar PV array with a water pump, there is a need for a power electronic converter. The DC-DC converter can be used for such conditions. There are so many types of DC-DC converter available, but Boost converter can be used to boost low voltage to high voltage along with maximum power utilized from solar PV array with MPPT technique. On-grid side to maintained unity power factor DC-DC boost converter can be used as power factor correction device. It also helps to maintain the DC link on the output of the converter [7-8].

This paper deals with grid-supportive solar water pump systems. It consists of a PV array, two DC-DC converters, grid, rectifier, and induction motor which serve as a motor pump. Further work explains in the following way.

II. Topology of Proposed System



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Analysis of Brushless DC Motor in Electric Vehicle

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***Abstract*—Energy management is a major gift to society in this era of conserving conventional fuels. Energy management is critical since it can extend the life of an electric vehicle's components. Energy management can help an electric car function better in a variety of ways. Electric vehicles, often known as battery electric vehicles, run entirely or partially on electricity. The analysis is the most effective method for extracting useful information from a set of data. As a result, it may be valuable in the design of an electric vehicle's control system. This article compares some statistical data to the vehicle's features and attempts to develop relevant outputs in this regard. It calculates electric vehicle data using relevant mechanical and electrical characteristics, resulting in the required outcomes. We can deduce from this study which motor type is best suited for electric vehicles.**

Keywords—Back EMF, BLDC Motor, Simulink, Torque, Tractive Force.

I. Introduction

Electric Vehicles are new future technologies that are alternatives to combustion engine vehicles. They are environmentally friendly and are considered as "Green Locomotives." It is one of the new ideas that can be used to reduce CO2 emissions. The essential component of an electric vehicle is its electric motor. How efficiently an E.V. can work will depend upon its motor performance. The motor performance will comprise of power performance and durability and safety of the motor. Through power performance, we can know how much maximum speed a vehicle can achieve in a particular interval of time. It can also tell us about how much inclination a vehicle can travel at a particular instance of time. The electric motor takes power from the battery and converts that power into mechanical power. Therefore, an Electric motor considers a vehicle's attributes entire in terms of speed, torque, power, current, voltage, and many more. The electric motor used for driving a vehicle should provide an adequate amount of torque and power to prevail overloads and unwanted forces acting on the vehicle. To check the vehicle's performance, the BLDC motor is taken into consideration. BLDC motor is an electronically commuted D.C. motor that does not have brushes. An electronic controller controls it. To see how this BLDC motor works under different conditions, the motor's analysis will be done by taking various parameters. Here we have mentioned some of the MATLAB simulation models based on the requirements of the data and, to observe the relations between various parameters.

II. Literature Review

Paper [1] designed BLDC motor analytically and analyzed using finite element analysis. To verify the characteristics mathematical modeling is done using MATLAB. On the basis of the vehicle dynamics, voltage balance, and rotor dynamic equations of BLDCM, a method for determining the modeling parameters of a motor was proposed to satisfy the power performance requirements of electric vehicles [2][5][10]. Parameter determination and power performance evaluation were established and analyzed. Paper [3] presents the analysis of recent developments done in brushless dc motors. On the basis of some parameters like torque, traction, grade ability and acceleration etc., the transmission system calculation of electric vehicle can be calculated easily [4].Paper [6-7] describes the procedure for proper selection of rating of electric motor with an example of Brushless DC motor for an electric car. Paper [8] presents one method of calculating the torque by considering required grade ability, acceleration and transmission system. In paper [9] by applying the statistical method of multiple linear regressions to real-world trip and energy consumption data for an EV three model for EV energy consumption prediction have been constructed. From [11] speed control of Brushless DC Motor paper develops PI & PID controller to verify the performance of BLDC motor. Paper [12-15] presents an overview which provides the status and future trends in electric vehicle technology. Also shown the importance of rapid development of electric motors, power electronics, microelectronics and new materials. Various electric drive systems and battery systems are compared.

III. Analysis of BLDC Motor

P.H. Trickey and T.G. Wilson introduced BLDC motors in 1962 for specific low-power applications. Robert E. Lordo designed the first high-power BLDC motor (i.e., 50 horsepower) at Powertec Industrial Corporation in the 1980s. A BLDC (Brushless DC motor) does not have the brush arrangement, but the commutation is done electronically as they are maintenance-free and have lower noise susceptibility and lesser power dissipation. The pulses of current are provided to the controller's motor windings, which control the speed and torque of the synchronous motor. Commutation with electronics has a broad scope of capabilities and flexibility. These motors are highly efficient in producing a

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Ripple Investigation of Sliding Mode Control for Grid-Tied 1-Phase QZSI

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Abstract: **Due to the nature of robust control, the sliding mode is most popularly used for most DC-DC and DC-AC converters. This paper deals with the investigation of sliding mode control on the grid-tied single-phase quasi Z-source Inverter (QZSI). Basically, two types of controls are applied. Firstly DC side control, where the duty cycle is regulated by applying sliding mode control (SMC). The second one is AC side control where the modulation index is controlled using closed-loop control. The main focus of this article is to investigate the low-frequency (100Hz) ripple content in DC side passive components' current and voltage under the influence of SMC. The obtained simulation result also shows that SMC provides faster dynamic response with change in reference capacitor voltage and input voltage. It also shows that the grid voltage and grid current is also well regulated for the dynamic change in capacitor voltage and input voltage. The ripple calculation shows that 100Hz ripples are very large in quasi-Z source (QZS) inductor current ripple compared to capacitor voltage. The simulation results are carried out using MATLAB/SIMULINK.**

Keywords: Dynamic response, ripple analysis, sliding mode control, single-phase QZSI, MATLAB simulation results.

I. INTRODUCTION

Renewable energy is worldwide in use due to restricted storage of fossil fuel. For the renewable energy applications, traditional converters does not provide satisfactory performance due to additional boost converter and non-availability of protection against short circuit condition [1],[2]. Due to single stage working operation and large boost due to shoot through nature, Impedance source converter (ZSI) is popularly used in many of the applications [3]. QZSI is one of the modified structures of ZSI. QZSI gives the improved system performance due to ripple free input current, bearing the low rating of passive components and broad variation range in input voltage[4],[5].The system performance mainly measured in terms of system efficiency, power density, power quality etc. The performance of the system can also be judge by system dynamic response. The faster dynamic response with changes in input voltage and capacitor voltage is the one of the objective of this article. The most of the pulse width modulation controller are implemented but cannot achieve faster dynamic response [6]-[8].The sliding mode control is one of the robust control technique which can control the capacitor voltage with faster dynamic response. The sliding mode control is design to provide an initial nonlinear and variable structure system (VSS). The sliding mode control is a closed-loop system controller which is known for stability and robustness towards system input/output variation and parameter uncertainties [9]-[14]. The main aim of this paper is to investigate SMC technique on grid tied single phase QZSI. Including faster dynamic response, this article will also investigate the low frequency ripple i.e. 100Hz ripple (2*fundamental frequency) percentage exist in DC side QZS inductor current and capacitor voltage. Low frequency power ripples are most dangerous in case of renewable energy source like photovoltaic cell/fuel cell applications as the ripple not only increases the current and voltage stress but also shorten their lifespan. To reduce these ripples, bulky capacitor and inductor are required. But practical implementation of large inductor and capacitor is not possible or facing many difficulties [15]. Reference [16] shows the reduction of load current ripple on ac side but does not focus on low-frequency ripple elimination on DC side. SMC control are used to reduce/eliminate 100Hz ripple with extended topology of QZSI [17],[18] but not mentioning systematic calculations of 100Hz ripple. In this article, the calculations of 100Hz ripple are done using systematic formula. The ripple (100Hz) content is analyzed using simulation results and it will also show that how SMC gives the fast response for the system corresponding to input, changing capacitor voltage reference is carried out.

The organization of this paper is given as: Section II focus on survey of single phase QZSI along with basic

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Control Strategy for Closed Control of Quasi-Z Source Based Cascaded H-bridge Inverter

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***Abstract*— In traditional Voltage Source Inverter (VSI), the magnitude of output voltage is less than or equal to the DC input voltage so boosting of voltage is required, generally DC-DC Converters are used to boost the voltage. But this boosting may create a complication in the power converter. And this limitation of traditional VSI can be replaced with the help impedance source network topology that is qZSI this has an advantage of lower THD's, less number of the component count, decreases the system losses and improves the efficiency, single stage conversion is there. This qZSI boost the voltage with the help of shoot through state and it has its limitation. This paper discusses the control strategy for closed loop control of Quasi-Z Source Inverter (qZSI) that can be applied as impedance source H bridge Inverter.**

Keywords— ***Q-Z Source Inverter (qZSI), Simple Boost Control (SBC), Voltage Source Inverter (VSI), Shoot Through (ST).***

I. INTRODUCTION

Multilevel Inverter is gaining more popularity in the recent development of electrical drives, Power System, especially in high power application. Conventionally two level inverters are used to generate two levels AC supply which is then converted into pure sine wave with the help of filter. The size of L-C filter required to filter out square wave into sine wave is large, due to presence of high harmonic content in the output of two level inverters. In order to overcome the drawback of two level inverter multilevel inverters are introduced which have stepped output nearer to sinusoidal wave. Therefore harmonics present in the output are less. Hence to filter out the waveform to sinusoidal waveform small size of filter is required. Multilevel inverter has additional advantage of low magnetic interference, high voltage in DC link and capable of handling more power. Multilevel inverter are complex in design, it requires more number of components to implement.

Owing to the advantages of the distributed generators and hybrid system, the inverter with more than one dc source is now increasingly investigated. The system becomes more complex if the dc sources are different and therefore a control system is required.

The multilevel inverters have several advantages such as improved quality output waveform, lower total harmonic distortion (THD), low electromagnetic interference and smaller filter size [1]. Using the additional boost converter it increases the cost and component count with lower efficiency [2]. In conventional voltage source inverter (VSI) the obtainable ac output voltage is usually lower than the dc input voltage, therefore an additional dc-dc boost converter is needed to generate the desired ac output voltage [4]. And this extra boost converter increases the complexity of power converter and this is replaced by the Quasi Z source inverter (qZSI).

There are three general topologies of multilevel inverters, such as CHB Inverters, Neutral Clamped Multilevel inverter and capacitor clamped inverter. From these multilevel inverter topologies has its, own pros and cons. The cascaded multilevel inverter is simple in design and implementation as compare with rest of the inverter. This inverter has less number of passive components. The CHB inverter has an advantage as compared to the other topologies due to its uniqueness in design and its control. In [3] An effective control technique is discussed in which single phase CHB-qZSI inverter is used to control the power generated by Photovoltaic system. Few more PV application of qZSI is presented in [4]-[5]. Three phases CHB-qZSI's control is proposed for application to PV power systems. A qZSI modular cascaded converter is for dc integration of high-power PV systems. A class of qZSI with the acceptance of symmetrical shoot through is been addressed in [6]. An active Control of multi DG microgrid is seen and Energy stored CHB-qZSI based PV power generation system is proposed. Fault-tolerant CHB inverters using Z-sourced network are investigated. A cascaded transformer-based multilevel inverter using a single Z source network is presented in [16]. A class of Quasi Z source inverter (qZSI) with the acceptance of symmetrical shoot through is been addressed in [6-7](S. G. Kadwane, 2017, Umesh Shinde.2018). The closed loop strategy is mentioned in [8] for DC motor control which can be application for motor control (S.G. Kadwane. 2006). In conventional voltage source inverter (VSI) the obtainable ac output voltage is usually lower than the dc input voltage, therefore an additional dc-dc boost converter is needed to generate the desired ac output voltage [7] (D. Sun, 2015) And this extra boost converter increases the complexity of power converter and this is replaced by the qZSI [8](M. K. Nguyen, 2015). The important challenge in multilevel inverter is the closed loop control design. SBC is particularly useful in multilevel inverter. Therefore this paper revels the use of SBC in multilevel inverters and presents some investigations on harmonics and closed loop control strategies with respect to equal and unequal voltages. Multilevel inverter cannot [13] discussed a new multilevel inverter topology in which simple z source network incorporated to boost the output voltage using a same technique [14] presents a new reduced switch

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Design and Development of Cost-Effective Solar PV Based DC Microgrid for Rural Applications

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***Abstract*—To provide quality and reliable energy demand Renewable Energy Sources (RES) are integrated with conventional AC grid. However, many challenges can arise while interfacing the renewable energy sources with AC grid. Recent research has proved that the establishment of smart grids with integration of utility grid and renewable sources can provide highly reliable and more competent power system in the cost-effective manner. In India there are many rural areas which have limited supply of electricity. For such location DC microgrid is an attractive and effective technology because of its easy interfacing with renewable sources, utility grid, DC loads and battery storage system. Also, DC grid is proved to be much better over AC grid. This paper describes the implementation of DC microgrid technology for rural electrification that covers solar photovoltaic (PV), AC interfaces, system architecture and energy storage system. The system is purely considered for rural remote locations with or without AC grid. The loads are considered as LED lights, and DC operated Fan. The different switching conditions are considered with load, PV, battery and utility grid. The system is simulated by using MATLAB/Simulink and comprehensive analysis is provided to show the efficiency of the system. Also, the paper provides advantages and challenges of using DC microgrid technology in rural electrification.**

***Index Terms*—Battery storage system, Bidirectional converter, boost converter, DC loads, solar PV, utility grid**

I. Introduction

For the past few years, the rural electrification program has been initiated in India. However, despite of electrifying about 85% rural area, some places continue to experience load shedding [1]. The duration of load shedding in such rural areas, particularly in summer season is about 14-15 hours a day [2]. One of the reasons for not being extensive electrification of rural areas could be the power tariff. The power tariff for home is approximately Rs 5 per unit [3]-[5]. A small home that uses 2 tube lights for 8 hours, 2 fans for 14hours, TV for 6 hours, cell phone being charged for 3 hours consumes 3 units per day which will cost about Rs 500 a month. This would be expensive for 40 % of all rural homes. This indicates that there is a need of effective approach to tackle such electrification crisis [6]-[9].

A rooftop solar PV with integration of utility grid and energy storage system would be a viable solution for providing a continuous and quality power to each and every home in rural areas. As, there would be no T&D losses in this system, this solution looks more efficient and affordable. A solar PV generates DC power and requires inverter to drive AC loads which increases the cost of overall system [5]. Whereas, most of the home appliances such as TVs, computers, laptops, cell phones etc. requires DC power [6]-[9]. Thus, converting generated solar power into AC and again converting this AC power into DC for driving the most of the DC powered home appliances is indeed not an attractive solution. In recent times an increase in research has been observed in DC appliances to create an alternative for conventional AC appliances. Similarly, ac driven fluorescent lamp is being substituted by LEDs. Also, the DC load reduces the power consumption by 50% as compared to AC appliances [5]-[9].

Therefore, this paper describes a solar PV system along with DC loads, AC interface and energy storage device to provide a favorable technology for rural electrification. Such approach not only helps in reducing the load shedding problem but also reduces AC power consumption which leads to low power bill, making it an effective and affordable solution. The design of proposed DC microgrid technology has common 48V DC bus to provide electricity for a small DC house with limited DC appliances. The proposed system configuration has solar PV, AC interface, DC-DC converter, DC loads, MPPT controller and battery energy storage system. A suitable battery control is used for its reliable operation. It is seen that the system shows an effective performance even in the presence of AC grid.

II. Proposed System Architecture

The system under consideration is a small DC powered home with essential home appliances whose primary sources of energy are solar PV and utility grid. It has a common DC bus charged at 48V, supplying power to the appliances. The proposed scheme is shown in Fig.1. Three sources of power solar PV, utility grid and battery are associated to a common DC bus through converters. During a day time solar energy can be easily accessible. Nevertheless, there are some environments where solar power cannot be utilized, such as cloudy weather or night period. In these situations, utility grid will be the primary source of power. The battery is treated as an emergency source of power when both primary power sources (PV and

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Fault Current Limiting using DSSC on the existing Transmission Lines

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***Abstract* – Flexible AC Transmission System (FACTS) provides a possibility to enable utilization of the existing transmission line to its full power flow rating. Distributed-FACTS converters proven to be the new horizon in power system operation and control. It is capable of controlling power flow with low cost and high reliability. Distributed Static Series Compensator (DSSC) is a series D-FACTS device which is distributed over the existing line. It is similar to lumped series FACTS device i.e. SSSC. This paper presents DSSC to limit fault current in the transmission system. The prime function of DSSC is to enable network to control power flow in the lines. DSSC is a single-phase inverter which is low power, light in weight and it can be directly attached on the existing transmission conductor. It is emulating inductive and capacitive reactance and alters line reactance to control active power flow in the lines. Scope of this DSSC devices to reduce fault current is presented. A fault current in DSSC compensated transmission line is investigated in this paper. MATLAB Simulink results are presented to validate DSSC operation in fault condition.**

Keywords— Flexible AC Transmission System, DSSC, Single turn transformer, SSSC

I. INTRODUCTION

FACTS system enhances controllability and improves security of today's large and complex power system. Electricity power consumption is increasing tremendously steadily. To meet this demand, generation is enhanced and it is transmitted through existing transmission network. Moreover, power generation through renewable energy also inserts power in existing line. But transmission network is not expanded in proportion to increase in generation. Transmission lines with less reactance carries more power as compared to lines having more reactance. Hence existing transmission network is either working overloaded or operating near to its thermal limit. At the same time some of the lines having more reactance are still working underloaded. It is an urgent requirement to control power through lines so that lines can be avoided overloading. FACTS technology provides a key solution to solve this problem of uncontrolled power flow. With the help of FACTS controllers, line reactance, bus voltage, phase angle can be altered and active and reactive power can be controlled.

Conventional FACTS system alters transmission line parameters with the help of thyristor-controlled capacitor and inductor. FACTS controllers vary reactive power in the system which controls active power flow in the lines. FACTS controllers uses power semiconductor switches to change the parameters on the lines. With respect to the connection with the system in shunt or series, FACTS devices can be classified as shunt FACTS, series FACTS of shunt-series FACTS device. It can also be classified as conventional and VSC based FACTS controllers. SVC, TCSC, TSSC, GCSC, FC are some of conventional FACTS controllers. Power electronics converter-based FACTS controllers like STATCOM, SSSC, UPFC are installed to control power system operation, control and security [1]. Static synchronous series compensator (SSSC) is inverter-based FACTS controller which is connected in series with the line with the help of coupling transformer. Active power control in the transmission line using SSSC can be achieved by adding voltage in series with the line at an angle of 90^0 to line current. With the help of SSSC power in the line can be increased and decreased as per the desired conditions. Reactive power exchange with the line and inverter is done through coupling transformer which finally controls active power in the line. This series FACTS controller can reduce fault current with proper control. Lumped FACTS devices are very costly due to high rated power electronics devices, high rated coupling transformers and insulation for EHV system [2]-[5]. Distributed FACTS device provides a way for these hurdles. Deepak Divan proposed DSSC which is a series FACTS device [6]-[7]. It provides active power regulator such that system cost will be lowered and it also increases reliability. It is a single-phase low power inverter and it can be directly connected in series with the existing transmission conductor with the help of single turn transformer (STT). It emulates inductive or capacitive reactance and active power in the line can be controlled. A third harmonic component can be utilized to control power flow in the lines and it is presented in [8]. This device consists of number of DSSC's hanged on transmission line and a single STATCOM device. Shunt connected STATCOM inserts third harmonic component in the line, which provides real power to DSSC for DC link capacitor charging and providing active power losses in the converter switches. DSSC device injects fundamental voltage in the line at 90^0 angle providing power flow control. Emitter Turn Off

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DSSC to Improve Power System Loadability Index

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Abstract

Distributed series FACTS controllers provides active power flow control through transmission line in cost effective and reliable manner. Distributed Static Series Compensator (DSSC) is one of the distributed series FACTS controller. It is a low power device which can be distributed over a transmission line at regular intervals emulating a small reactance in the line to control active power flow. Like SSSC, it injects a small voltage in series with the line in quadrature with line current. To achieve noticeable change in power flow, multiple number of DSSC devices need to be connected in the line. This paper presents DSSC to enhance system loadability index

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Pattern Recognition Classification for Myoelectric based Control of the Robotic Arm using Neural Network

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***Abstract*: Because of its relevance to society, human- robot interaction has long been a research subject for academics. The creation of a robust human-interactive robot that takes commands from electromyogram (EMG) signals is currently being investigated. This paper explores the movements of a system that enables signals to be recorded directly from a human body and then used to operate a small robotic arm. Pattern classification is done with neural network and used for gestures of the artificialarm.**

Keywords: gesture recognition; myoelectric patterns; neural network;

I. INTRODUCTION

Human-robot interaction, especially for the control of the human arm, is a relatively new technique today. The classification of myoelectric patterns is used in this article to define a technique for controlling a multifunctional prosthesis. It also means that the myoelectric signal has a distinct structure during muscle retraction [1], [2]. Several data can be obtained by using a computer with a myoelectric signal to reserve pattern structure for several repetitions. These extracted features can be used to train an artificial neural network and for classification purposes [3], [4], [5].

The neural network that was previously trained with this approach can now be used to recognize the new patterns. The neural network that was trained earlier using this technique can be used to identify the new patterns. The dynamic nonlinear neural network that is trained in this manner may be able to assist the amputee more efficiently while also reducing the amputee's efforts. [6], [7], [8], [9].

Individuals who have had their upper limbs amputated will benefit greatly from the use of myoelectric systems ascontrols for prosthetic devices. These systems are gaining in popularity among various organs (hand, elbow and wrist).

For pattern extraction, these systems can use proportional or derivative signal changes [10], [11], [12], [13], [14].

The Electromyography signal (EMG) is a one-dimensional array pattern that could be useful information for pattern recognition. All pattern recognition-based multifunctional my-oelectric control systems are based on the given electrode position and other parameters. [15], [16], [17], [18].

The extraction of EMG signals and gesture recognition for robotic manipulator control are defined in this article [19], [20].The myoelectric signals were extracted using a single bipolar electrode pair, which provided data for neural network training. During network training, a series of training sets is introduced to a neural network that can categories them. The back propagation algorithm is a weight-changing adaptive training process. These weights are saved, and they can be used to recover data after it has been categorized. The signals are used to guide the robotic manipulators [21]. The stepper motor based robot arm manipulator's simulation and port programming are performed in Matlab software, and hardware is implemented. The study of robotic hands has been the foremost in the robotic science. Robotic arms, with a gripping end -effectors, have been in production for a long time [22], [23]. For a long time, universities have been studying robotic hands that are anthropomorphic in nature. This is something that both the Stanford/JPL hand and the Utah/MIT hand try to do.The Stanford hand has 9 degrees of freedom, while the MIT hand has 16 degrees of freedom [24], [25].They're also shaped and sized like a human hand. DLR's (Deutsches Zentrum für Luft- und Raumfahrt) hand has four sensors and 12 degrees of freedom. The NASA Johnson Space Center's Robonaut hand has a total of 14 degrees of freedom. The Shadow hand, created by the Shadow Robot Company, is the most advanced robotic hand to date. It incorporates 24 DOFs in their robotic hand, which is the same as a human hand, using pneumatic "muscles." There is one thing that they all have in common. In terms of form, scale, and utility, they strive to mimic the human hand.

II. METHODOLOGY FOR GETTING STARTED

The acquisition of EMG signals is the first step in the process. The EMG machine is used for this. Before we get into the purchase, let's take a look at the project's basic block diagram. The proposed work's basic block diagram is shownin Figure 1.

A Simulation of Different Characteristics of Solar PV Grid Connected System

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***Abstract*— Solar energy is one of the most important non-conventional resources that can be used to produce electric energy through the solar photovoltaic process. A powerful advantage of solar photovoltaic (PV) systems is the use of comfortable and free energy from the sun. The characteristic of photovoltaic cell/array/module solar systems is necessary to gain a good show of structure under various conditions. The characteristics permit the simulation of photovoltaic cell/array/module systems that receive various solar temperatures and illumination levels. The solar array for a PV array turns on the unspecified variable, sometimes they turn on meteorological. This research paper expands the algebraic model in MATLAB/ Simulink environment of solar PV array system and plots different characteristics like Io - VO, Po-Vo, and Po- Io of solar array photovoltaic cell/array/module System**

Keywords—***Solar PV modeling, Solar cell characteristics, PV systems, MATLAB/ Simulink***

I. INTRODUCTION

Energy requirements of the customers achieved through the conventional power plant (TPS,HEPS,NPS) grid have become obsolete to meet the utilities. Further awareness of customers about green technologies, environmental concerns, and depletion of the stock of fossil fuel has forced planners and grid designers to explore the various renewable energy sources and alternative sources. PV-module and wind power generators, now, have become the standard renewable sources of electrical energy generation. PV Modules, which convert solar light photon energy to electrical energy. PV Modules is one of the best renewable energy and environmentally friendly solar energy sources. The main purposes of PV modules generate DC voltage [1-6]. Recently, PV array systems have been used in several electric power applications. Despite the high initial cost and low efficiency, the PV system has small operation and maintenance costs as it is a stationary source of energy fabricated from semiconductor material. Compared with oil prices, solar energy is a feasible energy supply with great long-term benefits. PV cell is considered the fundamental power conversion unit of a PV-based power system [1-6]. Temperature, solar isolating and voltage output of photovoltaic cell/array/module are the important factors that affect the output characteristics of a photovoltaic cell/array/module. Since the PV has a nonlinear current-voltage (I-V) characteristic, it is vital to model the PV unit for MPPT (maximum power point tracking) in PV- based power systems [1-5].The characteristic of PV solar systems is a condition to get a good result of systems under different situations. The solar PV characteristic permits the Matlab simulation of solar PV systems under various temperatures and Irradiances level. The solar models turn on the unknown parameters, sometimes, they turn on atmospheric Conditions. Therefore, the characterization and simulation of PV modules using models are important to determine the performance. Generally, as we know that the performance of solar PV cells, modules, and array systems depends on the I-V (current-voltage) curve of each cell, module, and array. The main purpose of an inverter is to get a DC from DC-DC Converter and convert it into AC and MPPT (maximum power point tracker) to show maximum power from the solar PV system.

In solar system there are different generations of PV technologies are available for electricity generation . But only three main generations of PV technologies are use .

1. Semiconductors materials- semiconductors materials as crystalline silicon are used.
2. Solar cell- In solar cell thin films made of Cadmium-Telluride (CdTe), Cu (In,Ga) are used for power generation
3. Hybrid cells-In this generation system organic and inorganic materials are used. [7-9]

The PV models developed so far describe output characteristics with solar insulations and cell temperature as input parameters whereas in this paper cell temperature is determined by taking into account ambient temperature, solar insolation, and wind speed [10-11].

This paper proposes a study of different characteristic of solar PV System. Section II deals with the solar system hierarchy. These equations are implemented for simulation purpose. Mathematical equivalent circuit for photovoltaic array is illustrating in section no. III and in Section no. IV simulation of system and output of solar PV system is given. Finally, Section no. V gives the conclusion.

II. PV SYSTEM HIERACHY

A. Phovoltaic Cell

In Fig. 1, the PV cell is a semi-conductor P-N junction-based photodiode. The main purpose of solar PV cell solar energy convert into electrical power. The photovoltaic cell can be manufactured in a variety of ways and from many different materials. The most common material for commercial solar cell construction is silicon (Si), but others include gallium arsenide (GaAs), Cadmium Telluride (CdTe), and Copper Indium Gallium Selenide (CIGS). Solar cells can be constructed from brittle crystalline structures(Si,

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Performance of an Evaporative Condenser: A Review

Vivek M. Korde, Shivam N. Dekate, Yash A. Bais, and Chirag P. Raut

Abstract Involving the proper design of an evaporative condenser to improve, system efficiency is a complex and difficult undertaking. Careful study is required in the construction of an evaporative condenser, since splitting of water, reduced effective cooling, lower power capacity and tubes identification are difficulties to deal with. The study is meant to offer a methodology for engineers to follow whilst working on evaporative-cooled heat exchangers. A method for increasing performance is discovered, and the research with several kinds of evaporative condensers is investigated. As it was discovered, it was possible to boost the system's performance by incorporating features like water beds, forced method, exhaust procedure above nozzles, tapering walls to the sump, dome-shaped fans and elliptical (oval) tube designs. Finally, conclusions on designing improved evaporative condensers are given.

Keywords Evaporative · Condenser · Water pad · Forced · Cooling · Efficiency · Industry

Nomenclature

(Taken as references from papers)

h_w	Film water heat transfer Coefficient, (W/m^2K)
h_d	Air water mass transfer coefficient, (W/m^2K)
G_w	Water mass velocity, (Kg/m^2s)
G_a	Air mass velocity, (Kg/m^2s)
T_{wm}	Mean deluge water temperature, (°C)
T_{wm}	Water Temperature, (°C)

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α_m	Mass transfer coefficient for water vapour, (W/m^2K)
α_{spray}	Heat transfer coefficient between tube surface and water film, (W/m^2K)
m	Mass flow rate, (Kg/s)
m_{max}	Maximum mass flow rates, (Kg/s)
ε_e	Efficiency of evaporative condenser.
L	Flow rate of liquid, (Kg/s)
G	Flow rate of air, (Kg/s)
T_s	Temperature of heating steam, (°C)
T_w	Wet bulb temperature, (°C)
ε_a	Efficiency of air condenser.
h_o	Outer heat transfer coefficient, $(W/m^2°C)$
E	Percentage of evaporated water

1 Introduction

Vital factors for the design of cooling systems include water shortage, energy conservation and effluent control. Because of this, the realisation of water uniformity from a single source with fine dispersion of water and minimal use is called for. An industrial unit that is run in accordance with all of these guidelines is known as an evaporative condenser. A machine that takes heat from operating refrigerant and transmits it to the environment using cooling tubes with water sprinklers is known as an evaporative condenser. Acquiring the circulation of air over the surface using axially fitting fans may be done, however these condensers are found in air conditioning plants, water cooling systems and industry facilities. Air velocity range of 1.5–4 m/s is generally accepted for economic design considerations. As the temperature of the air increased from 10 to 20 °C, finally, the air became warm. With a forced flow concept, most evaporative condensers are utilised for cooling purposes since they are needed to have excellent efficiency. However, improvements to the condenser unit's efficiency are currently being explored.

These passive and active type performance-improving factors are analysed first in this study. By contrast, 'active methods' include any alteration to the character design, such as tube modification, expanded surface area or even the addition of elements. To get particular attention, experimental studies are conducted along with condenser losses.

2 Passive Technique

This terminology may describe methods that are concerned mainly with solving design issues for evaporative condensers using numerical simulation, and where software simulations are used without any external changes.

Design and Performance of Plate-Fin Heat Exchanger: A Brief Review

Vivek M. Korde, Gauri S. Gotmare, Priya K. Kachhwah, and Divyanshu Lokhande

Nomenclature

Re_H	Reynolds number based on height
f	Friction factor
Ac	Minimum free flow area, m^2
Da	Darcy number, K/H2
L	Length of porous fin, m
H	Height of channel, m
A_0	Total heat transfer surface area of porous fin, m^2
j^*	Modified j factor
s	Flow maldistribution parameters
h	Velocity ratio
j	Colburn factor
CFD	Computational fluid Dynamics
Re	Reynolds number
h	Fin height, m
s	Fin spacing, mm
A	Wave amplitude, mm
L	Fin wavelength, m
VG	Vortex generator
CFU	Common flow up
EG	Ethylene glycol
Nu	Nussult number
JF_i	Thermal Hydraulic performance Factor
Φ	Nanoparticles weight fraction

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Pr	Prandtl number
μ_w	Wall fluid viscosity
μ_m	Average fluid viscosity
l	Lance length of fin, m
t	Thickness, m
s	Fin spacing, m
H	Height of fin, m
HTE	Heat transfer enhancement
PPF	Plain plate fin
JF	Thermal hydraulic performance factor
R	Humped radii
εNTU	Effective number of transfer units
s1	Non-louvered inlet and exit
s2	Redirection length of fin
Kc	Total heat transfer coefficient of cold fluid
CFD	Common flow down
IRW	Inline row winglet
SRW	Staggered rows of winglets
PFHE	Plate-fin heat exchanger
WFP	Wavy plate fins
E	Friction power per unit surface area, w/m^2
$E\beta$	Core Volume Goodness Index
$\eta aha\beta$	Friction power
η_a	Overall surface efficiency
h_a	Coefficient of heat transfer at air side ,$wm^{2\ 0}c$
F_p	Fin pitch, mm
D_e	Hydraulic diameter
F_h	Fin height, m
t	Thickness of fin, m
h	Coefficient of heat transfer , $wm^{2\ 0}c$
ΔP	Pressure drop
θ	Crease angle
λ	Crease cycles

1 Introduction

Heat exchangers with plate fins are a form of heat exchangers that is small and compact in which the surface area of heat transfer is increased by extending metal surfaces known as fins. Plate-fin heat exchangers are distinguished by their high efficiency, compactness, lightweight, and moderate price. The plate-fin heat exchanger is suitable for gas–liquid, gas–gas, and multi-phase applications across a broad variety

Electrically Operated Hygiene Bin to Simplify the Initial Stage of Diaper Composting

Dipti N. Kashyap, Rounak Choudhury, Pranav Thete, Savita Baviskar, and Pravesh Khatwani

1 Introduction

The world's population has been steadily increasing for the last 7 decades. According to UNICEF, in India every day 67,385 babies are born. Hence, India contributes for one-sixth of the world's infant birth. Thus, it leads to the consumption of more and more products especially the use of diapers which has been the main concern for environment as these diapers once used are disposed unprocessed. In 2020, the diaper market of India rose to 1.25 billion US dollars considering that all the leading brands in the states like Maharashtra, Delhi NCR, Tamil Nadu and others states by the survey conducted by IMARC, which predicted the trend is set to increase. As a matter of fact, the data suggested that all the children born are not privileged by birth. Thus, to use diapers in a developing country such as India assumptive calculating if a baby usage of least a diaper a day and there would be 50,000 of them and a baby diaper would weigh at least 300gm which is 1.5 tonnes of waste that these babies would produce in subsequent days to come. More than 90% of used diaper's go to the municipal corporation or are disposed carelessly on some abandoned land. This could add to burden on our environment which will take more than 400 years to discompose which is not a good indicator, as it shall release harmful pathogens while in the process. Hence, there is an urgent need for some technique to decompose these used diapers. Zulfikar, Wiwit Aditama, Nasrullah [1] discussed various methods and composition of material in accordance with experimenting composting temperature, composting moisture, composting time period and composting PH value and quality of compost and had come up with Takakura method which included taking 5 diapers with different ratios along with organic waste and then moisturised with sugar and salt solution and kept for 5–7 days, and then it was put in Takakura mixture which was taken into sack for 2 weeks also known as normalisation process. This makes the decomposition of

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the diapers by microorganisms most successful with 40% diaper and 60% organic waste which could turn out to be useful in agriculture. Navarro Ferronato, Máximo Lucio Nova Pinedo and Vincenzo Torretta [2] discussed the various assessment techniques for analysing baby diaper composting in Bolivia. In this method, diapers were mixed with things such as cow dung, activated bacteria and red earthworm. These samples were kept in hermetically sealed container, and the previous method was repeated again and again; some of them were mixed with components. It was found that components which were mixed with cow dung took 60 days to decompose, whereas one that was mixed with earthworm and activated bacteria took 70 days to decompose but the hydrogel remains as it is. Hence, the hydrogel needs cow dung to decompose. Hence, the results were obtained. Joan Colon, Luz Ruggieri, Antoni Sanchez, Aina Gonzalez and Ignasi Puig [3] discussed composting of diaper waste with municipal waste. Where they studied diaper source-separated organic fraction of municipal solid waste (OFMSW) and OFMSW without diaper. So, the evolution of routine parameters and biological activity were monitored. The result showed that both the compost was identical in every term with no pathogenic micro-organism but the OFMSW with 3% of disposable diaper was tested with slightly higher level of zinc which can prevent the use large amounts of diaper mixed with OFMSW. Norihiro Itsubo [4] discussed a new technology for closed-loop recycling of used paper diapers which are first- crushing, washing and separation technology, second-ozone treatment technology, third-SAP reactivation technology and fourth-verification of the quality and safety of recycled product. These all are the conventional ways to reduce the diaper waste with the other waste generated locally but also increased the use of diaper and the other hygiene product which signifies that the conventional ways would take time to process that amount of waste. So, the incineration bins were introduced to solve the problem. A study by TQH consulting for the NFSSM Alliance published a report in 'MENSTRUAL WASTE DISPOSAL IN INDIA' on March 2020 of all the actions taken by the government to promote waste disposal system and a brief study report whether all in India have taken place, with briefed norms and specification to use a public incinerator. But one cannot run from the fact that the gases produced from these techniques are harmful for an individual and also for the environment. The study by 'Chintan environmental research and action group' concluded that burning sanitary product released high toxic 'dioxins gas' which had been a reason for multiple health problems. So, the incinerators may produce energy and reduce the waste at the same time but also could release are much more harmful than expected. Therefore, keeping some of the main points in mind Kosemund [5] discussed all the risks before and after the diaper had been used to exposure-based risk assessment used by procter and gamble for absorbent hygiene product. Gerba [6] discussed the occurrence of enteric pathogenic viruses and protozoan parasite in composted municipal domestic solid waste and their concentration had increased by the addition of diapers by 2-3 folds. One out of 19 samples collected after 175 days of ageing were found positive for Salmonella. This indicated that the pathogens were destroyed during composting or present one organism per 40-50 gm of compost. Using this information, one could think of producing biogases and compost at the same time De Rycke [7] discussed that if the diaper has been composted with solid

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Performance evaluation of CNC turning process for tool tip temperature and tool wear by Taguchi method

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ANOVA

ABSTRACT

The performance of the CNC turning process is experimentally evaluated in this paper. The independent variables are feed rate, depth of cut, nose radius, tool type, and environmental condition. Three different levels of predictors are selected. The dependent variables are TTT (tool tip temperature) and TW (tool wear). The machine is run at 1337 RPM. The chatter in the spindle is included as an uncontrollable variable (Noise Factor) with three different values. The number of observations is calculated by Taguchi Method. The experimentation is conducted on CNC Spinner Lathe Machine. The responses are measured by a Non-contact laser gun and Canny Method in MATLAB software. The analysis is performed by Taguchi philosophy and ANOVA. The best setting for responses is identified by the main effect plot. The prediction of the output parameters at optimum levels is done by additive model. Minimum Tool Tip Temperature (50.545 °C) is achieved when Environmental condition is at high level (minimum quantity lubrication), Nose Radius is at low level (0.4 mm), Feed rate is at low level (0.15 mm/rev), Depth of cut is at low level (0.5 mm) and tool type is at high level (CVD Coated insert). Minimum Tool Wear (0.0401 mm) is achieved when Environmental condition is at high level (minimum quantity lubrication), Nose Radius is at high level (1.2 mm), Feed rate is at high level (0.35 mm/rev), Depth of cut is at low level (0.5 mm) and tool type is at high level (CVD Coated insert).

Selection and peer-review under responsibility of the scientific committee of the Second International Conference on Engineering Materials, Metallurgy and Manufacturing.

1. Introduction

Nowadays, it is very important to satisfy the end-users (Customers) as much as product quality is considered. Quality is nothing but the measure of performance of product after selling to the customer. And productivity is very crucial to the manufactures, when profit is considered. Both quality and productivity are contradictive in nature. Hence it becomes necessary to identify the best setting of factors related process/product that will satisfy both quality and productivity. Multi-objective optimization is a tool which helps to achieve this.

In machining process, especially in turning, milling and drilling, condition of cutting tool decides the quality of surface finish and MRR (Material removal rate). TTT and TW decide the condition of cutting tool. If the tool is not damaged (wear), the predefined value of quality characteristics can be achieved. But if the machining is done with damaged cutting tool, even if the optimal setting is used, the quality of finished products get degraded. Hence, in this paper, the tool tip temperature and tool wear are considered for performance evaluation of Turing process. AISI 4340 is used as workpeice material and coated (PVD & CVD) as well as uncoated inserts are used as cutting tool. Shilpa B. Sahare *et al.* [1], this paper described the use of Taguchi philosophy to optimize milling process for the workpeice Al2024. A comparative study is done for different type of lubrications though experimentation. A flow rate was the key factor for performance evaluation of lubrication. A regression

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Evaluating Torsional Properties of FDM Components for Various Layer Heights

Prasad A. Hatwalne and S. B. Thakare

Abstract In the below presented work, the steps are taken to evaluate torsional strength of parts developed using fused deposition modelling (FDM). For this test, samples were 3D printed using ABS material and then investigated to understand the influence of layer height on the torsional strength of components. The parts were fabricated and tested as per ASTM standards with varying the layer height of 0.14 mm, 0.16 mm and 0.22 mm. Further, the parts were applied with acetone bath treatment and its effect on torsion strength is also investigated. The obtained values of torsional properties were compared with the injection moulded parts from literature. The results show that torsional properties of components manufactured by FDM are significantly influenced by variation in layer height. Comparatively, injection moulded parts were found to have better torsional properties.

Keywords Fused deposition modelling (FDM) · Injection moulding · Torsional strength

1 Introduction

Fused deposition modelling is additive manufacturing methods in which the components are produced by layer-wise deposition of the thermoplastic material. In FDM, firstly, the 3D CAD model is developed using appropriate designing software. For more complex, geometry scanned images are directly used. The developed CAD model is changed to STL format which is suitable for the machine. The software of the FDM printer evaluates the geometry of the CAD model and accordingly develops the toolpath for component fabrication. As per the developed toolpath, heated extruded nozzle moves across the X–Y direction and deposits the layer of semi-molten thermoplastic material. This deposited layer solidifies instantly and then the extrusion

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Formulation of Empirical Correlation for Heat Transfer Coefficient, for Gases, in Terms of Fluid Properties, Tube Diameter and Mass Velocity; for Forced Convection Through Tubes

Narendra J. Giradkar, Vivek M. Korde, and Jayant Giri

Abstract The present investigation explains the mechanism of heat transfer for gases in forced convection through tubes. The experimental data from number of investigations for gases is correlated for gases in terms of basic variables (measured) and to obtain the empirical correlation. The above phenomenon is explained with the help of the concept of overall turbulence which is a combined effect of mobility of fluid in sublayer and eddy turbulence in core. The heat transfer rate, in tube diameter around 5.0 mm, is maximum for gases.

Keywords Heat transfer coefficient · Gases · Internal forced convection · Turbulence

1 Introduction

The heating and cooling of fluids flowing inside conduits are among the most important convective heat transfer processes in engineering. The design and analysis of all types of heat exchangers require the accurate evaluation of heat transfer coefficients between the inner surface of tube and fluid. Since the heat transfer coefficients are evaluated with the help of empirical correlations, it is essential that the correlation should represent the applied heat transfer phenomenon precisely. Forced convection in tubes involves many independent variables like D, u, ρ, μ, Cp, k; many of which cannot be manipulated individually without disturbing others while conducting experiments. To tackle this complex situation, investigators in this field have taken the help of a mathematical tool called the dimensional theorem, which reduced the above-mentioned six variables into two. For example, $\mathrm{Nu} = f(\mathrm{Re}, \mathrm{Pr})$. Because of this conversion of independent variables into dependent, it became necessary to study the effect of only two variables since the effect of the remaining four was then fixed automatically without experimental verification.

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McAdams [1], Knudsen and Katz [2], Gnielinski [3], Rice [4] and Petukhov [5] have given an excellent survey of heat transfer for internal forced convection. The summary of experimental results presented by various investigators for gases is given in Table 1. The following conclusions are drawn from these investigations.

1. The effect of the diameter, viscosity, specific heat and conductivity on coefficient of heat transfer is not individually determined. The results are presented in terms of dimensionless numbers.
2. Most of the authors have introduced the ratio of wall temperature to bulk temperature with some exponent to compensate for the property variation across the tube. This exponent varies from −0.7 to −0.185. In most cases, the properties are evaluated at film temperature, and some at bulk temperature. As fluid viscosity changes with temperature and to account for its variation, a viscosity ratio correction is introduced in the equation. However, the properties can be evaluated at film temperature rather than using a viscosity ratio correction. And so some authors have indicated that the ratio of wall temperature to bulk temperature has no effect on coefficient of heat transfer, if properties are calculated at film temperature.
3. As indicated by Pickett [6], Taylor [7] and Thompson and Geery [8], there is no effect of pressure on coefficient of heat transfer for gases.
4. To compare the correlations suggested by various investigators, the heat transfer coefficients were evaluated by using these correlations for the following conditions by taking air as a motive fluid, $G = 200$ kg/m^2-s, $T_w = 375$ K, $T_b = 330$ K and $D = 4$ mm ID. The variation in coefficient of heat transfer was observed to be quite wide; for example, Petukhov's [5] correlation gave the value of 604.4 W/m^2-K, whereas that of Humble [9] 1027.6 W/m^2-K.
5. If Reynolds number is increased by increasing tube diameter, these correlations show a decrease in coefficient of heat transfer; and if Reynolds number is taken as an index of turbulence, this decrease in coefficient of heat transfer with increased values of Reynolds number creates confusion; and necessitates critical examination of experimental results. Therefore, it was decided to correlate the experimental results in terms of basic measured variables.
6. McAdams [1] has given the velocity and temperature profiles for air and water in tubes from where it is clear that the velocity and temperature fields for gases are identical, whereas they deviate considerably from each other in case of liquids. Similarly, the resistance for heat transfer in case of water lies mostly in the laminar sublayer while the resistances due to sublayer and turbulent core are comparable for gases. This indicates that the mechanism of heat transfer in two cases might be different. Therefore, it was decided to study the data of liquids and gases separately.

PAPER • **OPEN ACCESS**

Physico-Chemical Key Parameters, Freundlich and Langmuir Isotherm, Rate Constant Studies on the Removal of Divalent Nickel using *Delonix regia* Fruit Pod as Low Cost Bioadsorbent

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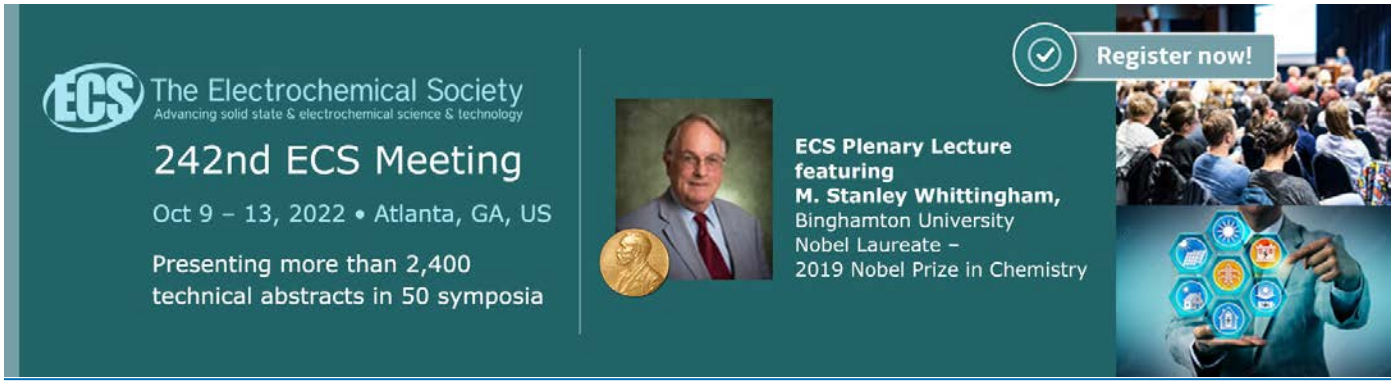

Physico-Chemical Key Parameters, Freundlich and Langmuir Isotherm, Rate Constant Studies on the Removal of Divalent Nickel using *Delonix regia* Fruit Pod as Low Cost Bioadsorbent

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Abstract. The exploitation of *Delonix regia* fruit pod (DRFP) as the low-cost biodsorbents is verified as an alternative for current pricey techniques for elimination of nickel ions from aqueous solutions. Batch adsorption studies is conducted to examine the effects of physico-chemical key parameters such as the initial metal ion concentration , pH, agitation time, stirring rate and adsorbent dosage on the adsorption from *Delonix regia* fruit pod (DRFP). The % adsorption, Langmuir constants, Freundlich constant for [Ni(II)] were determined for the adsorption system as a function of sorbate concentration. Equilibrium data were analyzed using the Langmuir and Freundlich isotherms whereas the adsorption kinetics data is also evaluated.

1. Introduction

Biosorption as a novel treatment tool is acquiring its standing in remediation of wastewaters from heavy metals [1]. Biosorption being a capable, clean and viable technique is evolving as an potent alternative for wastewater treatment specially in developing countries, as the cost involved in different treatment methods many time surpasses the requirement to treat water [2]. Heavy metal pollutions get out as effluents from different industries, like mining, electroplating, batteries, metal plating, stabilizers, pigments, sewage sludge and alloy industries where the chief constituent includes lead, nickel, copper, chromium, and other heavy metals. Heavy metals being non-biodegradable have a tendency to get mount up in living organisms through food chains. Few metals like Ag, Hg, Pb and Cd could be enormously toxic for to living beings. Other metals such as Zn, Cu, Fe, Mn, Co and Ni, when exist in excess concentrations above definite limits, could be very damaging to living organisms but are important for animals and plants in minute quantity as well.

Nickel is a silvery metal and Ni(0) and Ni(II) are the two oxidation states which occur in nature. Divalent nickel, Ni(II) has been identified as a common toxic pollutant. Nickel (II) and finds its way to the waterways from industries such as nickel plating, coins and jewellery making, electroplating, porcelain enamelling etc. At elevated concentrations nickel may cause cancer of nose, lungs and bones. Acute poisoning of Ni(II) results Allergic skin reactions, asthma, conjunctivitis, lung fibrosis, carcinogenic.

Removal of nitrate from water using zero – valent iron graphene oxide composite

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Abstract

Pollution of water and water bodies by various organic and inorganic contents because of ever increasing human activities due to industrialization attracting attention of many researchers to divert their mind in search of suitable scientific methods to meet with. With the advent of nanotechnologies it becomes users friendly to make water fit to use for end purpose and add values in mitigating with water pollution. In this paper, we have made an attempt to use zero valent iron graphene oxide (ZVI – GO) composite after its preparation followed by characterization by various methods like UV, IR, Xray diffraction, SEM and TEM to remove nitrate in water. In this work, a biodegradable, non toxic, "green" reducing agent, green tea extract is used for nano-particle synthesis instead of well known sodium borohydride. Graphene oxide is synthesized from 99.99% pure powder natural graphite powder according to modified Hummer method. Green tea (Figure. 1) extract is prepared by following the procedure as envisaged by X Weng et al and added in the mixture of 0.1 ferric chloride solution and graphene oxide. The resulted solution is heated with stirring on the hot plate for 01 hr. A black precipitate (ZVI-GO) thus obtained was dried in vacuum and it was further characterized by various analytical techniques. To what extent nitrate is removed has been studied by the adsorption of nitrate on zero valent iron graphene composite on the basis of thermodynamic parameters as well as Langmuir and Freundlich isotherms. This work endows satisfactory results in the removal of 90 % nitrate from water.

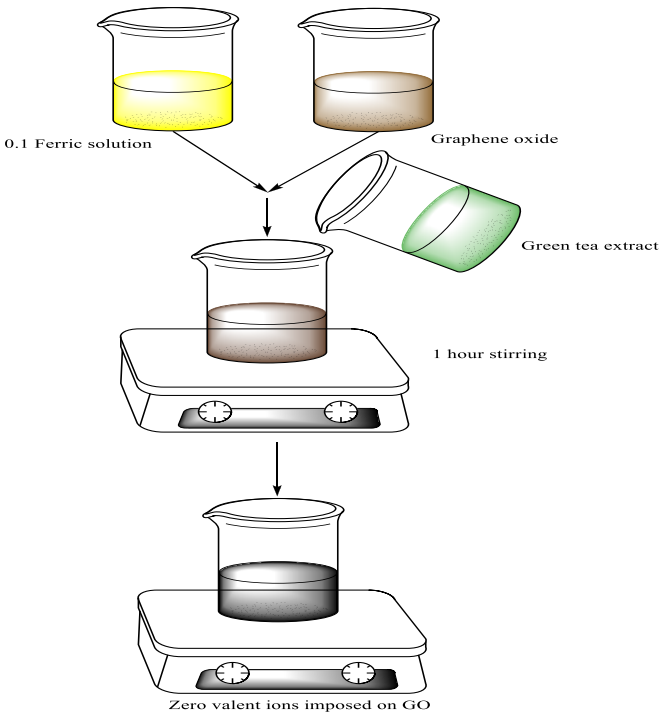
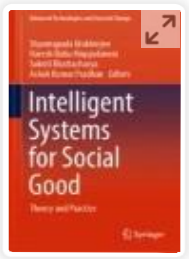


Figure1. Preparation of zero-valent iron graphene oxide composite



Intelligent Systems for Social Good pp 81–89

Fuel Larceny and Leakage Indication System Using IoT

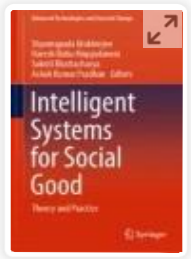
Prasanna Palsodkar, Prachi Palsodkar, Aniket Gokhale, Prabhakar Dorge & Ajay Gurjar

Chapter | First Online: 11 June 2022

Part of the Advanced Technologies and Societal Change book series (ATSC)

Abstract

In this chapter, an efficient Fuel Larceny and Leakage Indication System using IoT is presented. This chapter presents the design and implementation of an IoT and smartphones or tablet computers based monitoring of automobile fuel. The designed IoT based system estimate the quantity of fuel by using Fuel Gauge sensor (FGS). If there is a variation in fuel level between the initial and final level measurement in the vehicle tank, the owner gets an alert notification on their smartphones or tablet computers. The complete design and code is extrapolated in PDS with MCU 328p, FGS, ESP 8266 for IoT purpose and interfacing



Intelligent Systems for Social Good pp 193–205

Pandemic Surveillance Through Perspective Transformation Using YOLO and Mobile Net

Prachi Palsodkar, Prasanna Palsodkar, Yogita Dubey & Roshan Umate

Chapter | First Online: 11 June 2022

Part of the Advanced Technologies and Societal Change book series (ATSC)

Abstract

Even though India's rate of vaccination is growing in the world, the huge population and crowded public places demands to keep social distancing norms to prevent COVID-19 spread. This chapter has proposed a Machine Learning (ML) and Deep Learning (DL)-based technique to monitor social distance and mask to prevent coronavirus spread. The system will be using CCTV feed to monitor the area. It uses object detection models like YOLO, Mobile-Net that help to detect the pedestrians on the frame of the image and then the system calculates the distance between them by

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Cloud Based Examination Hall Authentication System Using Fingerprint Module

verfasst von: Monica Kalbande, Yashika Gaidhani, Tejswini Panse, Mahadev Mahajan

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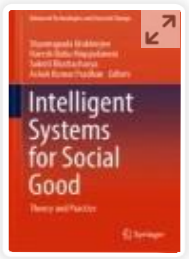

Intelligent Systems for Social Good pp 175–183

IOT Based Automated Fish Tank

Yashika Gaidhani, Manisha Waje, Monica Kalbande & Tejswini Panse

Chapter | First Online: 11 June 2022

Part of the Advanced Technologies and Societal Change book series (ATSC)

Abstract

In these days, fish tank keeping is popular, people from all age group be fond of keeping fish in their home, office, etc. In the aquarium if tank is not properly maintained, fish will be intended to an uncomfortable and short life. Hence it is not easy to control and monitor water conditions closely and enhance the water quality. Based on Arduino the Automated Fish Tank aquarium system uses sensors to control and monitor the water circumstances. Proposed solution gives quick access to utilize the smart system to control various water parameters. The system contains automatic feeder which will ensure the food is to be fed adequate and at right interval of time, Turbidity sensor which is deployed

Yocto Based Home Automation using Open BMC Platform and RestAPI

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***Abstract*— Automation in electronics growing and requires mass manufacture in an automated fashion with enhanced efficiency. Yocto based project gets built the tool named Bit bake. It works on multi-threading and scheduling, which aids in parallel testing of numerous boards in unit attempt. This paper expresses the innards of Yocto based system design for efficient automation using Open BMC. Open BMC supports open source Linux collaboration with a goal of producing baseboard management controllers to work across heterogeneous systems.**

Keywords*— *Yocto, Open BMC, Embedded, Raspberry Pi, Automation, Linux

I. Introduction

Yocto is an open embedded (OE) project progress, which needs a tool for development of Linux images [1]. It is a partnership project which provides template, tools and technique to set up customized Linux based embedded product [2]. Yocto project provides reduced memory footprint at kernel and at package level. It provides a flexibility to do addition as per application need. Bit Bake (command-line interface) and hob (GUI based interface) are two possible procedures to customize Linux packages in Yocto project to build optimum sized image with selected features [3]. Some Commonly known Yocto projects are Poky (It includes the Open Embedded-Core layer along with Bit Bake and metadata to help users get started on creating their own Linux distributions), Bit Bake is a build engine that allows the running of shell and Python scripts in parallel effectively. Layers in Yocto are collections of methods, generally clustered around a central theme, e.g. web development, Python or Java support, or secure repository for application data. Board support packages, or BSPs, contain information about certain devices, consisting of any hardware present (or missing) from the device, drivers, and information about the device kernel. There are several BSP-s available for Poky, with the option of developers to make their own custom BSP with the Yocto-BSP tool [4]

In [5], M. Swain uses the Yocto Project to customize an Embedded Linux kernel image useful for a Raspberry Pi Model B to be handled in a speech calling equipment. In [6], Brady et al. proposal that by creating a realistic emulated IoT environment, human effort and expenditure can reduce while increasing productivity.

II. Methodology

Yocto project development requires few standard steps, like user configuration setting for process building. It needs Metadata layers, Source files, and Bit bake build system, Package feed to generate images, SDK for application development. Fig 1 gives the steps for customization for steps to create a new image for Yocto project.

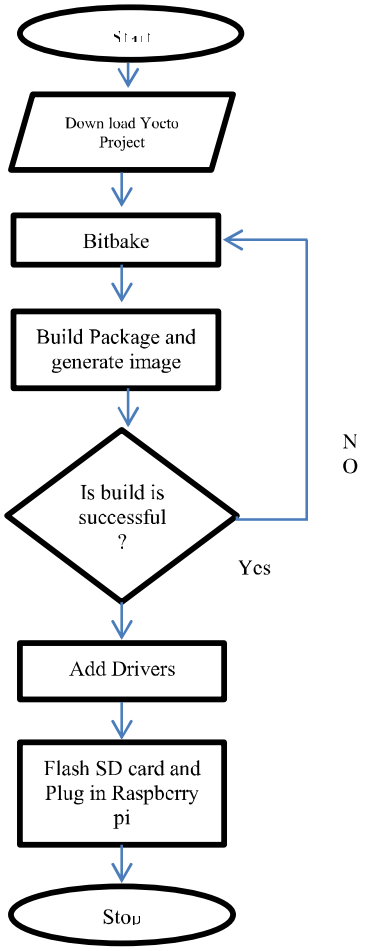

Fig.1. Image creation for Raspberry pi

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2022 IEEE 7th International conference for Convergence in Technology (I2CT)
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Identification of Fraudulent Credit Card transactions using Machine Learning Algorithms

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***Abstract*—Ever since the existence of e commerce payments systems came into being, people have found new ways to access someone's credentials illegally. This is a major issue in current era as more and more transactions are being done online. Every year fraud cost generated in the economy is more than $4 trillion internationally. This is not surprising, as the return on investment for fraud detection and prevention is massive. Cybercrime specialists estimate that an investment of 1 million dollars into fraud or attack can net up to $100 million. Financial institutions such as commercial and investment banks operations are increasingly being targeted and require some method to handle and support the progress of credit card fraud detection. To avoid fraud and to secure transactions systems they require some advanced technology that support the use of artificial intelligence (AI) and machine learning (ML) approaches to stay one step ahead of criminals. Being a classification type problem, we propose a ML model incorporating XGBoost algorithm along with SMOTE analysis. Our aim is to minimize the number of fraudulent transactions being predicted as legitimate transactions as the gravity of these type of errors outweighs that of the other in a real world scenario.**

Keywords- Artificial Intelligence, Machine Learning, XGBoost, SMOTE analysis

I. INTRODUCTION

Credit card fraud is one of the forms of identity theft where individuals make purchases or obtain money using a credit card that has been assigned to someone else. This can occur in multiple methods either by physical theft of credit card, account or PIN, or by opening new credit card accounts in someone's name without any permission. Once in, the thieves then make illegal transactions leaving the card holder and the company with the bill.

Credit Card issuers, obviously are aware of these issues and are continually developing new methods to foil any unauthorized transactions. At the same time, however, capable fraudsters which includes organized crime syndicates, are eager to find new work-around for these new security measures.

Credit card fraud methods include:

- Card theft: This involves physical theft of someone's credentials like account number, PIN or the card itself. Robbing a card or entire wallet or purse from restaurants or bars, are some of the classic cases of card theft.
- Account takeover: In account takeover, a fraudster contacts someone's card issuer and uses their personal credentials to change their PINs, passwords or even their mailing addresses and hence entirely gain access and control to the account. These issues are time consuming to sort out with card issuer.
- Clone cards: Devices called 'card skimmers' that fit over card readers in any departmental stores and supermarkets can allows robbers to duplicate card information for illegal use.
- Carding or Cyber-Attacks: Probably the most serious and complex way in which card credentials can be stolen is carding, in which hackers hack into payments servers and steal hundreds of accounts, worth of sensitive information.

II. LITERATURE REVIEW

A plethora of literature pertaining to fraud detection particularly in the domain of finance and credit cards have been published already and are available for public use. A team led by S. P. Maniraj, Assistant Professor from Department of CSE, SRE Institute of Science and Technology, provided a solution using Anomaly Detection algorithms namely, Local Outlier Factor and Isolation Forest Algorithm.

Local Outlier Factor is an unsupervised outlier detection algorithm. Local Outlier Factor values find anomalies based on local neighbours using k-nearest neighbours. The Isolation Forest tries to recursively partition each instances to isolate them. This random partition produces considerably shorter paths for outliers. Despite having high accuracy the model wasn't very precise. The only manages to score a precision of 28% for 1/10th of data and 33% when the entire dataset is used. [3]

Another study by students of M. H. Saboo Siddik Polytechnic, Mumbai, describes the potential use of an HMM model for fraud detection. The implementation of the model was theorized in the paper. The paper didn't provide any concrete results to compare. [5]

A review on credit card fraud detection using data mining techniques and machine learning algorithms were provided by Rahul Goyal and Amit Kumar Manjhvar from Dept. of CSE & IT, MITS, Gwalior. The paper gave a brief overview of machine learning algorithms such as Decision Tree, ANN, CNN to name a few, while also highlighting the various types of credit card fraud that generally occur and the difficulties that exists in detecting of the mentioned credit card frauds. The paper also provided a statistical classification of CCF occurrences, noting Ukraine with highest rate of fraud at 19%. [1]

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Greeniot: A Smart IoT Gateway for Connected Farming

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***Abstract*— This paper elaborates the use of Cloud computing and IoT for farmers. This brings the farm-land to the farmer's doorstep. Greeniot is a comprehensive Internet of Things solution to help farmers for execution of agricultural operations in smarter and efficient ways. The high-precision sensors are used to provide proper data for assessing soil quality, detect diseases in plants, predict ambient conditions, sunlight, humidity, moisture, and pH required for production and data driven farming for better crop production and smart use of farming resources. The devices are mapped to the local server and the data is sent to the server. The server can retain the data for some time and then transfers it to the cloud-based platform, which then provides predictive analytics for specific plant and crop models. Using this technique farmers can get all the analytics, insights, and personalized recommendations in layman's language on a mobile app.**

Keywords—MQTT protocol, sensors, LoRa communication

I. INTRODUCTION

In today's world, the population is rapidly growing, it is predicted to reach 9.6 billion by 2050, hence one of the world's problem is to generate more yield by 2050, cultivate more and more crops as per the need of the increasing population in the world. Along with this day by day, the requirement of additional farm-able land, and water is increasing. Solution to these difficulties faced by today's farmers is the need of a device or Equipment which can speed up production and reduce loss of time and crops which gets wasted and damaged due to weather conditions which can be solved by an IoT Device. This device will be helping farmers to control and monitor crops. In this paper Smart IoT solution for farmers is proposed that brings the farms-land to the farmer doorstep.

Different methods of IoT based farming is incorporated [1,2]by adding different measurement of parameters. Various smart farming methods are implemented using IoT [3,4,5]. Instead of going for a fixed type of system this proposes a system which is able to fulfill all types of agricultural needs of the farmer. Greeniot allows farmers to easily connect any sensor for monitoring parameters & access it from anywhere, and set up rules to control devices. This device measures soil parameters (temperature, moisture, conductivity, pH level, moisture absorbance rate); environmental parameters (temperature, humidity, atmospheric pressure, light intensity, CO2 level, and weather data from external stations), sends images from the camera module connected to the device and geographic parameters in real-time by deploying multiple sensor nodes. The high-precision sensors provide data for assessing soil quality, detect diseases in plants, predict ambient conditions sunlight, humidity, moisture, and pH required for production and data driven farming for better crop production and smart use of farming resources.

In this paper connections from sensors to the cloud is done using real time data as an extra helping hand. The system is having a virtual fencing system forming matrix of connected fencing poles for detecting sensor data required for processing and the lidar for detection of animal presence for alerting the farmer and triggering automation pre-programmed action like the sound generation and the herbal repellent on fencing so that animals not able to cross the boundary of farm. All the data collected from the sensors are stored in the data lake of the cloud and analyzed by the farmers for better understanding of crop conditions.

II. BLOCK DIAGRAM OF GREENIOT

Two hardware modules are designed one for handling I/O operation and sending sensor data to cloud. I/O unit collects environment data like temperature, Humidity, soil moisture and air speed from sensors. This data is sent to cloud using MQTT relay driver unit. Second hardware module is camera unit which is face/presence detection system. Camera unit helps in detection of unwanted entry of animals also used to monitor farm and plant growth using image detection feature.

Fig.1 gives block diagram of system. This consists of two Units i.e., Main Unit and Camera unit. Main unit is divided into seven sub units. Details of these seven subunits are given below.

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Congestion Avoidance Mechanism in Adhoc On-Demand Distance Vector Routing Protocol for Mobile AdHoc Networks

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***Abstract*— The Mobile AdHoc Network (MANET) is a wireless network of mobile nodes with limited energy and bandwidth that operates in a dynamic environment. It is based on decentralized management. Because of the limited amount of resources available, maintaining long-term contact with a large number of activities in a dense network is difficult. It is possible to communicate effectively in a light network without a congestion control strategy by using Adhoc On-Demand Distance Vector (AODV). Congestion, on the other hand, occurs in dense networks because of the high volume of traffic and the need to send packets in a continuous stream. Increased energy consumption and a shortened network lifespan are both consequences of congestion. With higher QoS in high-density networks, this research proposes a Congestion Avoidance Mechanism (CAMA) for AODV to reduce congestion. In order to reduce energy consumption and end-to-end delay while simultaneously improving packet delivery ratio and throughput, the suggested architecture makes use of the cross-layer idea. The suggested CAMA's performance assessments are superior to those of the Congestion Control AODV (CCAODV) and the AODV.**

Keywords—Congestion control; Cross layer approach; Energy efficient; Routing protocols; NS2.35.

I. INTRODUCTION

A MANET is a self-configuring and self-healing wireless ad hoc network made up of several mobile nodes without any central management. It is possible for each mobile node to establish communication with other nodes in the transmission range, or to assist other nodes in their communication. Packet collision, packet retransmission, packet losses, and many other problems are brought on by mobile nodes' dual nature in congested networks [1, 2]. For low-density networks, ADOV delivers higher service quality, but its performance degrades as the number of services in the network grows. MANET nodes' limited bandwidth and energy must be efficiently utilised to both extend the life of the network and improve communication between nodes.. A mobile node's limited bandwidth can't manage a slew of packets coming from a variety of sources and intended for a variety of purposes. This excessive transmission of packets uses the limited energy of the mobile nodes and hence shortens the network's lifespan. As a result of congestion, routing protocols' packet delivery capacity and latency suffer. Congestion in MANETs is a major concern for researchers, who are looking for ways to improve congestion control mechanisms in existing routing protocols. Overheads or excessive energy usage are required to reduce congestion in [1-3] and [5-10], respectively. Current routing protocols can't use congestion control because of limitations imposed by MANET. Cross-layer strategy to reducing energy consumption and congestion control mechanism to improve network performance for stable and dependable route are some of the contributions made by this work. We employ a cross-layer (CL) strategy to make efficient use of finite energy while also reducing communication delays from end to end. The CL method violates the TCP/IP model's layering requirements by sharing information between layers that are not contiguous. This non-adjacent information sharing contributes to the long-term viability of the network. Analysing traffic flow at each node is necessary for congestion management mechanisms, so that packet drops can be avoided. Control packets can be used as a counter in order to record and manage packets in a fashion that is useful in analysing traffic flow. AdHoc network performance improves as a result of the CL congestion control method. When multiple nodes are involved in a multihop communication, it can lead to connection breakages, higher energy usage, and longer delays. If a weak node joins in communication, the route discovery procedure is restarted since the weak node may abandon communication owing to depleted energy. Delays and congestion are caused by these issues, which are energy-intensive.

In brief, the following are the contributions of our work:

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Automated Surveillance System using Raspberry pi

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Abstract—— **Due to the increasing number of crimes and the increasing number of people living in cities, the requirement for a reliable and effective surveillance security system is spreading worldwide. Due to the continuous recording and the manpower required to monitor the activities of unauthorized individuals, the security systems consume a lot of memory and are not able to provide instant notification. In comparison to current monitoring systems, the Raspberry Pi has a number of advantages. Its mobility is one among them. This research work has introduced an Internet-based monitoring system that can be accessed remotely via the internet. This paper will look at how a PIR sensor and image processing may be used to monitor and track objects. Live video streams will be used to demonstrate how this can be accomplished.**

Keywords— ***Surveillance System: Motion Detection; Raspberry Pi; tracking; PIR Sensor; Web camera***

I. INTRODUCTION (*HEADING 1*)

Any establishment or location must have adequate security. Security is essential to prevent thieves and criminals from entering any location, from a modest apartment to a large business space. Keeping track of the displays, on the other hand, is a difficult task in most circumstances. This system sends and receives notifications about incoming photos and videos using Internet of Things technology. When it detects motion, it begins capturing videos [1]. The system will notify the administrator and send a push notification notice to the device when motion is detected. The recording will be preserved in the Raspberry Pi's memory. It can be used to establish the existence of criminal activities. This is the first time a security camera system for the Raspberry Pi has been offered. The purpose of this system is to create a system that is both simple to use and secure. The images are uploaded to a cloud server. When the server is down, the data is stored on the Raspberry Pi. Once the connection has been recovered, it will be sent. The first step in the review is to do a literature review. It then goes on to give a quick overview of the issue before delving into the various parts of the project. A conclusion and future work are included in the review's last section.

II. LITERATURE REVIEW

The design of a web-camera-based observation system that may be used remotely is proposed in this research. Raspbian is an open-source framework for creating Raspberry Pi-based projects. It enables gadgets to communicate with one another without the need for human intervention [2]. The goal of this project is to create the interface and detection of motion simple and user-friendly. When the camera is triggered, it will deliver a timely notification. The Raspberry Pi framework is a lot cheaper than the current one with greater objectives and lower force utilization highlights. The Internet of Things is a system where various gadgets communicate with one another using no human input. For the project, the aim is to form the interface easy and convenient. Due to the ubiquity of personal computers, it's difficult to justify the installation and maintenance of cameras at multiple places. In any case, the Raspberry Pi framework is significantly less costly and has better goals. It's small size and movability make it ideal for monitoring video content without being cluttered with sensors.

2022 10th IEEE International Conference on Emerging Trends in Engineering & Technology Signal and Information Processing (ICETET-SIP-22)

IOT Based Health Care Monitoring and Facilitation

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***Abstract*—Biomedical automation is one of the ever-emerging trends to provide better attention and healthcare. Presented work focuses on designing of an IOT Based Remote Healthcare Monitoring System with use of NodeMCU& Arduino IDE. The IOT platform referred in this presented work is Ubidots. Application Ubidots depends on open-source Internet of Things (IOT) application. Moreover, it's an API to store and retrieve data using the HTTP and MQTT protocol over the Internet or via Local Area Network. The pulse rate can be read, and the temperature and Blood Pressure can be measured using this IOT device. The proposed design continuously monitors a patient's vital signs and senses abnormalities. The ECG test results came out to be 72, 75,78 beats per minute. The oxygen percentages were recorded as 94,97,98%. And lastly, the temperatures of the test subjects were recorded as 94.78, 95.6 and 97.4 degree Fahrenheit. The proposed design is easy to use and cost efficient in terms of affordability.**

Keywords—Health monitoring system, controller, pulse sensor, temperature sensor, Blood Pressure Sensor, Ubidots : An IoT Platform.

I. INTRODUCTION

In recent years it is observed that there has been a considerable increase in advancement of technology driving various technology demanding sectors inclining towards wireless technology. And when it comes to wireless technology, IOT is the one of those that has been acquiring most of the automation sectors. Biomedical automation is one of the ever-emerging trends to provide better attention and healthcare. Nowadays not only in hospitals but also at the doorsteps extensive use of IOT is being utilized to ease personal health care and monitoring facilities. So, for having a smart system, various parameters are minutely observed and thought over including consumption of power, cost and efficiency. Doctors and nurses undoubtedly play the most crucial role in heath keeping but procedures like regular checkups of blood pressure, blood sugar levels, etc. and recently blood oxygen levels and respiratory monitoring have become an everyday thing in these difficult times of COVID-19. Visiting clinics frequently during this infection susceptible period is bound to raise unnecessary suspicion and fear amongst people. Considering all the factors many people have started avoiding, skipping, and delaying regular health checkups. Thus, the role of IOT is very important in health monitoring, and this modern technique provide instant health reports. Medical scientists, now for decades, have been working in the field of innovation and research to render better health services at everyone's doorsteps. This contribution towards the society is definitely time and resource worthy because people can now monitor and detect abnormalities of the body before falling prey to any serious problems. People now have to worry less as they can now monitor and track the health of their loved ones from anywhere in the world remotely. Temperature of Body, pulse rate, blood pressure, are the foremost signs to raise an early call to detect any benign irregularities. This work gives the edge of monitoring and predicting such calls in need. Also backing it up with a distress alarm system can prepare us and get us ready before any unfortunate incident happens enabling the crucial response time in order to act immediately.

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Arduino based Contactless Covid Booth Registration System

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***Abstract* — As per recent pandemic situation taken into consideration Corona virus testing is done at the specific center which does not provide safe environment. So there is need of advance system i.e. Contactless Covid Booth Registration system. This system helps to make Covid center automated and contactless which helps to reduce spreading of virus in the Covid testing centers. This system utilizes microcontroller, MATLAB, GSM modem. This system can be useful for all Covid testing centers, hospitals and public health centers. This system having advantages of reduction in spreading rate of virus, Break the chain of virus expansion, reduces patients rate and reduces the risk of infection. This system not only useful for Covid testing centers but help to our nation to minimize the risks of infections and death.**

Keywords* — *Microcontroller, GSM module, Voice output, Ardiono

I. INTRODUCTION

In order to efficiently facilitate health care system, the safety of healthcare workers should be our top priority. In times like COVID-19 pandemic, the number of healthcare workers involved in the process of testing such viruses should be minimized. So, the processes like testing should be fast and digitally enabled. Thus, the implementation of automated testing with the use of IoT and other advanced technologies is inevitable for taking advantage of testing's potential for fast and smooth functioning of testing booths. Our testing system is cost-effective, simplified, and optimized software testing process [1]. There is lack of automated systems in healthcare Industries for which the health staffs are held responsible for each minor treatment of the patient & to monitor them closely. Due to this reason the distance which must be maintained by the doctor and the patient is not acquired properly for which there a high-risk zone is created between them. Due to emergence of COVID-19 from the starting of year 2020 our society is highly insecure from the infection result of coronavirus which can affect the health of person, his family and ultimately society. Therefore, the testing process of coronavirus has emerged as a key factor to identify the infection of virus [2]. The process in itself has a lot of risk of getting infected of healthy person by the contact developed by another infected person on the Covid testing booth indirectly or directly. To eliminate such risks and to save our valuable time the traditional method of Covid testing can be interchanged with advance type of testing system which can be made by use of modern technology such as IoT. The idea of design and implementation of a networked e-health surveillance of system. The real time parameters needed for check-up of patient's health are analyzed using the system which is based on the architecture which utilizes intelligent devices and wireless sensor networks. The design of system is created such that it should follow a set of modules which can be used by physicians in tele-monitoring the patients and also helps to continuously investigate the emergencies that are examined by patients and caretakers [3]. The health and environment of patient is monitored by medical sensors and environment sensors integrated in

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Sustainable Communication Networks and Application pp 709–717

Competitive Analysis of Web Development Frameworks

Priyanka Jaiswal & Sumit Heliwal

Conference paper | First Online: 17 January 2022

Part of the Lecture Notes on Data Engineering and Communications Technologies book series (LNDECT,volume 93)

Abstract

In day-to-day working, when we are dealing with collecting and managing information for business, designing of interface plays a very important role. For designing
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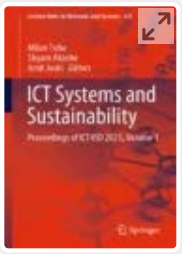

ICT Systems and Sustainability pp 113–121

Efficient Attendance Management System Based on Face Recognition

Ujwalla Gawande, Pratyush Joshi, Sumedh Ghatwai, Shreyas Nemade, Soham Balkothe & Nishant Shrikhande

Conference paper | First Online: 04 January 2022

Part of the Lecture Notes in Networks and Systems book series (LNNS,volume 321)

Abstract

Every education institution nowadays is concerned about student attendance and performance. In the current academic system, consistent class attendance of students plays a significant role in their performance, assessment, and quality monitoring. The traditional approach of taking attendance in several institutions is by calling the names of students one after the other or each student manually signs on the papers. In existing approaches, taking and tracking student's attendance manually, losing attendance sheets, dishonesty of students, and

Myths About COVID-19

Preeti l Jaiswa[1], Shriram Kane[2], Rakesh Kumar Jha[3], Ujwalla Gawande[4] and Atul Mahadik[5]

ECS Transactions, Volume 107, Number 1

Citation Preeti l Jaiswa *et al* 2022 *ECS Trans.* **107** 17135

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https://doi.org/10.1149/10701.17135ecst

Abstract

At the end of 2019, a new disease was identified in Wuhan, China. A new type of coronavirus was identified to be responsible for this illness, which was caused by a novel type of coronavirus and affected nearly the entire planet. 2019-nCov, or Wuhan-coronavirus, is the name given to this new virus by Chinese researchers. When working with the media, the World Health Organization refers to it as the COVID-19 virus to avoid confusion. COVID-19 is a brand-new product both globally and in India. People's minds have been thrown off by this. In Indian society, there are different rumors regarding the coronavirus that induce panic in people's minds. In humans it causes respiratory tract infections which can be mild or lethal. Mild infections include the common cold, headache, running nose, etc. In pigs and cows it causes diarrhea.

Recent Advancements in Civil Engineering pp 223–230

Artificial Neural Network (ANN) Models for Prediction of Steel Fibre-Reinforced Concrete Strength

A. M. Shende, K. P. Yadav & A. M. Pande

Conference paper | First Online: 15 December 2021

Part of the Lecture Notes in Civil Engineering book series (LNCE,volume 172)

Abstract

The objective of the present research paper is to develop artificial neural network simulation and analyse the most important π-term from five independent pi terms (aspect ratio, aggregate–cement ratio, water–cement ratio, percentage of fibre and control strength) for prediction of SFRC strength. The output of this network can be evaluated by comparing it with experimental strength and the predicted ANN simulation strength. The study becomes more fruitful when the most influencing π-term is calculated for the prediction of SFRC strength.

Earthquake Geotechnics pp 139–152

Filter Paper Calibration Using Osmotic Coefficients to Measure Total Soil Suction

P. B. Pande, S. R. Khandeshwar & S. P. Bajad

Conference paper | First Online: 04 January 2022

Part of the Lecture Notes in Civil Engineering book series (LNCE,volume 187)

Abstract

Suction is the pivotal parameter in arena of unsaturated soil. Filter paper method is the easy and cost-effective method for quantifying suction in which the calibration of filter paper is indispensable. The calibration curve with respect to total suction is impractical for measuring suctions a smaller than 1000 kPa. Thus, the distinct calibration curves are needed for measuring matric suction. Filter paper procedure is suitable up to the development of calibration curve in concern with total suction but difficult pertaining to development of matric suction calibration curve. Normally the pressure plate and pressure membrane were

A Review-Nidra (Sleep) and Nidranash (Insomnia)According to Samhita

ECS Transactions, 107 (1) 16297-16302 (2022)
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A Review- Nidra (Sleep) and Nidranash (Insomnia)According to Samhita

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Abstract: In the modern era, high percentage of people remains in a state of stress and frustration due to changing lifestyle, which predisposes the individual towards psychological and psychosomatic disorders.Insomnia is spreading silently all over the world. Each and every one is running endlessly after success and money. People today sleep 20% less than the required sleep.In India, more than 5% of the population and 30% of professionals are suffering from primary insomnia. Symptoms of primary insomnia and "Nidranash" are almost same hence we correlate it.

Keywords: *Nidra, Nidranash, Sleep,Insomnia*

Introduction:

Ayurveda is an ancient science of life which deals with both preventive and curative measures.

Aim of ayurveda is –

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A Review On Various Types Of Clinical Thermometers With Respect To Technological Advancements, Pros And Cons And Accuracy As Crucial Diagnostic Devices

ECS Transactions, 107 (1) 16223-16232 (2022)
10.1149/10701.16223ecst ©The Electrochemical Society

A Review On Various Types Of Clinical Thermometers With Respect To Technological Advancements, Pros And Cons And Accuracy As Crucial Diagnostic Devices

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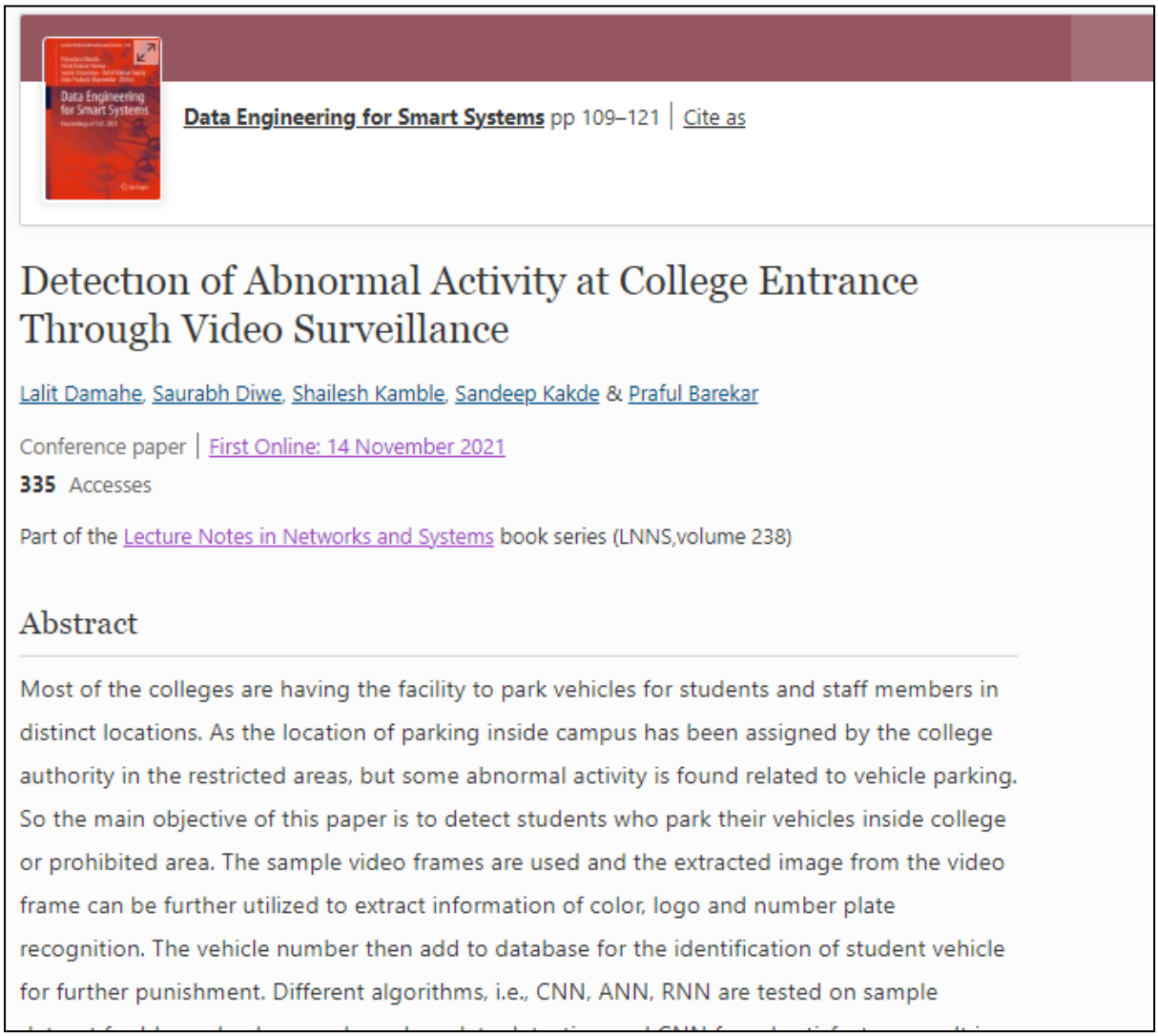
Clinical thermometers are considered to bethe most important diagnostic devices in diagnosis of any febrile disorders. The last two decades, have witnessed major changes in the clinical thermometrytechnology after the introduction of various types of modified thermometer for convenient diagnosis. Mercury thermometer stands up as the gold standard method for assessment of body temperature, but they are gradually getting replaced with newer devices that not only offer faster readings but inconvenience to the patients is also minimalized. This review focuses on accuracy, pros and cons of gold standard mercury-in-glass thermometer and also various technologically advanced thermometers like electronicdigitalthermometer, tympanic thermometer, non-contact infrared thermometer, liquid crystal skin thermometer, pacifier thermometer and smart thermometer. Various studies suggest that differentfactors can cause variation in the accuracy provided by such devices, like physical barriers, and calibration including the manner in which they are used.The review does not conclude that a particular clinical thermometer has better accuracy and reliabilitythanthe other. Rather, there were contradictory findings for all of the clinical thermometers evaluated.

Keywords: Diagnostic devices, mercury thermometer, electronicdigitalthermometer, tympanic thermometer, contactless infrared thermometer, liquid crystal skin thermometer, pacifier thermometer, smart thermometer.

Detection of Abnormal Activity at College Entrance Through Video Surveillance

https://link.springer.com/chapter/10.1007/978-981-16-2641-8_11#chapter-info



Data Engineering for Smart Systems pp 109–121 | Cite as

Detection of Abnormal Activity at College Entrance Through Video Surveillance

Lalit Damahe, Saurabh Diwe, Shailesh Kamble, Sandeep Kakde & Praful Barekar

Conference paper | First Online: 14 November 2021

335 Accesses

Part of the Lecture Notes in Networks and Systems book series (LNNS,volume 238)

Abstract

Most of the colleges are having the facility to park vehicles for students and staff members in distinct locations. As the location of parking inside campus has been assigned by the college authority in the restricted areas, but some abnormal activity is found related to vehicle parking. So the main objective of this paper is to detect students who park their vehicles inside college or prohibited area. The sample video frames are used and the extracted image from the video frame can be further utilized to extract information of color, logo and number plate recognition. The vehicle number then add to database for the identification of student vehicle for further punishment. Different algorithms, i.e., CNN, ANN, RNN are tested on sample

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Advanced IoT based parcel locking system

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Abstract*— Security is one of the prominent concerns with everything being digitized around us these days. One relating application of Iot based devices as result of this digitization for security of parcels is parcel locking system. In today's scenario when majority population steps out for work it becomes a problem for customers as well as delivery personnel to receive and deliver parcel on time to the right person. In case of important deliveries like passports or legal documents the customer needs to ensure safety, even if they aren't physically present to collect it. This advanced locking system discussed in this paper is effectively designed for user convenience by operating this lock by oneself through our customized website; this feature makes it unique as the entire control is in users hand without involvement of external person. This locking system reduces multiple challenges faced by logistics and increases security of parcels at the same time.

Keywords—Ai thinker NodeMCU, Wireless fidelity, Web hosting, automated locking system, Website Development, collection delivery points, automated circuit, parcel delivery system.

I. INTRODUCTION

Due to the pandemic and also otherwise, the popularity of platforms for online shopping and deliveries has resulted in a large increase in parcel deliveries. As it significantly grew in the state of lockdown as majority of shopping by the customers was done online and products were delivered to them at various locations there was a need for provision. Not only that but also earlier when product weren't ordered using e-commerce on such a large scale, commercial products are popularly known to be shipped out from centralized locations of manufacturing or storage and have to be known to be procured in accordance with the market demand at various locations.

In case of domestic deliveries where a delivery personnel has to go to each residential location to give the parcel, it is often troublesome as there are chances the recipient is not at the given address or home for an instance, this may result in an extra trip after communicating with the owner. This consumes time, extra fuel and in costs more to the delivery agency. In other cases if parcel is just left at the door, unattended it may get stolen or could be damaged by anyone or certain weather conditions. Even if parcels are handled to the resident's security personnel it may be misplaced due to human negligence. Important deliveries like legal documents or passports cannot be given to anyone else too. In such case delayed deliveries may give user a bad user experience and may affect delivery agencies image. This advanced parcel locking system is the one which helps us resolve such issues due to its advanced locking capability. It is specially designed to simplify and enhance this collection of parcel.

The major advantage of this system is that there is no interference of any external person in the locking operation. With a single click on our customized website, the lock inside the locker opens and closes. Also there is a provision for real time object detection update on the website itself for the ease of monitoring.

II. LITERATURE REVIEW

Collection-and-delivery point is a concept that is growing with each day as it helps to alleviate all the problems relating to parcel deliveries. We are majorly aware of and used to the existing traditional delivery methods. ([1]) Existing traditional method where delivery personnel hands the parcel to the user is widely in use. But in today's day and age where people have jobs away from home, there is a need for unsupervised parcel collecting system.([2]) This need resulted in creation of automated lockers. Broadly stating, the existing automated lockers were of the type where each user had a passkey to their particular locker which they shared with the delivery person on the time of delivery. This passkey had to be given as input through a keyboard or touchscreen dial pad that was attached with the locking system of these lockers.([3]) This came into use but wasn't exactly effective as the passkey was shared and this fixed code became to be known by multiple people. This was improvised by generating a new passkey each time the locker was accessed. The user got a message or email containing this variable opt or key which he

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Modern E-Trolley For Goods Purchase With Inventory Management Using Android Application

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***Abstract*— The traditional way of shopping will always be in trend, one problem which is always faced by customers is waiting in long queues. Because of this, customers waste a lot of time which leads to adding some innovation to the existing system. This proposed model will improve the existing shopping system. In this E-trolley, a connection between Arduino and android application through Bluetooth has been established. Arduino is connected with a barcode scanner and using it the user will scan the barcode of the product and the application will show the details of the scanned product. Further, this data will be shared in the database and after that user will be able to make payment through any online payment mode. The stock data which is present in the database will be updated after successful payment. The main aim of the proposed solution is to reduce the long queues and make the whole process hassle-free for the customers which will lead to more profitability in the store.**

Keywords*— Arduino UNO, Barcode Scanner, HC-05 Bluetooth Module, MySQL, Rest API, Android Development, Inventory Management.

I. INTRODUCTION

As known that most of the cities consist of supermarkets and malls, in these markets, there are cash counters where the customer needs to go for paying the bill of products they have added to their trolley. In recent times shopping at these markets has become a hectic job, and there are several people at these shopping markets specially on holidays, festivals, and when there are special discount days and because of this there is a huge rush at the billing counters. Therefore, customers need to wait in a long queue. Because of this situation, a lot of customer's time is wasted and the supermarkets or malls may face huge losses.

Here are some following situations when a customer will just leave the store:

The first situation is when a customer wants to buy a couple of products and they know that it will only take a minute for them to checkout, but after looking at the long queue they don't feel like buying the product and they leave the store. Another situation can be when a customer waited in a long queue and after waiting for so long, they pay the bill and checkout. After that, they realize that they have forgotten some products. Now if they want to purchase some other stuff they will have to wait again in the long queue for billing and that is frustrating. Some customers just don't enter the store after looking at the long queue for billing.

Therefore, the aim is to solve this problem by creating a trolley system which will have its own barcode scanner and the list of all products which the customer has scanned will be displayed on the customer's phone and they will be able to pay the total amount with their mobile phones. This is a win-win situation for both parties.

II. LITERATURE REVIEW

A hopping market is a place where a lot of people come to buy things, Because of the long wait at the stores the customers have to spend a lot of time here. In this trolley a camera is used to detect the product and display all the details on the LCD, it also has a recommendation system. This LCD screen also displays the offers which are available at the store. ([1]) The complexity of the existing smart trolley makes the whole process bit difficult to adapt with. This proposed smart trolley uses an LCD screen to display the data of the products which was fetched from RFID card.([2]) In older days the traditional way of shopping was used but in today's digital world people want to spend less time in queues so in this proposed smart trolley the cart details are sent directly to the billing counter and the customer needs to go to the counter and pay. ([3]) Shopping for most people means visiting a busy store, searching for products,

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IoT based Face Mask Detection System

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***Abstract*— The COVID-19 virus was first reported in December 2019 in China. Since then, it has created havoc on global level by causing health and financial crisis. The novel corona virus is continuously evolving into new variants of virus and still spreading in every part of the world. The virus is spread mostly by the droplets transferring from the infected person to an uninfected person. The only direct method of preventing such transfer of droplets can be done by washing of hands, avoiding contact with nostrils, eyes and mouth. Only complete vaccination of citizens can help in containment of virus till then use of face mask and social distancing has been made mandatory by authorities. This project proposes a contactless face mask detection model based on machine learning and image processing technology. It will follow the protocols of social distancing. This project will be helpful in accurately identifying whether a person is wearing a mask properly or not. This model can be easily installed in the entrance of ATMs, malls, educational institutions, offices and in the entrance of public offices. Being a contact less model it will effectively reduce the need of having a manual way of detection and will reduce the spreading of disease to further people. It is highly effective and cheap model as all the tools required for this project are free of cost and easily available online. Proposed model can be easily used on low end computers like Raspberry Pi. The model will encourage people to continuously wear mask in correct manner.**

Keywords*— *Machine learning, Image processing, Python, OpenCV, Matplotlib, SVM, Viola Jones algorithm, Scikit library, etc.

I. INTRODUCTION

The Corona virus or the COVID-19 virus is a member of SARS virus family which was originated from WUHAN, CHINA and was first reported in December 2019 [1]. This disease causes infections in respiratory tract and can range from mild to lethal. It is a contagious disease. The virus has evolved into multiple variants [2]. A fatality caused by this disease in old people is high. Furthermore, it can permanently damage lungs as per the reports. Also, it has after effects like fatigue, eye disease like mucormycosis, loss of appetite, body pain, chest pain and muscle pain in cured patients [3-4]. With an incubation period of around 15days the disease can show a symptom after a fortnight which makes it's difficult to diagnose [5]. Hence the authorities have advised people to be quarantined if came into contact with affected person. Its uncontrollable spread has turned out to be a pandemic and is still continuously spreading until now everywhere in world, causing a direct severe health crisis and an indirect financial crisis by long term lockdowns all around the world [6-8]. Every government & health organization has made eradication of COVID-19 virus as their top priority. So to control the pandemic from spreading preventing it at first is very important as prevention is better than cure [9]. Vaccination all over world has begun yet with an average efficacy over 60% it cannot guarantee one will become immune to this disease after injecting anti-bodies through vaccines [10]. Hence containing it with all possible methods is very important. The disease spread through droplets spread by an infected person because of coughing or sneezing hence it's mandatory for both infected and uninfected person to wear mask [11-12]. The droplets usually, enter the body through nose, mouth and eyes. Multiple guidelines have been issued by WHO (World Health Organization) for prevention of COVID-19 which includes regularly wearing face mask, regularly checking body temperature, sanitization with alcohol based, sanitizer, avoiding crowds and public gatherings, maintaining distance with other individuals if possible. Thus, monitoring individuals that are wearing the mask or not is more significant. Hence the main aim of project is to create a contactless monitoring system that would be beneficial in reducing the spread of this infectious disease and will encourage people to use face masks properly & it can make any public or working space a safer environment [13-15].

Automatic Feature Abstraction from High Resolution Satellite Data for Urban Land Cover and Land Use

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***Abstract*—Urbanization is a beginning trend of the once two centuries, shaping numerous confines of the ultramodern world. To guide this miracle and support growth of metropolises that are competitive and sustainably give demanded services, there's a need for information on the extent and nature of civic land cover. Still, measuring urbanization is grueling, especially in developing countries, which frequently warrant the coffers and structure demanded to produce dependable data. With the increased vacuity of ever tasted data, new styles are available to collude civic land. Yet, being bracket products vary in their description of "civic" and generally characterize urbanization in a specific point (or points) in time. Arising pall grounded computational platforms now allow one to collude land cover and land use (LC/ LU) across space and time without being constrained to specific bracket products. We perform a Automatic point abstraction image bracket procedure in Google Earth Engine (GEE), using two sources of reference data (executive data and hand- labeled exemplifications). By fusing intimately available optic and radar data as input to the classifier, we achieve accurate charts of constructed-up LC/ LU in the fiefdom. In moment's period of big data, an fluently deployable system for accurate bracket of constructed-up LC/ LU has expansive operations across a wide range of disciplines and is essential for assembling the foundation for a sustainable mortal**

Keywords—Urbanization, Built-up land cover, Automatic feature abstraction, Google Earth Engine

I. INTRODUCTION

Automatic Point abstraction has plant its operations in colorful areas like LULC mapping, change discovery, civic planning, disaster operation also numerous other socio-profitable conditioning. Remote seeing and Civilian's ways play a major part in similar operations. Still, operation areas of remote seeing have been vastly increased with vacuity ofsub-metre resolution data from high- resolution drone image by flying over certain place it can capture the image depending upon the quality of the image we provide. HRS imagery facilitates to identify colorful civic affiliated features, similar as, road, tree, structure and all the other area that are present on the earth that also includes the one which ismanmade [1][2]. Since, homemade birth of structures using satellite imagery is time consuming and expensive affair, hence, automated styles for birth been on a rise as a time and will be cost effective result with minimum stoner involvement [3][4]..

Automatic point abstraction for Urban Land Use and Land cover from the image is to get sensitive details for numerous reasons, similar as, land structure and shape, which may vary, or presence of obstacles posed by girding objects, similar as, trees, other structure with a high height, and many more[5]. Further, the discrepancy between roof of structure and girding region might be low this is an important criterion in segmentation and various spectral characteristics. Considering all these situations, different pollutants, which have been used to prize edges using satellite imagery, have been astronomically classified into three groups, videlicet, grade grounded, laplacian grounded and morphology grounded. Since, both grade laplacian-grounded pollutants are veritably, fine morphology- grounded fashion is used to study to prize structures by HRS image [6].

Structure covers in civic area don't have analogous size, shape and texture. Still, these structures have certain common characteristics, similar as, their bright appearance and high discrepancy to the girding features. Considering these common structure characteristics, the ideal of this study is to prize structures from the drone image and performed various methods on the system to determine the best possible land differential. The proposed methodology is used via Erdasimage [7].

II. MATERIALS AND METHODS

The primary hardware used for capturing images is Google Earth for satellite image and Erdas Imagine as a software with the min requirement of PC should have at least 12 GB of RAM, 10th-gen i5 or i7 CPU core or similar processor for AMD Ryzen, and HDD of 20 GB, Onboard Graphics such as desktop with 2 –4 GB VRAM and 15-inch monitor or 1920 × 1080 large (FHD). The pre-processing of input images requires various steps that are discussed below

A. Histogram Equalization

Histogram tool provide a one variable data. This means it shows the statistics of the image by calculating the frequency of the image. Frequency distribution is a bar graph that displays the values of an image which includes its location, spread and shape this are the most important values that makes up a Histogram. The three important parts are of the following:

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Hand Gesture Recognition to Facilitate Tasks for the Disabled

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Abstract - **Deaf and dumb people communicate with gestures. Number of applications have been developed using gesture recognition computer vision, machine learning etc. A simple technique to recognize gestures is presented in this paper. Here Python libraries such as Opencv, Numpy are used. The technique involves capture of live gestures and recognition of the same using Opencv functions. Parameters such as the area ratio and convexity defects are considered to differentiate between different gestures. The system will also display text message and an audio file will be used for vocalizing the different gestures. A functionality where gestures are recognized for entertainment purpose is presented. This can be of use to blind people for the purpose of entertainment such as playing music, radio or listening to news. Here Multiprocessing library is used. The tasks are assigned to specific gestures.**

Keywords: Gestures, Python, OpenCV, Human Computer Interaction, image

I. INTRODUCTION

Gesture recognition systems are making their way in numerous applications and provide a starting point for the advancement in smart appliances as well as IoT enabled devices. A gesture recognition system is presented here which recognizes some predefined gestures to perform tasks. The tasks defined here are related to opening various pages on the internet. The focus here is on enabling the user to open entertainment related websites with the use of simple gestures. Human Computer Interaction is based on working together of human and computer. Researchers have observed many ways in which user can interact with a computer and be able to design different types of applications. Thus the aim here is to develop a system which identifies different gestures and generates audio output along with text.

Here the Opencv image processing library is used for the purpose of image detection and extraction.
The aim of this research is to develop a real time system which recognises gestures. This is achieved by finding out the peak and angel and conversion of gestures into performing tasks. The concept is based on designing and implementing a system that uses artificial intelligence, image, image processing and data mining concepts to take inputs as hand gestures and generate outputs that are recognizable in the form of text and voice accurately to quite a large extent

It has the following steps

1) Initial setup,
2) Calculation of area of hand, contours and convex hull,

3) Calculation of area ratio,

4) Detection of defects,

5) Identification of gestures and generation of text display

6) Launching of sites related to news, radio, music and audio files.

II. LITERATURE REVIEW

Earlier number of researches related gesture recognition is done.

Paper proposed by Shweta S. Shinde, Rajesh M. Autee and Vitthal K. Bhosale have calculated peak value and angle by recognizing the gesture and converting them into voice commands and vice versa . A 20-megapixel night vision web cam is used. A system which uses artificial intelligence, image processing and data mining for recognition of gestures and converting it into recognizable outputs in the form of text and voice with about 91% accuracy. They have used a method of hand gesture recognition in MATLAB, in this they calculate angle and peak for feature extraction of image and then use MATLAB's inbuilt command to convert the recognized image(Gesture) to speech.[1]

Rajat Shrivastava has proposed a new and fast system for gesture recognition which uses intel's image processing library openCV. The author has proposed several hand gesture recognition methods such as syntactical analysis, neural

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Sustainable Water Management using Internet of Things

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***Abstract*— A water management system with the Internet of things approach is proposed for a framework, where a water network consisting of water pumps and valves at each node is connected to water tanks provided with level sensors which are controlled by an ESP-32 microcontroller which acts as an IoT platform. Output has been observed for different situations based on water availability of tanks. The whole process has been monitored through the blynk app. This research can be used to replace the conventional methods and would be more time-efficient, cost-effective easily monitored, and completely autonomous. This design is useful in many applications of water, sanitation, and industrial projects.**

Keywords—IoT Blynk App, ESP-32 Microcontroller, ArduinoIDE, Embedded C,Wi-Fi Module, Liquid Crystal Display.

I. INTRODUCTION

To meet the ever increasing demand of water supply we cannot totally depend on groundwater sources, orthodox and outdated water management systems and uneven rainfalls. Thus there is a need for an effective water management system which can deal with these types of situations effectively and efficiently. To deal with the ever-increasing demand for water, pipelines and tanks have been constructed across the cities, towns, and villages. For a particular framework consisting of water tanks and pipelines when there is sudden shortage of water in one of the tanks due to excessive usage of water .The current way of solving this problem was manually checking the water level and diverting the water from other tanks to these tanks. If these method have not been done in time then people are forced to depend on other water sources such as groundwater and water tankers. But erroneous management of water supply leads to major water crisis [4][5]. With the help of a proper water management system based on geo-information and IOT, We can try to minimize the problem with an effective and efficient way.[13] The main objective of our research is to provide water to water deficient tanks by transferring water from water available tanks with the help of Internet of Things.[17] To demonstrate this process we have chosen a group of 4 different tanks which is equipped with water level sensors and water pumps and connected to a network with valves connected at each node. These sensors, motors and valves are connected to ESP-32 which acts as a IoT platform for this research, The ESP-32 has an integrated Wi-fi module with the help of this we have connected our project to an IoT cloud to monitor the whole process from anywhere and any period of time. LCD is also connected to the ESP-32 to get alternate real time updates of the process.

II. Related Work

Water management frameworks are prone to water misfortunes. Despite the fact these misfortunes could lead to major or minor problems. This paper gave us a brief knowledge about applications of Iot in water management system by which we were inspired to work on this research with an Iot approach [1]. Water supply in a framework should be prioritized on the basis of consumption, geographical factor, population etc. Improper prioritization of water supply could lead to scarcity of water in many areas leading to a water crisis [2],[3]. The orthodox way of solving this problem is manually analyzing the water requirement and availability of each and every area in a framework, and diverting surplus amount of water to the areas required. But this method is time consuming which does not make it ideal for an efficient water management system. Water Management Based on Geo information and IOT offer a solution which is quick, economical and effective.

Case study:

There was a recent case which has happened in the Wadi region of Nagpur District. The residents were experiencing dry throats and parched lives. The locality was going through a severe water shortage for five months. The situation was so worse that they were forced to cut down their water consumption extremely. This was perhaps the worst-ever crisis in the region's recent history

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IoT based Digital Production Counting System

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***Abstract*— The Objective of this research is to Design and build a IoT Base Digital Production Counting system. It decreases the likelihood of counting errors and improve counting accuracy, which is used in big enterprises since it outperforms human techniques. Production manufacturing and counting can be a time-consuming process that includes quality control, large-scale analysis, and quantity measurement. The classification especially supports the quantity factor, or production rate which is accomplished by human resource present in industry with having either a max or min rate of production but keeping the exact count throughout the manufacturing process is still impossible. The quantity outcome is an important factor in steadfast the industry's economic growth and financial health. As IoT is quickly growing as the next phase of the Internet's development, it's becoming more necessary than ever to understand the several prospective domains for IoT operations. Since the previous few decades, technology has played an increasingly important role in our daily lives. As IOT is developed, industries can increase productivity and data collection efficiency. In order to improve production demographics this project aims to count the multiple products which are counted by IR sensor using IR interruption concept and Microcontroller is used here to keep track of a huge number of items and display on a LCD display as well as upload the data on web via Node MCU (IOT Module)**

Keywords—Microcontroller At-mega 328 p, Node MCU, IR Sensor, Production object, IOT Module

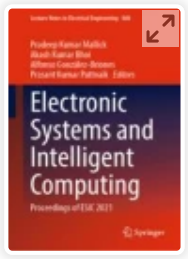
I. INTRODUCTION

The main aim of this research is to expose the IoT Base Digital Production Counting system. This is the main subject of this research. It reduces labour costs and saves time in industries. As internet is widely used in a variety of industries, including transportation, healthcare, agriculture, and manufacturing. The evolution of the IoT has become indispensable in our daily lives. IoT network refers to collections of interconnected devices without interruptions of human involvement.[1] It permits machine-to-machine and machine-to-human communication, and it is widely employed in industrial process. Manufacturing companies may boost production and data collecting efficiency by implementing IoT technologies. IoT also provides the manufacturing business with numerous benefits and conveniences. So with the application of IoT technologies, industries are able to increase productivity. Using IoT and IR sensors with a microcontroller and a node MCU to count products in industries [12It is now possible to acquire huge amounts of data for counting products in industry because of the extension of IoT devices such as sensors, security systems, trackers. The Internet of Things is quickly becoming one of the most essential technologies for improving the efficiency of industrial processes.

The target of this research is to design a IoT Base Digital Production Counting system which can be employed in large industries since it surpasses hand operated method. Hand-operated systems are ineffective since they entail employees remuneration that must be paid on a regular basis. The more workers there are the more capital the management needs to disburse on payment. Human resources are also not always authentic. It is possible that a few occurrences will be counted incorrectly, making them unreliable. It also takes a long time because manpower is slower than any machine intended for a specific purpose. To solve this problem, we proposed an IoT-based Digital Production Counting system that decreases the risks of counting errors and displays the counted data on a website using the internet of things (IoT). The given data should be uploading on web within a specific time frame. This system is implemented by using Microcontroller and Node MCU (IOT Module) which are main components along with the IR sensor.

II. RELATED WORK

While referring the related paper for research following arethe papers we are going through .Counting a number of things



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Energy-Efficient Automated Guided Vehicle for Warehouse Management System

Minal Keote, Tanmay Choudhari, Tanmay Alone & Ashar Ahmad

Conference paper | First Online: 03 June 2022

Part of the Lecture Notes in Electrical Engineering book series (LNEE,volume 860)

Abstract

The automation business has grown at a breakneck pace, breathing new life into an otherwise dormant industry. The use of robots has lowered human workload and freed up the workforce from boring, non-cr
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Design and Fabrication of Portable Insulation Box for Medical Applications

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***Abstract*—As per the research, the number of diabetic patients in India is very high which makes it the second most diabetes affected country in the world. The insulin pen is largely used to limit the effect of this disease. The insulin should be stored at low temperature and for this purpose a portable insulin box which provides low temperature using solar power has been proposed. The temperature of the insulin box can be monitored by the temperature sensor which is placed on the box.**

Keywords— Insulin Pen, IoT module, Electrical Safety, Temperature Monitoring and Control, Diabetes

I. INTRODUCTION

This project resolves the purpose of storing insulin which has to be stored at a low temperature in order to be effective. This designed Insulin box is used to provide a portable and effective storage of insulin. This box can be carried along everywhere and hence called portable insulin box. The system provides a solution to control and monitor the temperature of the insulin box. The temperature of the insulin box should be low which is based on the storage temperature of Insulin pen. The temperature module which is placed in front of insulin box allows to set the required temperature. The most important component of this project is the Peltier module. The peltier module is used to cool down the temperature of the Insulin box. Through this module, one heat sink sends the cool air inside the box and another heat sink pushes the hot air outside the insulin box. It works on the principal of solar panel which convert light energy into electric energy.

This is a cost effective and user-friendly insulin box which can store 6 insulin pens at a time. It has a Door Lock System which is used to maintain the safety of the Insulin Box. Others cannot open the box until he enters the password to the door locked system. The door stays open for 5 sec and then gets locked automatically. The programming of the Door Lock System is done by using Arduino uno. A servo motor is used for the rotation propose of the door.

II. LITERATURE REVIEW

The motivation for the project was the project that designed and implemented a safe medical box to maintain Insulin pens [1]. Insulin must be preserved in good condition in order to maintain its efficiency. Ambient temperature is very important for Insulin. The system provided a solution to monitor and control the temperature of the Insulin pen. The process consisted of creating a portable medical box with two chambers where new pens were placed in one chamber and the used pens in the other.

From the paper [2], where Thermoelectric Refrigeration Box was designed and fabricated for the use in medical service, the information that a control unit heats up based on the temperature of the chambers, was studied.

In terms of medication, a large number of patients utilize insulin pens to keep their blood sugar levels under control. This pen must be kept in a secure location with a predetermined temperature level. Failure to follow this specification, results in drug distortion on multiple occasions. If such insulin is injected, it may endanger the diabetic patient's life [3][4][5].

III. CONSTRUCTION OF MODEL

This design produces the thermal contact between two sides of peltier module. Peltier module is used to cool the box and blow out the hot air from another side. 2 Fans are used with the module to perform this operation. The second main part of this module is the solar panel for

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Design & implementation of fine ADC block in 8-b folding and interpolation

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Abstract— Analog design like ADCs, DACs, and PLLs are the crucial analog circuits. Achieving the low supply voltage in data converters design is the challenge task. At the same time achieving the desired conversion rate, resolution, sampling frequency and power dissipation are becoming crucial.

Now a day the demand of designing low voltage, high speed, low power consumption, less area and low-cost ADCs is increasing. To fulfill these requirements in designing of ADCs are crucial for many innovative design applications. In this work, folding and interpolation ADC architecture using trans-resistance amplifier followed by current steering folding amplifier is designed and implemented in UMC CMOS 180nm technology. This ADC provides moderated resolution.

In several applications Moderated resolution ADCs with low voltage, high speed and low power are in use. Also, the demand of low voltage ADCs is increasing in the field of embedded application. This motivates us to design the folding and interpolating ADC architecture. Furthermore, synchronizing the coarse and fine converters bits is challenging task in folding and interpolation ADCs. Hence, the main aim of my work is to design low voltage folding and interpolation ADC which operates at the input frequency of 85 MHz using the less silicon chip area.

Keywords- Analog to Digital Converters (ADCs), Complementary metal–oxide–semiconductor (CMOS), interpolation, voltage folding

I. INTRODUCTION

In the recent years, there are mainly two structures investigated of folding circuit. First one is the conventional folding amplifier and second one is the current steering folding amplifier. In this thesis work current steering folding amplifier is used as an analog pre-processing block. The power consumption and delay of the current steering folding amplifier block is less compared to the conventional folding amplifier block. At the same power consumption, working speed of the current steering folding amplifier circuit is higher than conventional folding amplifier.

In the folding and interpolation ADC, two separate converters are needed. First one is fine converter and second is coarse converter. Here both converters require separate digital encoder. Because fine converter generates the circular code at the output of fine ADC and coarse converter generates the thermometer code at the output of coarse ADC. Hence there are two different digital encoders are needed. One is circular to binary encoder and other one is thermometer to binary encoder. In case of folding and interpolation ADC, fine converter and coarse converter generate bits parallel. Fine converter generates the lower 5 LSB bits and coarse converter generates the upper 3 MSB bits. But the synchronization is necessary between 5 LSB and 3 MSB bits. Designing the synchronizer is not an easy job. For generating 8 bit folding and interpolation ADC total 40 comparators are required out of which, 32 comparators are needed for generating the 5 LSB bits and 8 comparators are for generating the 3 MSB bits. Folding block is the main block for deciding the number of comparators used in this architecture. As the folding factor increases the number of comparators decreases. But the increment in the folding factor has negative impact on the input frequency of the circuit. Increment in the folding factor lowers the maximum input signal frequency of the ADC.

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LoRa Communication based Wireless Sensor Monitoring system

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***Abstract* - The Internet of Things [IoT] technology is recently used to autonomously collect and send data via a wireless channel. However, as the name implies, the primary requirement is Internet access, which is the main limitation for low-network locations. To send data from Sender to Receiver, the system employs LoRa Modules, mostly Ra-02, depending on the location. The sender can process the sensor data and send it over the personal network by utilizing LoRa (Long Range) Modules and the ESP8266. Solar panels can also be used for even reduced power usage. The data obtained will then be updated by the Real-Time Database on the Web Server through the Internet via Wi-Fi or GSM/GPRS Modem. Stored data may be accessed via a Web Application (Dynamic Website) on a mobile device. On both the transmitter and receiver sides, a low power OLED display is linked to provide real-time status. Due to the lack of power source on the transmitter side, we will power up utilizing a solar panel, charge controller, and battery. The solar panel will be 4V and the charge controller will be TP4056. The battery rating of 2200mAh is determined by the amount of power consumed.**

Keywords— LoRa (Long Range), Gateway, OLED (Organic Light Emitting diode), Modem, Dynamic Website

I. INTRODUCTION

The internet's growth is entirely dependent on itself, therefore its non-availability is a constraint. To overcome this shortcoming, the idea of developing a wireless sensor network that does not require internet access or networks such as GSM (Global System for Mobile Communications), CDMA, LTE, and so on. This wireless sensor network design is made up of nodes and a gateway, and it attempts to effortlessly transfer any sensor data across a wide range without any internet connectivity.

This wireless sensor network consists of a LoRa module, which makes this proposition possible. The fabrication of LoRa module along with sensors can make this network a pioneer for accessing of data remotely from anywhere even from the places like a rural area, forests, farming, monitoring transportation on national highways where there is no network access, surveillance and monitoring for security, etc. and it comes with additional features like low power consumption.

A wireless sensor monitoring network consists of nodes and gateway using LoRa with the capabilities of long distance transmission. LoRa consumes low power i.e. battery operated, which can be used for end to end transmission without human intervention. LoRa can sense certain types of sensor data and transmit/receive it over a long-range without any internet connectivity, not even GSM, CDMA, LTE, etc. without consuming much power. These nodes can be used for many applications.

II. LITERATURE SURVEY

In [3], author[s] are focusing mainly on Long Range Wide Area Network (LoRaWAN) and Water Grid (SWG).The methods in this paper includes LoRaWAN technology which describes LoRa modulation, LoRaWAN protocol clustering. The method in this paper includes relay nodes its discovery and layer formation, network joining, spreading factor assignment, flow tables set up data transmission, protocol requirements and protocol validation. The algorithm in this paper has achieved better accuracy to calculate packet error rate and total energy consumption for single hop network. The limitations or research gap in this research manuscript is it requires some improvement that for each RN the number of nodes are not evaluated [3].

The system uses LoRa modules mainly Ra-02, which depends on the location to transmit data from sender to receiver. The sender can process data from sensors and can transmit it over the personal network using LoRa (Long Range) Modules and ESP8266. Furthermore, for even low power consumption driven solar panel can be used. The data received will then be updated by real-time database in web server through internet using Wi-Fi or GSM/GPRS Modem. Stored data can be able to access using web application (Dynamic Website) using mobile, laptop anytime and anywhere.

III. METHODOLOGY

Due to lack of connectivity in some areas (No Network Area), it results in no Internet. In such cases, when we need to transmit sensor data from one location to another where there is no Internet or Mobile Network, this Wireless Sensor Monitoring setup is mostly utilized for data transmission from a low network area to an area with internet access. The sensors in the low network area are used to sense data like temperature, humidity, and so on and communicate it to the LoRa module transmitter. Now, the data will be sent from the transmitter LoRa module to the receiver LoRa module. This will develop a gateway, which will then be connected to the cloud, allowing the information to be accessible remotely from any device and anywhere using the proposed web application, which will update the data in real-time in the cloud. It mainly consists of a transmitter module, a receiver module and any digital devices for accessing information through web server.

Process Improvement of Finishing Machine by Real Time Monitoring using IoT

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***Abstract*—At present many small-scale fabric industries finishing machines are not automated, Human intervention is required for analysis and highlighting the technical parameters deviations. In fabric industry parameter analysis like temperature, water level, humidity and pressure has to be done and usually it's done manually. This led to high workload on engineers and operators for parameters logging and communication to engineering department and also its time consuming for maintenance team members to get different types of analysis, e.g., down time %, Repeated breakdown % etc, which may lead to poor analysis process for defectives in fabric. So, to overcome this problem in fabric industry, process improvement can be done by real-time monitoring of finishing machines using IOT. This paper presents the technique to make the finishing process of fabric industry automated i.e. to do real time monitoring of finishing process, using IoT technology. By automation of the finishing process there will be good analysis of poor fabric, and this will also prevent fabric wastage. This process saves human power, as the output is directly received through WhatsApp or Email in form of graphs which prevent manual analysis of parameter. Since the finishing process is automated the cost is controlled by reduction in rejection of fabric and it also increases productivity of machines and human resource. This leads to smart working practices by eliminating paper works and time-consuming methods**

Keywords— Finishing Machines, Real Time Monitoring, Cloud, IoT

I. INTRODUCTION

IoT applications provide new paradigms to improve productivity and optimize expenses in fabric manufacturing industries. Till date human intervention is required for analysis and highlighting the technical parameters deviations. Manual monitoring of machine parameters can lead to human errors which can further result in major defects or accidents [1]. In fabric manufacturing industries this can lead to defects in the fabric material. At present many small-scale fabric industries finishing machines are not automated, Human intervention is required for analysis and highlighting the technical parameters deviations. In fabric industry parameter analysis like temperature, water level, Humidity and pressure has to be done and usually it's done manually. This led to high work load on engineers and operators for parameters logging and communication to engineering department and also its time consuming for maintenance team members to get different types of analysis, e.g., down time %, Repeated breakdown % etc, which may lead to poor analysis process for defectives in fabric. So, to overcome this problem in fabric industry process improvement can be done by real-time monitoring of finishing machines using IOT. The aim of this paper is to use IoT to obtain real time data for monitoring and control of fabric manufacturing process. Internet Of Things helps to capture data and provide simple and hidden insights to decision making authorities. Overall equipment effectiveness can be achieved by real time monitoring physical parameters of production process. Sustainability of the plant can also be enhanced significantly.

There is a significant surge in applications of IoT in industries such as in healthcare [2], transportation and logistics and even firefighting as use of RFID tags, WiFi and other wireless communication technologies are emerging [3].

IoT is powered by smart sensors, communication technologies and internet protocols. The fundamental agenda is to have smart sensors communicate directly without human interference to provide a new platform of applications. The current development in mobile, internet, M2M (Machine to Machine) has marked the beginning of IoT era [4]. IoT, cyber computing and advanced manufacturing methods are interlinked. Wireless communication operations can bring about smart manufacturing with latest innovation which can even help ease the obstructions in Supply Chain Management (SCM) in future [5]. The paper is organized as follows. Section II presents the methodology of the process improvement of finishing machines, results are shown in section III and concluded in section IV.

II. METHODOLOGY

Many users would search for more advanced ways to access and evaluate the data residing in control systems. Partly this is for convenient accessibility, but in many cases these users want to add Industrial Internet of Things (IoT) data connectivity and analytical abilities [6].

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Flower Image Classification Using Convolutional Neural Network

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Abstract—**In the field of pharmaceutical industry, botany and agricultural there is a need of algorithm which will classify the flowers by processing its image. In this context, we propose a flower classification approach based on convolutional neural network. We have applied transfer learning approach for classification of flowers. We have used VGG19 convolution neural network architecture for extraction of features. As we wanted to classify flowers in 17 different classes so we have used 17 neurons in final dense layer of VGG19 convolution neural network architecture with the use of softmax activation function. Results show that we have classified flowers with the validation accuracy of 91.1% and training accuracy of 100%.**

Keywords—Flower classification, Convolutional neural network, Transfer learning, VGG16, Deep Learning.

I. INTRODUCTION

About 369000 different species of flowers plants exists in the world [1].For flower species classification the traditional feature like color, shape and texture of the flowers are used. But it is complicated and difficult to choose this feature properly. At different times and different environments gestures of flowers are different but the shape and color of the various flower species are same, which leads a big problem in identification. In past few years, research carried out on flowers identification includes: In [2] the authors suggested a method to place a black color cloth at the back side of the flower. But this method is not feasible and convenient. In [3] used multilevel thresholding to classify foreground and background.

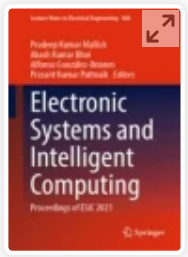
In [4] the Gabor responses, for the classification of flowers the combination of texture features and gray-level co-occurrence matrix is used. Probabilistic neural network is effectively used for the classification of flowers in this approach. Authors shows that use of combination of features for classification improves the performance up to 79%.For classification of the product some authors have used other than neural network approach. Images are classified on the basis of key features given by SIFT [5].

In [6] for extracting features of flower images segmentation based Fractal Texture Analysis (SFTA) and Scale Invariant Feature Transform (SIFT) techniques are used. This method consists of three stages namely: segmentation, extraction of features and classification. To remove complex background, flower region is segmented in the first step. In the second step the features are extracted from the segmented flower image. In the last stage classification is carried out. For classification flower spices it uses Support Vector Machine (SVM) and Random Forests (RF) algorithms. The result of experimentation on 215 images shows that Support Vector Machine (SVM) algorithm with SIFT to extract features gives more accuracy compared to the Random Forests (RF) algorithm. While, Random Forests (RF) algorithm is used with SFTA then it gives better accuracy. Due to smaller dataset of only 215 images algorithm highly over fits and provides an accuracy of 100%.
In [7] authors tried to improve the performance of classification by combining the features. In this approach four features are computed for each flower image, each image describes different aspects like local texture, the spatial distribution of petals, shape of the boundary and the color. Features are combined using multiple kernels. Support vector machine (SVM) algorithm is applied for the classification. The experimental results show that combining multiple features improves performance, from 55.1% to 72.8%.

Deep Learning shows really good results in various fields such as natural language processing, face recognition, robotic vision, voice generation, and many other fields in past few years [8]. Deep Learning is a branch of Machine Learning that depends upon features that are extracted by feeding the images to the neural networks. The Convolutional Neural Network shows extremely good performance. One of the advantage of CNN is that it overcomes the reliance on hand-crafted features [9]. To classify and recognize images related to various fields uses Convolutional Neural Network (CNN) which is a deep learning algorithm [10] [11] [12].

If the test dataset and training dataset are taken from the same feature space and the same distribution then machine learning methods work well. In case, if there is a change in distribution, then we have to rebuilt statistical models from scratch by using newly collected training data. In many situations, it is expensive or impossible to recollect the required training dataset and rebuild the model. It is required to reduce the need of recollection of training data. In such type of situations transfer learning is required [13].

There are many methods for classification of images like supervised learning classification algorithms e.g. support vector machine (SVM), K-nearest neighbors (KNN), Random forest, convolutional neural networks, All these methods do not yield better testing accuracy because of over fitting. Therefore, we proposed use of pre trained CNN with



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Detection of Stress with Deep Learning and Health Parameters Monitoring Using Raspberry Pi

Sujata S. Chiwande, Ashutosh Bagade, Sakshi Deshmukh & Sushma Nagdeote

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Abstract

Now in day-to-day life, every individual faces some sort of stress due to workload, school, or form their lifestyle. Stress is an unwanted portion of life that is seen in people. As stress can have some positive effects, but it has adverse effects on your health if it is for a long time. Therefore, it is crucial to detect a person's stress, as it can lead one to depression. It is observed that stress leads to worse health situations. It is also found that stress can affect health by increasing heart rate, decrease in oxygen level of the body, and increase in weight. It can lead to obesity. Regular change in BMI also indicates

Design of Substrate Integrated Waveguide Technology Supported Dual Band MIMO Antenna

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***Abstract* – This paper introduces an outline of a Dual Band MIMO antenna for applications based on Substrate Integrated Waveguide technology (SIW). SIW has acquired a valuable and various kinds of researches, extending from microwave to optical bands due to their outstanding properties such as low costs, low losses, small footprints followed by incorporating with other types of PCBs. SIW structures can be used to prevail the above-mentioned advantages readily compared to various kinds of technologies such as co-planar waveguides, conventional waveguides, micro-strip transmission lines and so on. The indispensable cavity mode is designed on Substrate integrated waveguide to resonate at 2.4 GHz. Moreover, the 2nd and 3rd mode are altered and combined carefully by placing a via inside the cavity to allow the coverage of wideband in 5 GHz WLAN band.**

***Index Terms* – MIMO, waveguide, substrate integrated waveguide (SIW) antenna, dual-band antenna**

I. INTRODUCTION

Substrate Integrated Waveguide technology shows a prominent approach for performance and combination of wireless systems, microwave and millimetre wave components. Substrate Integrated Waveguide technology allows active element, passive structures, and antennas to be incorporated into one substrate, eliminating transitions and lowering losses. SIW technology unites theadvantages of classical micro-strip circuits (low weight, easy fabrication, low cost, compact size) and metallic waveguides. It appears that Substrate Integrated Waveguide technology is designed to become thestandard for the implementation of cost-effective millimetre wave systems in the near future. Radiation, conductor losses, and dielectric losses are the three mechanisms that generate losses in Substrate Integrated Waveguide.[1] The metal used (usually copper), the height of the Substrate Integrated Waveguide, and the roughness of the metal all affect conductor losses. These losses are difficult to regulate since they aredependent on the quality of the substrate's copper lamination. In contrast to micro-strip lines, one of the most significant restrictions of Substrate Integrated Waveguide structures is the single-mode bandwidth (which is limited to one octave) and breadth (which depends on the cut off frequency and the dielectric substrate).[2][3]

Different SIW architectures have been proposed to solve these constraints. For designing and analysing for electromagnetic wave the researchers employ CST software in the high-frequency band. CST can address every high-frequency field problem because to its compatibility, and hence it is the preferred choice of scientific researchers.[4]

II. LITERATURE REVIEW

Substrate Integrated Waveguide technology-based MIMO Antenna is proposed. Two wide bands achieved suitable for two-band WLAN operations. The performance of antenna 1st assessed in open space and then on the body. The Γ (reflection coefficient), radiation characteristics, and specific absorption rate are all computed mathematically & empirically. The antenna is fed by a standard SMA connector having 1.25mm internal diameter. SMA connectors can be replaced with micro connectors, making an antenna extra appealing adding tractability and sturdiness during process of folding [5]. CST Studio Suite comprehends EM field solutions for applications across the EM spectrum in a one operator interface. Researcher can run- through the solvers combine to perform hybrid analysis, permitting them to rapidly and effortlessly analyse complete systems having numerous modules Leading technology and engineering companies all over the world use CST Studio Suite. It enables quicker development cycles and lower costs, resulting in significant product to market advantages. Four purely textile patch antennas for Bluetooth applications in wearable computing in the 2.4 GHz frequency range are shown by the authors. Textile material and a planar shape of antenna allow for seamless incorporation into clothes while maintaining textile qualities. The deployed materials and antenna polarity differ amongst the four antennas, however they all use a micro-strip line as an antenna feed [6][7].

ANTENNA TOPOLOGY**:** In order to get the better result we need different MIMO antenna orientations and then they are are examined. A piece of metalized material is sandwiched among the antenna and the human body to reduce coupling. Within this frame of reference, two types of antennas are broadly classified as Patch antennas and Reflector antennas. The former one is significant because of simple topology, less backward

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Identification and prevention of Gray hole attack using IDS mechanism in MANET

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***Abstract*—Since the mid-1990s, the growth of laptops and Wi-Fi networks has led to a great increase in the use of MANET (Mobile ad hoc network) in wireless communication. MANET is a group of mobile devices for example mobile phones, computers, laptops, radios, sensors, etc., that communicate with each other wirelessly without any support from existing internet infrastructure or any other kind of fixed stations. As MANET is an infrastructure-less network it is prone to various attacks, which can lead to loss of information during communication, security breaches or other unauthentic malpractices. Various types of attacks to which MANET can be vulnerable are denial of service (DOS) and packet dropping attacks such as Gray hole, Blackhole, Wormhole, etc. In this research, we are particularly focusing on the detection and prevention of Gray hole attack. Gray hole node drops selective data packets, while participating in the routing process like other nodes, and advertises itself as a genuine node. The Intrusion Detection System (IDS) technique is used for identification and aversion of the Gray hole attack. Use of AODV routing protocol is made in the network. The network is incorporated and simulation parameters such as PDR (Packet Delivery Ratio), Energy Consumption, End-to-end delay, and Throughput are analyzed using simulation software.**

Keywords— *MANET, AODV routing protocol, Intrusion detection System (IDS), Gray hole attack, PDR, Energy consumption, end to end delay, throughput.*

I. INTRODUCTION

The communication technologies have advanced significantly over the years, as a result, wireless technologies have emerged and became the most rapid and easy way to communicate. MANET is one of such wireless technology which grew in mid 1990s. It is a decentralized type of wireless network, that does not need any pre-existing infrastructure, such as routers, hubs, switch, cables in wired networks or access points in wireless networks [1]. Dynamic topology, autonomous behavior, energy constraint operation and less human intervention are some of the key features of MANET. In wireless network, security plays an important role. Achieving, safeguarding the aspects of security such as confidentiality, authentication, integrity, availability, access control, and no repudiation in a network is important. As MANET does not require any infrastructure, there is no centralized control over the communication, hence it becomes more challenging to secure such kind of network against various attacks, such as Gray hole, Blackhole, Wormhole attack, denial of service attacks, etc. It is easier to implement such type of attacks in AODV protocol. AODV is designed to be self-starting in an environment of mobile nodes, withstanding variations in behavior of network such as mobility of node, link failures and packet losses [2].

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PERFORMANCE IMPROVEMENT OF AODV UNDER WORM HOLE ATTACK

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***Abstract*—All across the world, majority of humans rely upon wireless ADHOC network. So, it turns into the maximum priority to lessen the vulnerability of wireless network. Wireless networks are exposed to many distinct varieties of attacks out of which wormhole attack is most dangerous. Unlike many different attacks on ad hoc routing, wormhole attack could be very effective and cannot be avoided with cryptographic approach due to the fact intruders do now no longer modify the packet data, it replays the packets. An intentionally positioned wormhole can cause a significant breakdown in communication. An analysis was performed in this study that removed wormhole attacks from MANET using changes to the AODV routing protocol. We have used Smart Packet Detection and Prevention Technique (SPDPT) to remove Wormhole. We have examined simulation parameters such as packet delivery ratio, end-to-end delay, energy consumption, and throughput.**

Keywords— MANET, AODV, Wormhole attack, Smart Packet Detection and Prevention Technique (SPDPT), NS2, Routing protocol.

I. INTRODUCTION

Mobile Ad-hoc Networks also are referred to as self-sustaining and decentralized wireless systems. MANET has capabilities like loss of significant monitoring, open medium, management, no clean protection mechanism, converting its topology dynamically, and cooperative algorithms due to those capabilities MANET can also additionally be afflicted by safety attacks. Manet are greater at risk of attacks because of Wireless links. To get admission to the continued conversation, Wireless links make it less difficult for the attacker to move withinside the network. To take part withinside the network, Mobile nodes ought to gift withinside a variety of wireless links. As there may be growing threats of attacks at the Mobile Networks, there are exceptional kinds of attacks and their consequences at the Manet to offer stable conversation and transmission. Communication is primarily based totally on a mutual belief among the nodes due to this MANET is greater open to those sorts of attacks, there may be no authorization facility, no significant factor for network management, vigorously converting topology, and confined resources.

A. Wireless Networks :

As wireless networks are convenient to use, they are gaining popularity gradually. The consumer/user needs no longer rely on wires as people are able to move easily and enjoy being connected to the network. Due to features like mobility, the wireless network is fascinating and distinguishable. Because of this feature, users are able to move freely when connected to a network. For installation, wireless networks are easy compared to wired networks. Pulling the cables/wires in the walls and ceilings is not a problem. Wireless networks can be customized to meet the needs of individual users.

Wireless networks are of two types:
•Infrastructure Mode
•Infrastructure less Mode or Ad hoc Mode

B. Wormhole Attack:

Wormhole makes use of a couple of colliding nodes, and it is a trivial form of attack which transfers the packet from one region to any other region with the assist of a personal link. Within the network, the primary attacker node is positioned which transfers the packets to some other area in which the following attacker node is positioned [2]. The long-variety tunnel is referred to as the wormhole link. They numerous hops far from every different, however, those attacker nodes act as neighbor nodes to different nodes. Hop count decreases however delays increase, withinside the presence of a wormhole attack. Cryptography techniques cannot come across and save you wormhole attacks due to the fact attacker nodes do not alter packets contents in wormhole attacks.

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Analysis of Daubechies 2 Wavelet in WPM System for Adhoc Network

M. B. Chakole & S. S. Dorle

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Abstract

Wavelet packet modulation (WPM) has been proven as one of the multi-carrier modulation (MCM) techniques with improved features and improved characteristics. To make the WPM system more efficient, different techniques were used. In this research work, WPM system is designed by using db2 wavelet on three different modulation schemes BPSK, QPSK and 16-PSK. Further, each modulation scheme was tested under three different channel conditions, i.e. AWGN, Rayleigh and Rician. After successfully experimentation, it has been concluded that the WPM system with QPSK modulation under AWGN channel condition using Daubechies (db2)

Evaluation of Bit Error Rate (BER) for OWDM System

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***Abstract*— In modern age due to requirement of high bandwidth and increased data transfer rates. A digital multicarrier communication system is known as Orthogonal Wavelet Division Multiplexing System (OWDM). This paper proposed the implementation of the OWDM System with BPSK Modulation Scheme to evaluate Bit Error Rate for BPSK-OWDM System in presence of additive White Gaussian noise (AWGN) to achieve high performance both in bandwidth and data transfer rate. A comparison was made between the OFDM-BPSK System with OWDM-BPSK under similar conditions because of this comparison achieved improved BER as compared to OFDM-BPSK System.**

Keywords*— *Additive White Gaussian Noise (AWGN), Orthogonal Wavelet Division Multiplexing (OWDM), Binary Phase shift Keying (BPSK), Discrete wavelet Transform (DWT),Inverse discrete wavelet Transform (IDWT)

I. INTRODUCTION

In recent years, wireless digital communication has Become a necessity for communication, in mobile communication high speed and high data rate needs to be achieved and so has been the need to develop efficient modulation technique has emerged. Due to addition of AWGN the performance of the system decreases [1]. OWDM system is different from OFDM which works on the principal of frequency division multiplexing. AWGN is used to simulate background noise of the channel. This OFDM system is also used in latest technology like 4G OFDM which uses Fast Fourier Transform (FFT) and Inverse Fast Fourier Transform (IFFT) [2-3]. OFDM also has limitations like higher phase noise. To overcome this limitation, new system developed known as Orthogonal Wavelet Division Multiplexing (OWDM) System which works on the principal of Wavelet Division Multiplexing where the wavelet decomposition and reconstruction is a main tool for detailed analysis. The OWDM system is a Multicarrier system in which the information Bits are superimposed on n subcarriers also it follows the orthogonality (orthogonal orientation is seen between the side lobes of sub carriers) this system has better Bit Error Rate performance. Since Bit Error Rate is defined as the rate at which error occurs per transmitted bit. Here the Bit Error Rate performance is evaluated in the presence of AWGN fading channel with the equalization process (which takes place at the receiver section). A comparison is made between the BPSK OWDM and OFDM system, both of which are multicarrier systems, and the Bit Error Rate Performance is evaluated. Ideally for good communication system Bit Error Rate is expected to be as low as possible with respect to different SNR values. SNR is the ratio of signal power to noise power whose unit is decibels, to obtain SNR, author subtracted the noise quantity from desired signal. Here E_b/N_0 ratio is considered, which stands for energy per bit to noise power spectral density which is a normalized SNR ratio. It is very useful while comparing the Bit Error Rate performances of different Digital Communication Systems. The value E_b in the ratio is referred as the signal energy associated with every individual transmitting bit and N_0 in the ratio stands for noise spectral density. We know that the limit of reliable information transmission rate of any communication channel depends upon the bandwidth and Signal to Noise Ratio (SNR), so this principle could be used to establish bound on E_b/N_0 that can achieve reliable communication. [4-5].

OFDM has very high bit error rate hence designing this OWDM system which has low Bit Error Rate as compared to OFDM. The results for bit error rate for OWDM system are plotted and are compared and analyzed with OFDM system at various values of Signal to noise Ratio (SNR) which are compared in this paper below.

II. RELATED WORK.

Wavelet Modulation is a Modulation technique in which every data bit being transmitted is represented by their wavelet transformation.

The researchers also proposed this Wavelet Modulation Technique for Efficient implementation for 4G/5G communication where bandwidth requirements are more. They also developed less complex wavelet algorithms to ease the process of Modulation and Demodulation. Researchers also found out that while comparing the computational abilities of FFT based system and Wavelet based system. The Wavelet based system was computationally fast as compared to the FFT based system [6-7].

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Wireless Floating WQ(Water Quality) Monitoring System

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***Abstract*—The wireless sensors for environmental parameters monitoring are getting very popular due to their low power working capacity. Continuous real-time water quality (WQ) monitoring is critical for the environmental engineer due to non-accessorily at many sampling locations. Therefore, a system needs to be designed that will practically work 24X7 using real-time sensors data and a Graphical User Interface (GUI) system. At the same time, such systems demand a continuous power supply source to send the data from node to base station.**

This paper presents a unique design of a floating low-cost wireless WQ monitoring system that can be deployed in water bodies. The calibrated pH, turbidity, temperature, water level sensors were interfaced to the PIC microcontroller with a GPS module. The system was communicating from 100-500 m using-WIR-1186 modules. The nodes were solar-powered and floating above the water body for 24X7 with a duel power supply.

The obtained results using low-cost sensors demonstrate the system's feasibility in deployment and long-term use over larger water bodies like ponds, lakes, rivers etc. The floating designs will be a reliable and cost-effective solution for pollution monitoring agencies to monitor water quality.

Keywords— WQ monitoring system, LoRA, Floating system, self-power nodes

I. INTRODUCTION

The Water is a key parameter of current environmental research as it is very essential for agriculture, industries & human beings. The water quality (WQ) includes physicochemical and biological parameters for monitoring surface water bodies [1,2]. The pollutants in the water bodies can spread at a longer distance, inflowing rivers, waterways, etc. However, in stagnant water bodies, the pollutants normally saturate near a smaller area or centre. Therefore, monitoring the water bodies due to their dynamic nature is crucial for researchers.

The pollution in the water bodies has increased since the last two decades due to human interventions and activities like developing small industries near rivers, erection of tanneries, or dye industries near old waterways. Activities like excessive use of pesticides discharge of hazardous pollutants from sewage treatment plants (STP's) and Effluent Treatment Plants (ETP's) through drains during nighttime are critical and challenging to track. These factors invite various water-borne diseases for human beings and animals that lead to panic in society. The diseases like typhoid, diarrhea, schistosomiasis, arenicolid, polio, etc., are caused by poor water quality. Nearly eighty per cent of the population is being affected due to poor water quality [3]. World Health Organization (WHO) reports say that one in three people globally does not have safe drinking water [4]. The developing countries are equipped with traditional devices and portable testers available at a low cost in the market. These practices need a large workforce, chemicals, and sophisticated laboratories to get the results. The traditional water quality monitoring equipment is immovable, complex to operate, and very costly to deploy over the water bodies. The real-time data acquisition, transmission, and processing at the sensor node is crucial for autonomously monitoring the WQ. Therefore, there is an emergency need to deploy a suitable wireless sensor enabled system for monitoring the physical and biological parameters of water in real-time during day and night. The application of aquatic Wireless Sensor Network (WSN)system is very challenging and critical compared to terrestrial WSN systems due to humidity, temperature and path loss effects on the water surface. In most of the experimentation work, the WQ monitoring devices are deployed near the boundary or bank of rivers or water bodies for safety or provision of power supply. The water quality parameters are always different at the centre of the water body compared to the boundary of a water body. Therefore, such systems are inadequate to sense the WQ. Therefore, advanced low-cost WSN based devices and in situ sensor-based modules are very popular in developed countries. In India, very few researchers are working on the design and monitoring aspects of such a lightweight, floating, and calibrated WQ system.

Many researchers have attempted to monitor the WQ using multiple low-cost sensor-based technologies [5,6,7]. However, such systems have few issues with their working principle or onsite deployments and reliability after 24 hrs. Shwesin Koko et al. studied dissolved oxygen (DO) concentration in multiple wastewater treatment ponds. They used YSI 6920 multiparameter to send the data to monitor the DO level at different time intervals. The study reveals WQ parameter monitoring is a very critical task and important for sustainability [8]. Central Pollution Control Board (CPCB) deployed imported real-time WQ monitoring devices at a national level and established a water quality network for river Ganga. However, few reports revealed that

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Analysis of Greenness in Urban Cities Using Supervised and Unsupervised Classification

Nita Nimbarte, Shraddha Sainis & Sanjay Balamwar

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Abstract

Satellite images are widely used in urban planning and growth analysis with different technology being developed. A remotely sensed image is at first pre-processed to remove anomalies from it, thus resulting in a clear and informative image. Image classification is categorized into two techniques, namely supervised and unsupervised techniques. Both the techniques give different outputs and accuracy parameters. This paper describes the analysis of supervised and unsupervised techniques of remotely sensed images for land cover classification and to evaluate greenness in terms of the area over a period of time. Both the methods

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Investigation of structural and electrical properties of nickel chloride doped pyrrole aniline copolymer

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ABSTRACT

Chemical oxidative copolymerization has been employed for the synthesis of pyrrole and aniline copolymer at room temperature, in equal proportion. The prepared copolymer was undoped and then further doped with 10% NiCl2 using immersion method. Structural characterization of self-doped, undoped and doped copolymer was performed using FTIR, WAXD and SEM techniques. Results reveal the modifications in the original copolymer structure accompanied by various shifts in the band positions and appearance of the new bands in IR spectrum due to doping. The X-ray diffractograms reveals presence of modified and shifted peaks indicating the changes due to doping. The scanning electron micrographs of undoped and doped copolymers show globular structure due to doping when compared with that of the parent copolymer. In addition, using two probe methods the dc electrical conductivity of these samples was recorded in the temperature range of 313 K to 673 K, at a field of 27 V/cm. The log σ Versus 1/T plots of the self-doped and doped samples display the transformation of the sample at a given temperature from metallic to semi conducting and vice versa. The I-V plots for the self-doped and doped copolymer has also been plotted at a fixed temperature of 323 K which shows linear behavior of the samples. The conductivity measurements show reduction in conductivity of prepared samples thereby suggesting the presence of bipolarons as charge carrier. The results confirm the effect of doping on the copolymer properties.

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1. Introduction

The quest of novel materials with improved structural, optical, electrical and thermal properties has resulted into a series of investigations. The traditional polymers can be designed and modified with a view to maximize their processibility and enhancing the conductivity. Thus various applications of these polymeric materials like polymeric batteries, display properties, photovoltaic cell, diodes, and electromagnetic shielding properties, dielectric, and magnetic properties have stimulated the researchers to study the properties of various polymers, composites and copolymers [1–3]. In comparison to composites, copolymerization provides the prospect of producing various functional polymers with unique composition, characteristics, and structure. Copolymerization also acts as a means of polymerizing/synthesizing certain monomers that do not individually polymerize [4]. Therefore, two completely separate monomers can be simultaneously polymerized in the same reaction formulation and desired chemical heterogeneity may be imparted. Thus copolymerization is considerably significant to study the effect of complexation on copolymer chain formation and its propagation.

Aniline and Pyrrole are the most exciting conducting polymers as they have fast polymerization capacities, and are environmentally safe and highly conductive. Amid these advantages, the two monomers have been frequently polymerized electrochemically (low yield) and to a little extent chemically as per literature. Hence aniline and pyrrole have been chemically polymerized in the present work so as to study the bulk properties. From literature survey it has been observed that very little work is devoted to study of doping of copolymers of pyrrole and aniline. Hence it was thought very interesting to investigate the doping mechanism and effect of NiCl2 on the structural and electrical properties of the copolymers.

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Physical and optical study of Nd_2O_3 doped sodium borosilicate glasses

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ABSTRACT

In this research, Nd_2O_3 doped sodium borosilicate glasses were produced using a standard melt quench technique. Various characterization techniques, such as XRD analysis, FTIR spectroscopy, density analysis, absorption and photoluminescence spectroscopy measurements, were used to investigate the synthesized glassy samples. XRD spectra demonstrated the amorphous existence in the studied glasses. FTIR analysis was used to determine the stretching and bending vibrations of various borate groups. The high molecular weight of Nd_2O_3 and the broader ionic radius of Nd^{3+} ions resulted the rise in molar volume (V_m) and density (ρ) with inclusion of Nd_2O_3. The optical band gap was observed to shrink with increasing Nd^{3+} ion concentrations. The intensity of Nd^{3+} emission spectra improved from 0.5 mol per cent to 1.0 mol per cent with Nd_2O_3 material and the concentration quenching was reported at concentrations higher than 1.0 mol percent. The emission spectra of the synthesised glass shows three notable peaks found at 902 nm ($^4F_{3/2}\rightarrow{}^4I_{9/2}$), 1063 nm ($^4F_{3/2}\rightarrow{}^4I_{11/2}$) and 1334 nm $^4F_{3/2}\rightarrow{}^4I_{13/2}$ of Nd^{3+} ions transitions.

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1. Introduction

Recent studies have centered on REO doped glasses owing to their versatile applications like laser, optical amplifiers, sensors, display devices, light emitting diodes etc. [1,2]. In addition, the optical characteristics of REO doped glass materials play a crucial role in the progress of glass lasers and in the fabrication of various types of optical fibers and filter glass elements [3].

A comprehensive investigation on REO-doped glasses is necessary due to their variety of applications in optical storage devices, immobilization of radioactive waste materials, laser technology and optical communications [4,5]. Among different RE, neodymium oxide is mostly investigated and discovered to have a wide range of uses in photonic devices [1,3,4,6,7]. Nd_2O_3 doped glassy materials are continuously fascinating to scientist and researchers due to their extensive applications as laser materials and luminescent solar concentrators [8]. Furthermore, sodium borosilicate glasses are an outstanding host material for high-performance optics because of strong UV transmission and low exposure to defect [9,10].

Neodymium is indeed most finest rare earth elements used in solid-state lasers, with an emission wavelength of 1060 nm and the ability to lase at additional wavelengths such as 1800, 1350, and 880 nm, which is advantageous for broadband laser amplifiers and other photonic applications [9,10].

Due to wide applications and advantages of neodymium doped glasses, it is quite exciting to investigate the influence of Nd_2O_3 doping on sodium borosilicate glasses to examine their potential use as a laser medium. So in present work, we discuss in-depth analysis of various physical and optical characteristics of Nd_2O_3 doped sodium borosilicate glasses.

2. Experimental

The glass formulations employed in the current study '$30Na_2O$: ($70 - x\ Nd_2O_3$) {$1/7\ SiO_2$:$6/7\ B_2O_3$}' was prepared with normal melt quenching process where 'X' ranged from 0 to 2 in the stage of 0.5 mol percentage. High purity preliminary raw materials such as SiO_2, Na_2CO_3, B_2O_3 and Nd_2O_3 (Purity Quality greater than 99.9 per cent of make E-MERCK) were used for sample preparations. These additives were thoroughly blended in acetone for around 1 h in adequate amounts and then this mixture was kept for 3 h in a crucible made of platinum in an electric furnace at 1223–1273 K. Then this hot melt was poured into an aluminium

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Developing a framework of beta cryptosystem based on Santilli's isofields second-kind

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***Abstract*— Society initiated use of several gadgets for various purposes with the expansion in high-tech mechanisms, smart devices etc. So, there is enormous interest of data safety in cyberspace. The present endeavor takes the unique framework to create beta cryptosystem ($\mathcal{bc}$) built on santilli's isofields second-kind ($\mathcal{sisk}$), its safety is located in generalized isodiscrete-logarithm-problem ($\mathcal{gidlp}$) , isointeger-factorization-problem ($\mathcal{iifp}$) and $\mathcal{sisk}$ in the isoproduct isogroup of isofinite $\mathcal{sisk}$. To break the proposed framework of $\mathcal{bc}$ is to search isonumber from $\mathcal{sisk}$ and numerate both discrete $\mathcal{gidlp}$ and $\mathcal{iifp}$ side by side in the isoproduct isogroup of isofinite $\mathcal{sisk}$ in order to fetch genuine plaintext against the available cipertext and therefore present framework is feasible to succeed a greater level of safety.**

***Keywords*— public key cryptosystem ($\mathcal{pkc}$), $\mathcal{gidlp}$, $\mathcal{iifp}$ and $\mathcal{sisk}$.**

I. INTRODUCTION

In 1976, Diffie-Hellman recommended framework of key establishment mechanism for safe transmission between two subscribers, each subscriber requires two keys, namely, public key for encrypt the data in the form of ciphertext and secret key for decrypt ciphertext to retrieve original data [1]. The Diffie-Hellman key establishment mechanism is an important aspect in securing cyberspace. Henceforth, various $\mathcal{pkc}$ mechanisms were recommended and built on hard mathematical constructions that safety is reliant on the unfeasible factoring of enormous digit [2], insolubility of computing the square root modulo of enormous composite digit [3]. An effective $\mathcal{pkc}$ framework built on $\mathcal{dlp}$ that is complexity of prime field or elliptic curve described over a finite field recommended by ElGamal [4]. If mathematical construction for $\mathcal{dlp}$ and $\mathcal{ifp}$ are determined then entire $\mathcal{pkc}$ built on $\mathcal{dlp}$ and $\mathcal{ifp}$ are not authentic. Thus, $\mathcal{pkc}$ built on particular mathematical construction have safety concerns, consequently scholars have recommended $\mathcal{pkc}$ framework built on multiple hard mathematical constructions. Numerous $\mathcal{pkc}$ framework built on jointly $\mathcal{dlp}$ and $\mathcal{ifp}$ [5-12]. In 2017, Meshram et al. recommended few $\mathcal{pkc}$ frameworks built on mathematical construction based on $suzuki-2$ and $dihedral\ group$ [13-15]. A new perspective of $\mathcal{pkc}$ frameworks built on $partial\ \mathcal{dlp}$ recommended in [16]. In 2020, Meshram et al. recommended key exchange frameworks built on Santilli's isomathematics [17]. Futhermore, in 2021, Dani et al. recommended key exchange frameworks built on $\mathcal{si}$ first-kind and $\mathcal{sisk}$ [18-19], Thatere et al. recommended $iso\ \mathcal{bc}$ framework built on $\mathcal{si}$ first-kind [20] and Meshram et al. offered extended chaotic maps based off-line electronic cash protocol [21].

Unfortunately, $\mathcal{pkc}$ frameworks built on $\mathcal{dlp}$ and $\mathcal{ifp}$ have safety concerns as per our observation. Thus, we have recommended a novel $\mathcal{bc}$ built on $\mathcal{sisk}$, $\mathcal{gidlp}$ and $\mathcal{iifp}$ along its guaranteed safety, furthermore, we validated that it is enormously effective to be implemented in the cyberspace.

Accordingly, this article is separated into five parts. Mathematical background is explained in $part-II$ followed by $part-III$ which describes the $\mathcal{bc}$ framework. In $part-IV$, we have given subsidiary example for validation of recommended $\mathcal{bc}$ followed by $part-V$ which gives detailed safety analysis and efficiency performance. The last $part-VI$ delivers the Conclusion.

II. RESPECTIVE MATHEMATICAL MATERIAL

In this part, we will shortly present the respective mathematical material used to create $\mathcal{bc}$ built on $\mathcal{sisk}$, along with $\mathcal{gidlp}$ and $\mathcal{iifp}$ over isofields.

A. Mathematical construction of $\mathcal{sisk}$

If the isounit $\hat{\mathbb{I}}$ belong to the original field $\mathbb{F}$ and inverted isounit $\hat{\mathbb{I}}$ satisfy $\hat{\mathbb{I}}\hat{\mathbb{I}}=1$ such that $1\neq\hat{\mathbb{I}}=\frac{1}{\hat{\mathbb{I}}}\in\mathbb{F}$ then the product describe as $m\hat{\times}n=m\hat{\mathbb{I}}n\in\hat{\mathbb{F}}$ for each $m,n\in\mathbb{F}$ not raised to $\hat{m}=m\hat{\mathbb{I}}$ satisfy every theorem of a field is known as isoproduct in $\mathcal{sisk}$ [22].

B. Mathematical construction of $\mathcal{gidlp}$

The problem is to search an isonumber $\hat{a}\in[0,r-1]$ satisfy $\hat{b}\equiv\hat{g}\hat{a}$ for cyclic isogroup $\hat{\mathcal{G}}$ of order $\hat{r}$, a primitive isoroot $\hat{g}$ of the isogroup isonumber $\hat{b}$ is known as $\mathcal{gidlp}$.

C. Mathematical construction of $\mathcal{iifp}$

The problem is to compute decomposition for positive isointeger $\hat{\mathcal{N}}$ into isoprime isonumbers $\hat{\mathcal{N}}=\widehat{p_1}*\widehat{p_2}*\widehat{p_3}\cdots\widehat{p_r}$ is known as $\mathcal{iifp}$.

III. PROPOSED THE RECOMMENDED FRAMEWORK

In this part, we have developed a framework of $\mathcal{bc}$ by utilizing $\mathcal{sisk}$ over isofield. The framework is inclusive of three procedures:

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Procedure-A: Key Design Mechanism:

Runs under below mentioned mechanism by subscriber-I for key design

i. Elect dual $\widehat{\mathcal{K}}$ and $\hat{\mathcal{L}}$, an extensive isoprime isonumbers with identical size.
ii. Compute isonumbers $\widehat{\mathcal{N}} = \widehat{\mathcal{K}} * \hat{\mathcal{L}}$ satisfy the isoeulerphi operate $\varphi(\widehat{\mathcal{N}}) = (\widehat{\mathcal{K}} - 1)(\hat{\mathcal{L}} - 1)$.
iii. Elect a random isonumbers $\hat{s}$ belong to $[1, \varphi(\widehat{\mathcal{N}})]$ satisfy greatest common divisor of $\hat{s}$ and $\varphi(\widehat{\mathcal{N}})$ is unity.
iv. Elect a random isonumbers $\hat{t} \in [2, \varphi(\widehat{\mathcal{N}}) - 1]$ and certain random isonumbers $\widehat{u}$ of the isoproduct isogroup $\widehat{\mathbb{Z}}^*_{\widehat{\mathcal{N}}}$ for computing $\widehat{v}_1 = \widehat{u}^{\hat{t}} (mod\ \widehat{\mathcal{N}})$.
v. Utilizing extended Euclidean mechanism to compute $\hat{s}\hat{q} \equiv 1 (mod\ \widehat{\mathcal{N}})$ for unique isonumbers $\hat{q} \in [1, \varphi(\widehat{\mathcal{N}})]$.

Hence, $(\widehat{\mathcal{N}}, \hat{s}, \widehat{u}^{\hat{t}})$ is an asymmetric isokey for corresponding isoprivate isokey $(\hat{q}, \hat{t}, \widehat{u})$

Procedure-B: Encryption Mechanism

Runs under below mentioned mechanism by subscriber-II for encrypt the data $\widehat{\mathcal{M}}(\hat{Q})$ to subscriber-I:

i. By utilizing asymmetric isokey $(\widehat{\mathcal{N}}, \hat{s}, \widehat{u}^{\hat{t}})$, an original data as $\hat{Q}$ satisfy $1 \le \hat{Q} \le \widehat{\mathcal{N}} - 1$, hashed and assume that the resultant in the form of $\widehat{\mathcal{M}}(\hat{Q})$.
ii. The ciphertext $\widehat{\mathfrak{C}}$ represents as $\left(\widehat{\mathcal{M}}(\hat{Q})\widehat{u}^{\hat{t}}\right)^{\hat{s}} (mod\ \widehat{\mathcal{N}})$

Procedure-C: Decryption Mechanism

Runs under below mentioned mechanism by subscriber-I to recover the original data $\widehat{\mathcal{M}}(\hat{Q})$ against the ciphertext $\widehat{\mathfrak{C}}$

i. Compute $\widehat{v}_2 = \widehat{u}^{\varphi(\widehat{\mathcal{N}})-\hat{t}} (mod\ \widehat{\mathcal{N}}) = \widehat{u}^{-\hat{t}} (mod\ \widehat{\mathcal{N}})$
ii. Then compute $\widehat{v}_3 = (\widehat{v}_2)^{\hat{s}} (mod\ \widehat{\mathcal{N}})$
iii. Compute $\left((\widehat{v}_2)^{\hat{s}} * \widehat{\mathfrak{C}}\right)^{\hat{q}} (mod\ \widehat{\mathcal{N}})$ to recover the original data $\widehat{\mathcal{M}}(\hat{Q})$

IV. SUBSIDIARY EXAMPLE FOR VALIDATION OF RECOMMENDED FRAMEWORK:

In this part, we have tested a subsidiary example for validation of recommended $\mathcal{bc}$ framework:

Procedure-A: Key Design Mechanism:

Runs under below mentioned mechanism by subscriber-I for key design

i. For given isonumbers $\widehat{\mathcal{N}}$, compute the isoeulerphi operate $\varphi(\widehat{\mathcal{N}}) = (\widehat{\mathcal{K}} - 1)(\hat{\mathcal{L}} - 1)$.
ii. Elect a random isonumbers $\hat{s} = 11 \in [1, \varphi(\widehat{\mathcal{N}})]$ satisfy $gcd(11,1176) = 1$.
iii. Elect a random isonumbers $\hat{t} = 19 \in [2, \varphi(\widehat{\mathcal{N}}) - 1]$ and certain random isonumbers $\widehat{u} = 10$ of the isoproduct isogroup $\widehat{\mathbb{Z}}^*_{\widehat{\mathcal{N}}}$ for computing $\widehat{v}_1 = \widehat{u}^{\hat{t}} (mod\ \widehat{\mathcal{N}}) = 10^{19} (mod\ 1247)$.
iv. Utilizing extended Euclidean mechanism to compute $11\hat{q} \equiv 1\ (mod\ 1247)$ for unique isonumbers $\hat{q} = 107 \in [1, \varphi(\widehat{\mathcal{N}})]$.

Hence, $(\widehat{\mathcal{N}}, \hat{s}, \widehat{u}^{\hat{t}})$ is an asymmetric isokey for corresponding isoprivate isokey $(\hat{q}, \hat{t}, \widehat{u})$

Procedure-B: Encryption Mechanism

Runs under below mentioned mechanism by subscriber-II for encrypt the data $\widehat{\mathcal{M}}(\hat{Q})$ to subscriber-I:

i. By utilizing asymmetric isokey $(\widehat{\mathcal{N}}, \hat{s}, \widehat{u}^{\hat{t}})$, an original data as $\hat{Q}$ satisfy $1 \le \hat{Q} \le \widehat{\mathcal{N}} - 1$, hashed and assume that the resultant in the form of $\widehat{\mathcal{M}}(\hat{Q}) = 1122$.
ii. The ciphertext $\widehat{\mathfrak{C}}$ represents as $\left(\widehat{\mathcal{M}}(\hat{Q})\widehat{u}^{\hat{t}}\right)^{\hat{s}} (mod\ \widehat{\mathcal{N}}) = 791$

Procedure-C: Decryption Mechanism

Runs under below mentioned mechanism by subscriber-I to recover the original data $\widehat{\mathcal{M}}(\hat{Q})$ against the ciphertext $\widehat{\mathfrak{C}}$

i. Compute $\widehat{v}_2 = \widehat{u}^{\varphi(\widehat{\mathcal{N}})-\hat{t}} (mod\ \widehat{\mathcal{N}}) = \widehat{u}^{-\hat{t}} (mod\ \widehat{\mathcal{N}}) = 917$.
ii. Then compute $\widehat{v}_3 = (\widehat{v}_2)^{\hat{s}} (mod\ \widehat{\mathcal{N}}) = 483$
iii. Compute $\left((\widehat{v}_2)^{\hat{s}} * \widehat{\mathfrak{C}}\right)^{\hat{q}} (mod\ \widehat{\mathcal{N}}) = 1122$ to recover the original data $\widehat{\mathcal{M}}(\hat{Q})$

V. SAFETY ANALYSIS AND EFFICIENCY PERFORMANCE

In this part, we have analyzed the safety and efficiency performance of recommended $\mathcal{bc}$ framework in following sub-part;

A. Consistency:

By showing below mentioned theorem to validate my recommended cryptosystem.

Theorem: If isokey design mechanism and encryped mechanism run efficiently then decrypted mechanism of encryption data in decrypted mechanism is appropriate.

Proof: If all encrypted data is correct then ciphertext $\widehat{\mathfrak{C}} = \left(\widehat{\mathcal{M}}(\hat{Q})\widehat{u}^{\hat{t}}\right)^{\hat{s}} (mod\ \widehat{\mathcal{N}})$ in encryption mechanism and $\widehat{v}_2 = \widehat{u}^{\varphi(\widehat{\mathcal{N}})-\hat{t}} (mod\ \widehat{\mathcal{N}}) = \widehat{u}^{-\hat{t}} (mod\ \widehat{\mathcal{N}})$ in decryption mechanism,

And $(\widehat{v}_2)^{\hat{s}} (mod\ \widehat{\mathcal{N}}) = \left(\widehat{u}^{-\hat{t}}\right)^{\hat{s}} (mod\ \widehat{\mathcal{N}})$, $\left((\widehat{v}_2)^{\hat{s}} * \widehat{\mathfrak{C}}\right)^{\hat{q}} (mod\ \widehat{\mathcal{N}}) = \left(\widehat{u}^{-\hat{t}\hat{s}} \left(\widehat{\mathcal{M}}(\hat{Q})\right)^{\hat{s}} \widehat{u}^{\hat{t}\hat{s}}\right)^{\hat{q}} (mod\ \widehat{\mathcal{N}}) = \left(\widehat{\mathcal{M}}(\hat{Q})\right)^{\hat{s}\hat{q}} (mod\ \widehat{\mathcal{N}}) = \widehat{\mathcal{M}}(\hat{Q}) (mod\ \widehat{\mathcal{N}})$

B. Safety Analysis:

- The recommended framework of $\mathcal{bc}$ is safe against below mentioned offensives, if attacker is unable to search $\hat{\mathbb{I}}$, an isounit of $\mathcal{bc}$
- It show that the $\mathcal{bc}$ framework is safe against under mentioned common offensives, if attacker is able to

search $\hat{\mathbb{I}}$.

- *Isodirect offensive*: By using the isonumber isofield sieve mechanism that is built on the size of isomodulus $\widehat{\mathcal{N}}$, attacker has to compute iifp and gidlp. Elect dual $\widehat{\mathcal{K}}$ and $\hat{\mathcal{L}}$ with $\frac{\widehat{\mathcal{K}}-1}{2}$ and $\frac{\hat{\mathcal{L}}-1}{2}$, an extensive isoprime isonumbers with identical size (of size 512-bit each) such that isomodulus $\widehat{\mathcal{N}} = \widehat{\mathcal{K}} * \hat{\mathcal{L}}$ to increase the safety of recommended $\mathcal{bc}$ framework.

- *Isofactoring offensive*: Assume that attacker have the confidential isonumbers $(\hat{u}, \hat{t})$ and recover the original data by exclude $\hat{u}^{\hat{t}}$ from ciphertex $\widehat{\mathfrak{C}}$. On the other hand gidlp still difficult to compute and therefore attacker would fail.

-*Isodiscrete logarithm offensive*: Assume that attacker recover the original data from ciphertex $\widehat{\mathfrak{C}}$ by computing gidlp and able to search confidential isonumbers $\hat{t}$ as attacker will aware to $\hat{v}_2$ and $(\hat{v}_2)^{\hat{s}}(mod\ \widehat{\mathcal{N}}) = (\hat{u}^{-\hat{t}})^{\hat{s}}(mod\ \widehat{\mathcal{N}})$. Regrettably, to recover the original data, attacker need have the confidential isonumbers $\hat{p}$ but this is infeasible as iifp is difficult to compute.

C. Efficiency performance:

For investigation and execution of the recommended $\mathcal{bc}$ framework in terms of transmission costs, isonumber of isokeys, and numerical intricacy. $\hat{\tau}_{-isoexp}$, $\hat{\tau}_{-isopro}$, $\hat{\tau}_{-isosq}$,$\widehat{\tau_{-isosq\_rt}}$, $\hat{\tau}_{\_isoinv}$ and $\hat{\tau}_{-isohash}$ is the duration taken for performing isomodular isoexponentiation, isoproduct, isosquare, isosquare-root, isoinverse and isohash map computation respectively.

TABLE I. JUXTAPOSITION BETWEEN RECOMMENDED $\mathcal{bc}$ FRAMEWORK AND SIMILAR SUGGESTED $\mathcal{bc}$ FRAMEWORK IN [30]

$\mathcal{bc}$ framework	Thatere et al[30]	our recommended framework
asymmetric isokey	3	3
isoprivate isokey	3	3
numerical intricacy	encryption: $2\hat{\tau}_{exp} + \hat{\tau}_{mul} + \hat{\tau}_{hash}$ decryption: $3\hat{\tau}_{exp} + \hat{\tau}_{mul}$	encryption: $\hat{\tau}_{exp} + \hat{\tau}_{mul} + \hat{\tau}_{hash}$ decryption: $2\hat{\tau}_{exp} + \hat{\tau}_{mul}$
communication cost	encryption: $2n$ decryption: n	encryption: n decryption: n

VI. CONCLUSION

In this article, we have recommended new $\mathcal{bc}$ framework built on sisk, gidlp and iifp in the isoproduct isogroup of isofinite isofields sisk. If attacker is capable to compute mentioned offensive together then developed $\mathcal{bc}$ framework is broken and this is enormously unfeasible to happen. The offered $\mathcal{bc}$ framework remains safe as another problem is difficult to compute at the best in more timeframe. If the attacker anyhow achieves to search confidential isonumbers to one of the primary hard problem. Moreover, recommended $\mathcal{bc}$ framework is safe against the isodirect offensive, the isofactoring offensive and the isodiscrete logarithm offensive.

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A fixed point theorem for extended B-metric space satisfying rational type contractive condition

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A Fixed Point Theorem for Extended B-Metric Space Satisfying Rational Type Contractive Condition

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Abstract. For a complete extended b-metric space with continuous mapping satisfying the rational type contractive condition, a distinctive common fixed point theorem is established. Our outcome is the extension of several results available in the literature, from metric space to extended b-metric space. In specific, Dass and Gupta[Indian J. Pure Appl. Math. 6, 1455–1458 (1975)], Jaggi[Indian J. Pure Appl. Math. 8, 223–230 (1977)], Alqahtani et.al.[J. Inequal. Appl. Paper No. 220, 11 pp (2019)] and even the well-known Banach contraction mapping theory are extracted. A proper example is also given in sustenance of it.

INTRODUCTION

In fixed point theory, the Banach contraction theorem is a fundamental and remarkable result. It has huge applications in almost all areas of mathematical sciences for example to prove the existence of solutions of ordinary and partial differential equations, integral equations, system of linear equations, closed orbit of dynamical systems. It has been expanded and generalized in various directions and spaces over the years. Rational type expressions were considered in the contraction condition in the results of Dass and Gupta[2] and Jaggi[3].

Jaggi[3] defined the main result for complete metric space.

1.1-Theorem[3]-Let (X,d) be a complete metric space and $\mathrm{I}: X \to X$ be a continuous mapping. If there exists $\delta, \rho \in [0,1)$ with $\delta + \rho < 1$ such that

$$d(\mathrm{I}a, \mathrm{I}b) \le \delta \cdot \frac{d(a,\mathrm{I}a)\,d(b,\mathrm{I}b)}{d(a,b)} + \rho \cdot d(a,b)$$ for all distinct $a, b \in X$, then I has a unique fixed point in X.

Dass and Gupta [2] have presented the result in complete metric space.

1.2-Theorem [2]- Let (X,d) be a complete metric space and $\mathrm{I}: X \to X$ be a continuous mapping. If there exists $\delta, \rho \in [0,1)$ with $\delta + \rho < 1$ such that

$$d(\mathrm{I}a, \mathrm{I}b) \le \delta \cdot d(b,\mathrm{I}b)\frac{\{1 + d(a,\mathrm{I}a)\}}{1 + d(a,b)} + \rho \cdot d(a,b)$$ for all distinct $a, b \in X$, then I has a unique fixed point in X. Moreover, the sequence $\{\mathrm{I}^n x\}$ converges to a unique fixed point u for all $a \in X$.

One of important extension of metric spaces is b-metric space. This concept was introduced by Bakhtin[4] in 1989 and Czerwik[5,6] in 1993.

Later the notion of extended b-metric space was introduced by Kamran et.al. [7] which is an extension of b-metric space.

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1.3-Extended b-metric space [7]: Let X be a non-empty set and $\Omega : X \times X \to [1,\infty)$. A function $d_\Omega : X \times X \to [0,\infty)$ is called an extended b-metric space, if for all $a,b,c \in X$, it satisfies

(1) $d_\Omega(a,b) = 0$ if and only if $a = b$;

(2) $d_\Omega(a,b) = d_\Omega(b,a)$

(3) $d_\Omega(a,c) \le \Omega(a,c)\{d_\Omega(a,b) + d_\Omega(b,c)\}$.

The pair (X, d_Ω) is called an extended b-metric space.

It is obvious that an extended b-metric space is a metric space $\Omega(a,b) = s \ge 1$ where s is a real number and it is a metric space if $\Omega(a,b) = 1$.

Alqahtani et. Al.[1] in 2019, have extended and generalized the results of Dass and Gupta [2] and Jaggi [3] for extended b-metric space.

1.4-Theorem [1]- Let (X, d_Ω) be an extended *b*-metric space and $\mathrm{I} : X \to X$ a continuous mapping such that, for all distinct $a,b \in X$

$d_\Omega(\mathrm{I}a, \mathrm{I}b) \le \lambda M(a,b)$ where $\lambda \in [0,1)$ and

$$M(a,b) = \max\left\{ d_\Omega(a,\mathrm{I}a)\frac{[1+d_\Omega(b,\mathrm{I}b)]}{1+d_\Omega(a,b)}, d_\Omega(b,Tb)\frac{[1+d\Omega(a,\mathrm{I}a)]}{1+d_\Omega(a,b)}, \frac{d_\Omega(b,\mathrm{I}b)\,d_\Omega(a,\mathrm{I}a)}{d_\Omega(a,b)}, d_\Omega(a,b) \right\}$$ Also

for each $a_0 \in X$, $\lim_{m,n\to\infty} \Omega(a_n, a_m) < \frac{1}{\lambda}$, where $a_n = \mathrm{I}^n a_0$, $n \in N$.

Then I has a unique fixed point u. Also for each $a \in X$, we have $\mathrm{I}^n a \to u$

PRELIMINARIES

2.1-Definition[7]: Let (X, d_Ω) be an extended *b*-metric space.

A sequence $\{a_n\}$ in X converges to $a \in X$, if for every $\varepsilon > 0$ there exists $n(\varepsilon) \in N$ such that $d_\Omega(a_n, a) < \varepsilon$, for all $n \ge n(\varepsilon)$. In this case, we write $\lim_{n\to\infty} a_n = a$.

A sequence $\{a_n\}$ in X is said to be Cauchy if for every $\varepsilon > 0$ there exists $n(\varepsilon) \in N$ such that $d_\Omega(a_m, a_n) < \varepsilon$, for all $m,n \ge n(\varepsilon)$.

An extended *b*-metric space (X, d_Ω) is complete if every Cauchy sequence in X is convergent.

Notice that the extended b-metric does not need to be continuous.

MAIN RESULT

Our result is for complete extended b-metric space with continuous mapping satisfying rational type contractive condition. It extends the results of Dass and Gupta [2] and Jaggi [3] and generalizes the results of Alqahtani et. al.[1].

3.1-THEOREM:

Let (X, d_Ω) be a complete extended *b*-metric space and $\mathrm{I} : X \to X$ a continuous mapping such that, for all distinct $a,b \in X$

$$d_\Omega(Ia, Ib) \le \lambda N(a,b) \qquad \ldots(3.1.1)$$

where $\lambda \in [0,1)$ and

$$N(a,b) = \max\left\{ \begin{array}{l} d_\Omega(a,\mathrm{I}a)\dfrac{\left[1+d_\Omega(b,\mathrm{I}b)\right]}{1+d_\Omega(a,b)}, d_\Omega(b,\mathrm{I}b)\dfrac{\left[1+d_\Omega(a,\mathrm{I}a)\right]}{1+d_\Omega(a,b)}, \dfrac{d_\Omega(b,\mathrm{I}b)\,d_\Omega(a,\mathrm{I}a)}{d_\Omega(a,b)}, \\ d_\Omega(a,\mathrm{I}b)\dfrac{\left[1+d_\Omega(b,\mathrm{I}a)\right]}{\left[d_\Omega(a,\mathrm{I}b)+d_\Omega(b,\mathrm{I}a)\right]}, d_\Omega(b,\mathrm{I}a)\dfrac{\left[1+d_\Omega(a,\mathrm{I}b)\right]}{\left[d_\Omega(a,\mathrm{I}b)+d_\Omega(b,\mathrm{I}a)\right]}, \\ \dfrac{d_\Omega(a,\mathrm{I}b)\,d_\Omega(b,\mathrm{I}a)}{1+d_\Omega(a,b)}, \dfrac{d_\Omega(a,\mathrm{I}a)\,d_\Omega(a,\mathrm{I}b)+d_\Omega(b,\mathrm{I}b)\,d_\Omega(b,\mathrm{I}a)}{\left[d_\Omega(a,\mathrm{I}b)+d_\Omega(b,\mathrm{I}a)\right]}, d_\Omega(a,b) \end{array} \right\}$$

Also for each $a_0 \in X$, $\lim_{m,n\to\infty} \Omega(a_n,a_m) < \dfrac{1}{\lambda}$, where $a_n = \mathrm{I}^n a_0$, $n \in N$.

Then I has a unique fixed point u. Also for each $a \in X$, we have $\mathrm{I}^n a \to u$.

Proof: Let $a_0 \in X$ and define the iterative sequence $\{a_n\}$ by $a_n = \mathrm{I}^n a_0$ (equivalently $a_{n+1} = \mathrm{I}a_n$) where I^n stands for the map obtained by n-time composition of I with I.

If for some $a_{n_0} = a_{n_0+1} = \mathrm{I}a_{n_0}$ for some $n_0 \in N$, then $u = a_{n_0}$ forms a unique fixed point for I. So, we assume that $a_n = a_{n+1}$ for all $n \in N$.

Putting $a = a_{n-1}, b = a_n$ in (3.1.1), we get

$d_\Omega(\mathrm{I}a_{n-1}, \mathrm{I}a_n) \le \lambda N(a_{n-1}, a_n)$

i.e. $d_\Omega(a_n, a_{n+1}) \le \lambda N(a_{n-1}, a_n)$ …(3.1.2)

where $N(a_{n-1},a_n) = \max\left\{ \begin{array}{l} d_\Omega(a_{n-1},\mathrm{I}a_{n-1})\dfrac{\left[1+d_\Omega(a_n,\mathrm{I}a_n)\right]}{1+d_\Omega(a_{n-1},a_n)}, d_\Omega(a_n,\mathrm{I}a_n)\dfrac{\left[1+d_\Omega(a_{n-1},\mathrm{I}a_{n-1})\right]}{1+d_\Omega(a_{n-1},a_n)}, \\ \dfrac{d_\Omega(a_n,\mathrm{I}a_n)\,d_\Omega(a_{n-1},\mathrm{I}a_{n-1})}{d_\Omega(a_{n-1},a_n)}, d_\Omega(a_{n-1},\mathrm{I}a_n)\dfrac{\left[1+d_\Omega(a_n,\mathrm{I}a_{n-1})\right]}{\left[d_\Omega(a_{n-1},\mathrm{I}a_n)+d_\Omega(a_n,\mathrm{I}a_{n-1})\right]}, \\ d_\Omega(a_n,\mathrm{I}a_{n-1})\dfrac{\left[1+d_\Omega(a_{n-1},\mathrm{I}a_n)\right]}{\left[d_\Omega(a_{n-1},\mathrm{I}a_n)+d_\Omega(a_n,\mathrm{I}a_{n-1})\right]}, \dfrac{d_\Omega(a_{n-1},\mathrm{I}a_n)\,d_\Omega(a_n,\mathrm{I}a_{n-1})}{1+d_\Omega(a_{n-1},a_n)}, \\ \dfrac{d_\Omega(a_{n-1},\mathrm{I}a_{n-1})\,d_\Omega(a_{n-1},\mathrm{I}a_n)+d_\Omega(a_n,\mathrm{I}a_n)\,d_\Omega(a_n,\mathrm{I}a_{n-1})}{\left[d_\Omega(a_{n-1},\mathrm{I}a_n)+d_\Omega(a_n,\mathrm{I}a_{n-1})\right]}, d_\Omega(a_{n-1},a_n) \end{array} \right\}$

$$= \max\left\{ \begin{array}{l} d_\Omega(a_{n-1},a_n)\dfrac{\left[1+d_\Omega(a_n,a_{n+1})\right]}{1+d_\Omega(a_{n-1},a_n)}, d_\Omega(a_n,a_{n+1})\dfrac{\left[1+d_\Omega(a_{n-1},a_n)\right]}{1+d_\Omega(a_{n-1},a_n)}, \\ \dfrac{d_\Omega(a_n,a_{n+1})\,d_\Omega(a_{n-1},a_n)}{d_\Omega(a_{n-1},a_n)}, d_\Omega(a_{n-1},a_{n+1})\dfrac{\left[1+d_\Omega(a_n,a_n)\right]}{\left[d_\Omega(a_{n-1},a_{n+1})+d_\Omega(a_n,a_n)\right]}, \\ d_\Omega(a_n,a_n)\dfrac{\left[1+d_\Omega(a_{n-1},a_{n+1})\right]}{\left[d_\Omega(a_{n-1},a_{n+1})+d_\Omega(a_n,a_n)\right]}, \dfrac{d_\Omega(a_{n-1},a_{n+1})\,d_\Omega(a_n,a_n)}{1+d_\Omega(a_{n-1},a_n)}, \\ \dfrac{d_\Omega(a_{n-1},a_n)\,d_\Omega(a_{n-1},a_{n+1})+d_\Omega(a_n,a_{n+1})\,d_\Omega(a_n,a_n)}{\left[d_\Omega(a_{n-1},a_{n+1})+d_\Omega(a_n,a_n)\right]}, d_\Omega(a_{n-1},a_n) \end{array} \right\}$$

$$= \max\left\{ d_\Omega\left(a_{n-1}, a_n\right) \frac{\left[1 + d_\Omega\left(a_n, a_{n+1}\right)\right]}{1 + d_\Omega\left(a_{n-1}, a_n\right)}, d_\Omega\left(a_n, a_{n+1}\right), 1, d_\Omega\left(a_{n-1}, a_n\right) \right\}$$

Case-I: If

$$N\left(a_{n-1}, a_n\right) = \max\left\{ d_\Omega\left(a_{n-1}, a_n\right) \frac{\left[1 + d_\Omega\left(a_n, a_{n+1}\right)\right]}{1 + d_\Omega\left(a_{n-1}, a_n\right)}, d_\Omega\left(a_n, a_{n+1}\right), 1, d_\Omega\left(a_{n-1}, a_n\right) \right\} = d_\Omega\left(a_n, a_{n+1}\right)$$

Then from (3.1.2), we get $d_\Omega\left(a_n, a_{n+1}\right) \le k d_\Omega\left(a_n, a_{n+1}\right)$ which is a contradiction.

Case-II: If

$$N\left(a_{n-1}, a_n\right) = \max\left\{ d_\Omega\left(a_{n-1}, a_n\right) \frac{\left[1 + d_\Omega\left(a_n, a_{n+1}\right)\right]}{1 + d_\Omega\left(a_{n-1}, a_n\right)}, d_\Omega\left(a_n, a_{n+1}\right), 1, d_\Omega\left(a_{n-1}, a_n\right) \right\} = d_\Omega\left(a_{n-1}, a_n\right)$$

Then from (3.1.2), we get $d_\Omega\left(a_n, a_{n+1}\right) \le \lambda d_\Omega\left(a_{n-1}, a_n\right)$ ….(3.1.3)

Case-III: If

$$N\left(a_{n-1}, a_n\right) = \max\left\{ d_\Omega\left(a_{n-1}, a_n\right) \frac{\left[1 + d_\Omega\left(a_n, a_{n+1}\right)\right]}{1 + d_\Omega\left(a_{n-1}, a_n\right)}, d_\Omega\left(a_n, a_{n+1}\right), 1, d_\Omega\left(a_{n-1}, a_n\right) \right\}$$

$$= d_\Omega\left(a_{n-1}, a_n\right) \frac{\left[1 + d_\Omega\left(a_n, a_{n+1}\right)\right]}{1 + d_\Omega\left(a_{n-1}, a_n\right)}$$

Now, Case-III-(A) if $\max\left\{ d_\Omega\left(a_n, a_{n+1}\right), d_\Omega\left(a_{n-1}, a_n\right) \right\} = d_\Omega\left(a_n, a_{n+1}\right)$

i.e. $d_\Omega\left(a_{n-1}, a_n\right) \le d_\Omega\left(a_n, a_{n+1}\right)$ ….(3.1.4)

$$d_\Omega\left(a_n, a_{n+1}\right) \le d_\Omega\left(a_{n-1}, a_n\right) \frac{\left[1 + d_\Omega\left(a_n, a_{n+1}\right)\right]}{1 + d_\Omega\left(a_{n-1}, a_n\right)}$$

$$\therefore d_\Omega\left(a_n, a_{n+1}\right)\left\{1 + d_\Omega\left(a_{n-1}, a_n\right)\right\} \le d_\Omega\left(a_{n-1}, a_n\right)\left[1 + d_\Omega\left(a_n, a_{n+1}\right)\right]$$

$$\Rightarrow d_\Omega\left(a_n, a_{n+1}\right) + d_\Omega\left(a_n, a_{n+1}\right) d_\Omega\left(a_{n-1}, a_n\right) \le d_\Omega\left(a_{n-1}, a_n\right) + d_\Omega\left(a_{n-1}, a_n\right) d_\Omega\left(a_n, a_{n+1}\right)$$

$\Rightarrow d_\Omega\left(a_n, a_{n+1}\right) \le d_\Omega\left(a_{n-1}, a_n\right)$ which is a contradiction from (3.1.4).

Now, Case-III-(B) if $\max\left\{ d_\Omega\left(a_n, a_{n+1}\right), d_\Omega\left(a_n, a_n\right) \right\} = d_\Omega\left(a_n, a_n\right)$

i.e. $d_\Omega\left(a_n, a_{n+1}\right) \le d_\Omega\left(a_{n-1}, a_n\right)$ ….(3.1.5)

i.e. $d_\Omega\left(a_{n-1}, a_n\right) \le d_\Omega\left(a_{n-1}, a_n\right) \frac{\left[1 + d_\Omega\left(a_n, a_{n+1}\right)\right]}{1 + d_\Omega\left(a_{n-1}, a_n\right)}$

$\Rightarrow 1 + d_\Omega\left(a_{n-1}, a_n\right) \le 1 + d_\Omega\left(a_n, a_{n+1}\right) \Rightarrow d_\Omega\left(a_{n-1}, a_n\right) \le d_\Omega\left(a_n, a_{n+1}\right)$ which is a contradiction from (3.1.5)

Thus Case-III does not hold.

Case-IV: $N\left(a_{n-1}, a_n\right) = \max\left\{ d_\Omega\left(a_{n-1}, a_n\right) \frac{\left[1 + d_\Omega\left(a_n, a_{n+1}\right)\right]}{1 + d_\Omega\left(a_{n-1}, a_n\right)}, d_\Omega\left(a_n, a_{n+1}\right), 1, d_\Omega\left(a_{n-1}, a_n\right) \right\} = 1$

Then from (3.1.2), we get $d_\Omega\left(a_n, a_{n+1}\right) \le \lambda < 1$ which is always not true.

Hence Case-II holds. So, from (3.1.3)

$d_\Omega\left(a_n, a_{n+1}\right) \le \lambda d_\Omega\left(a_{n-1}, a_n\right)$

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$$d_\Omega\left(a_n, a_{n+1}\right) \le \lambda^n d_\Omega\left(a_0, a_1\right) \qquad \because \lambda \in [0,1)$$

$$\lim_{n\to\infty} d_\Omega\left(a_n, a_{n+1}\right) \le \lim_{n\to\infty} \lambda^n d_\Omega\left(a_0, a_1\right) = 0 \qquad \ldots.(3.1.6)$$

By the definition of extended b-metric space (3), $d_\Omega\left(a,c\right) \le \theta\left(a,c\right)\left\{d_\Omega\left(a,b\right) + d_\Omega\left(b,c\right)\right\}$

Using the above triangle inequality, $n \ge 1, p \ge 1$

$$\begin{aligned}
d_\Omega\left(a_n, a_{n+p}\right) &\le \Omega\left(a_n, a_{n+p}\right)\left\{d_\Omega\left(a_n, a_{n+1}\right) + d_\Omega\left(a_{n+1}, a_{n+p}\right)\right\} \\
&\le \Omega\left(a_n, a_{n+p}\right) d_\Omega\left(a_n, a_{n+1}\right) + \Omega\left(a_n, a_{n+p}\right)\Omega\left(a_{n+1}, a_{n+p}\right)\left\{d_\Omega\left(a_{n+1}, a_{n+2}\right) + d_\Omega\left(a_{n+2}, a_{n+p}\right)\right\} \\
&\le \Omega\left(a_n, a_{n+p}\right) d_\Omega\left(a_n, a_{n+1}\right) + \Omega\left(a_n, a_{n+p}\right)\Omega\left(a_{n+1}, a_{n+p}\right) d_\Omega\left(a_{n+1}, a_{n+2}\right) + \ldots\ldots. \\
&\qquad + \Omega\left(a_n, a_{n+p}\right)\Omega\left(a_{n+1}, a_{n+p}\right)\ldots\Omega\left(a_{n+p-1}, a_{n+p}\right) d_\Omega\left(a_{n+p-1}, a_{n+p}\right) \\
&\le \Omega\left(a_n, a_{n+p}\right)\lambda^n d_\Omega\left(a_0, a_1\right) + \Omega\left(a_n, a_{n+p}\right)\Omega\left(a_{n+1}, a_{n+p}\right)\lambda^{n+1} d_\Omega\left(a_0, a_1\right) + \ldots\ldots. \\
&\qquad + \Omega\left(a_n, a_{n+p}\right)\Omega\left(a_{n+1}, a_{n+p}\right)\ldots\Omega\left(a_{n+p-1}, a_{n+p}\right)\lambda^{n+p-1} d_\Omega\left(a_0, a_1\right) \\
&= d_\Omega\left(a_0, a_1\right)\lambda^n \sum_{i=0}^{p-1} \lambda^i \prod_{j=0}^{i} \Omega\left(a_{n+j}, a_{n+p}\right).
\end{aligned}$$

Now, $\sum_{i=0}^{p-1} \lambda^i \prod_{j=0}^{i} \Omega\left(a_{n+j}, a_{n+p}\right) \le \sum_{i=0}^{p-1} \lambda^i \times \prod_{j=0}^{i} \Omega\left(a_{n+j}, a_{n+p}\right)$.

Using ratio test, we observe that the series $\sum_{i=0}^{p-1} \lambda^i \times \prod_{j=0}^{i} \Omega\left(a_{n+j}, a_{n+p}\right)$ converges to some $\mu \in \left(0, \infty\right)$.

From ratio test, $\lim_{i\to\infty} \frac{a_{i+1}}{a_i} = \lim_{i\to\infty} \lambda\Omega\left(a_i, a_{i+p}\right) < 1$.

Thus we get $\mu = \sum_{i=0}^{\infty} \lambda^i \times \prod_{j=0}^{i} \Omega\left(a_{n+j}, a_{n+p}\right)$ with $\mu_n = \sum_{i=0}^{n} \lambda^i \times \prod_{j=0}^{i} \Omega\left(a_{n+j}, a_{n+p}\right)$

Consequently, we observe that, $d_\Omega\left(x_n, x_{n+p}\right) \le \lambda^n d_\Omega\left(a_0, a_1\right)\left(\mu_{n+p-1} - \mu_{n-1}\right)$ …(3.1.7)

Taking $n \to \infty$ in (3.1.7), we get $\left\{a_n\right\}$ is a cauchy sequence in extended b-metric space.

As $\left(X, d_\Omega\right)$ is a complete extended b-metric space, we conclude that there exists $u \in X$ such that $a_n \to u$ as $n \to \infty$.

From to the continuity of I, we get

$\mathrm{I}u = \mathrm{I}\lim_{n\to\infty} a_n = \lim_{n\to\infty} \mathrm{I}a_n = \lim_{n\to\infty} a_{n+1} = u$.

Unique: let if possible there are two fixed points say $u \ne v$ such that $\mathrm{I}u = u \ne v = \mathrm{I}v$,

Putting $x = u, y = v$ in (3.1.1), we get

$$d_\Omega\left(\mathrm{I}u, \mathrm{I}v\right) \le \lambda N\left(u, v\right) \qquad \ldots(3.1.8)$$

where $\lambda \in [0,1)$ and

$$N(u,v)=\max\left\{\begin{array}{l} d_\Omega(u,\mathrm{I}u)\dfrac{\left[1+d_\Omega(v,\mathrm{I}v)\right]}{1+d_\Omega(u,v)}, d_\Omega(v,\mathrm{I}v)\dfrac{\left[1+d_\Omega(u,\mathrm{I}u)\right]}{1+d_\Omega(u,v)}, \dfrac{d_\Omega(v,\mathrm{I}v)d_\Omega(u,\mathrm{I}u)}{d_\Omega(u,v)}, \\ d_\Omega(u,\mathrm{I}v)\dfrac{\left[1+d_\Omega(v,\mathrm{I}u)\right]}{\left[d_\Omega(u,\mathrm{I}v)+d_\Omega(v,\mathrm{I}u)\right]}, d_\Omega(v,\mathrm{I}u)\dfrac{\left[1+d_\Omega(u,\mathrm{I}v)\right]}{\left[d_\Omega(u,\mathrm{I}v)+d_\Omega(v,\mathrm{I}u)\right]}, \\ \dfrac{d_\Omega(u,\mathrm{I}v)d_\Omega(v,\mathrm{I}u)}{1+d_\Omega(u,v)}, \dfrac{d_\Omega(u,\mathrm{I}u)d_\Omega(u,\mathrm{I}v)+d_\Omega(v,\mathrm{I}v)d_\Omega(v,\mathrm{I}u)}{\left[d_\Omega(u,\mathrm{I}v)+d_\Omega(v,\mathrm{I}u)\right]}, d_\Omega(u,v) \end{array}\right\}$$

$$=\max\left\{0,0,0,d_\Omega(u,v),\frac{\left[d_\Omega(u,\mathrm{I}v)\right]^2}{1+d_\Omega(u,v)},0,d_\Omega(u,v)\right\}=d_\Omega(u,v)$$

$\therefore d_\Omega(u,v)\le\lambda d_\Omega(u,v)$ $\quad\because \lambda<1$

$\Rightarrow d_\Omega(u,v)=0\Rightarrow u=v$. Thus the fixed point is unique.

In the following we have simplified the condition by omitting the continuity of the mapping.

3.2-THEOREM

Let (X,d_Ω) be a complete extended b-metric space and $\mathrm{I}:X\to X$ is mapping such that

$d_\Omega(\mathrm{I}a,\mathrm{I}b)\le\lambda N(a,b)$ …(3.1.9)

for all distinct $a,b\in X$,where $\lambda\in[0,1)$ and

$$N(a,b)=\max\left\{\begin{array}{l} d_\Omega(a,\mathrm{I}a)\dfrac{\left[1+d_\Omega(b,\mathrm{I}b)\right]}{1+d_\Omega(a,b)}, d_\Omega(b,\mathrm{I}b)\dfrac{\left[1+d_\Omega(a,\mathrm{I}a)\right]}{1+d_\Omega(a,b)}, \dfrac{d_\Omega(b,\mathrm{I}b)d_\Omega(a,\mathrm{I}a)}{d_\Omega(a,b)}, \\ d_\Omega(a,\mathrm{I}b)\dfrac{\left[1+d_\Omega(b,\mathrm{I}a)\right]}{\left[d_\Omega(a,\mathrm{I}b)+d_\Omega(b,\mathrm{I}a)\right]}, d_\Omega(b,\mathrm{I}a)\dfrac{\left[1+d_\Omega(a,\mathrm{I}b)\right]}{\left[d_\Omega(a,\mathrm{I}b)+d_\Omega(b,\mathrm{I}a)\right]}, \\ \dfrac{d_\Omega(a,\mathrm{I}b)d_\Omega(b,\mathrm{I}a)}{1+d_\Omega(a,b)}, \dfrac{d_\Omega(a,\mathrm{I}a)d_\Omega(a,\mathrm{I}b)+d_\Omega(b,\mathrm{I}b)d_\Omega(b,\mathrm{I}a)}{\left[d_\Omega(a,\mathrm{I}b)+d_\Omega(b,\mathrm{I}a)\right]}, d_\Omega(a,b) \end{array}\right\}$$

Also for each $a_0\in X$, $\lim_{m,n\to\infty}\Omega(a_n,a_m)<\dfrac{1}{\lambda}$, where $a_n=\mathrm{I}^n a_0$, $n\in N$.

Then I has a unique fixed point u. Also for each $a\in X$, we have $\mathrm{I}^n a\to u$.

Proof: Proceeding in the same way as in theorem-3.1.1, we get that $\{a_n\}$ is a Cauchy sequence.

As stated X is a complete extended b-metric space, there exists $u\in X$, such that $a_n=\mathrm{I}^n a_0$ converges to u , that is $\lim_{n\to\infty}d_\Omega(a_n,u)=0$ ….(3.1.10)

By the definition of extended b-metric space (3), $d_\Omega(a,c)\le\Omega(a,c)\{d_\Omega(a,b)+d_\Omega(b,c)\}$

$d_\Omega(u,\mathrm{I}u)\le\Omega(u,\mathrm{I}u)\{d_\Omega(u,\mathrm{I}a_n)+d_\Omega(\mathrm{I}a_n,\mathrm{I}u)\}$ From (3.1.9), we get

$\le\Omega(u,\mathrm{I}u)\{d_\Omega(u,\mathrm{I}a_n)+\lambda N(a_n,u)\}$ …(3.1.11)

$$N(a_n,u)=\max\left\{\begin{array}{l} d_\Omega(a_n,\mathrm{I}a_n)\dfrac{\left[1+d_\Omega(u,\mathrm{I}u)\right]}{1+d_\Omega(a_n,u)},d_\Omega(u,\mathrm{I}u)\dfrac{\left[1+d_\Omega(a_n,\mathrm{I}a_n)\right]}{1+d_\Omega(a_n,u)},\dfrac{d_\Omega(u,\mathrm{I}u)d_\Omega(a_n,\mathrm{I}a_n)}{d_\Omega(a_n,u)},\\ d_\Omega(a_n,\mathrm{I}u)\dfrac{\left[1+d_\Omega(u,\mathrm{I}a_n)\right]}{\left[d_\Omega(a_n,\mathrm{I}u)+d_\Omega(u,\mathrm{I}a_n)\right]},d_\Omega(u,\mathrm{I}a_n)\dfrac{\left[1+d_\Omega(a_n,\mathrm{I}u)\right]}{\left[d_\Omega(a_n,\mathrm{I}u)+d_\Omega(u,\mathrm{I}a_n)\right]},\\ \dfrac{d_\Omega(a_n,\mathrm{I}u)d_\Omega(u,\mathrm{I}a_n)}{1+d_\Omega(a_n,u)},\dfrac{d_\Omega(a_n,\mathrm{I}a_n)d_\Omega(a_n,\mathrm{I}u)+d_\Omega(u,\mathrm{I}u)d_\Omega(u,\mathrm{I}a_n)}{\left[d_\Omega(a_n,\mathrm{I}u)+d_\Omega(u,\mathrm{I}a_n)\right]},d_\Omega(a_n,u) \end{array}\right\}$$

$$=\max\left\{\begin{array}{l} d_\Omega(a_n,a_{n+1})\dfrac{\left[1+d_\Omega(u,\mathrm{I}u)\right]}{1+d_\Omega(a_n,u)},d_\Omega(u,\mathrm{I}u)\dfrac{\left[1+d_\Omega(a_n,a_{n+1})\right]}{1+d_\Omega(a_n,u)},\dfrac{d_\Omega(u,\mathrm{I}u)d_\Omega(a_n,a_{n+1})}{d_\Omega(a_n,u)},\\ d_\Omega(a_n,\mathrm{I}u)\dfrac{\left[1+d_\Omega(u,a_{n+1})\right]}{\left[d_\Omega(a_n,\mathrm{I}u)+d_\Omega(u,a_{n+1})\right]},d_\Omega(u,a_{n+1})\dfrac{\left[1+d_\Omega(a_n,\mathrm{I}u)\right]}{\left[d_\Omega(a_n,\mathrm{I}u)+d_\Omega(u,a_{n+1})\right]},\\ \dfrac{d_\Omega(a_n,\mathrm{I}u)d_\Omega(u,a_{n+1})}{1+d_\Omega(a_n,u)},\dfrac{d_\Omega(a_n,a_{n+1})d_\Omega(a_n,\mathrm{I}u)+d_\Omega(u,\mathrm{I}u)d_\Omega(u,a_{n+1})}{\left[d_\Omega(a_n,\mathrm{I}u)+d_\Omega(u,a_{n+1})\right]},d_\Omega(a_n,u) \end{array}\right\}$$

Taking $\lim_{n\to\infty}$ and considering (3.1.6), (3.1.10), we get

$d_\Omega(u,\mathrm{I}u)\le\Omega(u,\mathrm{I}u)\lambda d_\Omega(u,\mathrm{I}u)\qquad\because\Omega(u,Tu)\lambda\ne 0$

$\Rightarrow d_\Omega(u,\mathrm{I}u)=0\Rightarrow \mathrm{I}u=u$.

Again the unique fixed point may be proved following the same steps as in theorem-3.1.1

3.3-COROLLARY

Let (X,d_Ω) be a complete extended *b*-metric space and $\mathrm{I}:X\to X$ a continuous mapping such that, for all distinct $a,b\in X$

$$d_\Omega(\mathrm{I}a,\mathrm{I}b)\le\alpha_1 d_\Omega(a,\mathrm{I}a)\frac{\left[1+d_\Omega(b,\mathrm{I}b)\right]}{1+d_\Omega(a,b)}+\alpha_2 d_\Omega(b,\mathrm{I}b)\frac{\left[1+d_\Omega(a,\mathrm{I}a)\right]}{1+d_\Omega(a,b)}+\alpha_3\frac{d_\Omega(b,\mathrm{I}b)d_\Omega(a,\mathrm{I}a)}{d_\Omega(a,b)}$$
$$+\alpha_4 d_\Omega(a,\mathrm{I}b)\frac{\left[1+d_\Omega(b,\mathrm{I}a)\right]}{\left[d_\Omega(a,\mathrm{I}b)+d_\Omega(b,\mathrm{I}a)\right]}+\alpha_5 d_\Omega(b,\mathrm{I}a)\frac{\left[1+d_\Omega(a,\mathrm{I}b)\right]}{\left[d_\Omega(a,\mathrm{I}b)+d_\Omega(b,\mathrm{I}a)\right]}$$
$$+\alpha_6\frac{d_\Omega(a,\mathrm{I}b)d_\Omega(b,\mathrm{I}a)}{1+d_\Omega(a,b)}+\alpha_7\frac{d_\Omega(a,\mathrm{I}a)d_\Omega(a,\mathrm{I}b)+d_\Omega(b,\mathrm{I}b)d_\Omega(b,\mathrm{I}a)}{\left[d_\Omega(a,\mathrm{I}b)+d_\Omega(b,\mathrm{I}a)\right]}+\alpha_8 d_\Omega(a,b)$$

where $\alpha_i\in[0,1),i=1,2,3,4,5,6,7,8$ with $\sum_{i=1}^{8}\alpha_i\le 1$ also for each $a_0\in X$, $\lim_{m,n\to\infty}\Omega(a_n,a_m)<\dfrac{1}{\sum_{i=1}^{8}\alpha_i}$, where $a_n=\mathrm{I}^n a_0$, $n\in N$. Then I has a unique fixed point u. Also for each $a\in X$, we have $\mathrm{I}^n a\to u$..

Proof: The result is easily obtained from Theorem-3.1 by taking $\lambda=\sum_{i=1}^{8}\alpha_i<1$..

3.4-REMARK

1- Corollary-3.3 is an extension of Jaggi[3] to extended b-metric space if we consider $\alpha_3 + \alpha_8 < 1$ and $\alpha_1 = \alpha_2 = \alpha_4 = \alpha_5 = \alpha_6 = \alpha_7 = 0$.

2- Corollary-3.3 is an extension of Dass and Gupta [2] to extended b-metric space if we consider $\alpha_2 + \alpha_8 < 1$ and $\alpha_1 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = \alpha_7 = 0$.

3.5-EXAMPLE

Let $X = \left\{\frac{1}{2}, \frac{1}{4}, \frac{1}{8}\right\}$, $\Omega : X \times X \to [1, \infty)$ such that $\Omega(a,b) = a + b + 1$

$d_\Omega : X \times X \to [0, \infty)$ such that $d_\Omega\left(\frac{1}{2}, \frac{1}{4}\right) = d_\Omega\left(\frac{1}{4}, \frac{1}{2}\right) = 1$, $d_\Omega\left(\frac{1}{2}, \frac{1}{8}\right) = d_\Omega\left(\frac{1}{8}, \frac{1}{2}\right) = 2$,

$d_\Omega\left(\frac{1}{4}, \frac{1}{8}\right) = d_\Omega\left(\frac{1}{8}, \frac{1}{4}\right) = 3$, $d_\Omega\left(\frac{1}{2}, \frac{1}{2}\right) = d_\Omega\left(\frac{1}{4}, \frac{1}{4}\right) = d_\Omega\left(\frac{1}{8}, \frac{1}{8}\right) = 0$,

$\lambda = \frac{7}{12}$ and $\mathrm{I} : X \to X$ is defined as $\mathrm{I}\left(\frac{1}{2}\right) = \mathrm{I}\left(\frac{1}{4}\right) = \frac{1}{4}$, $\mathrm{I}\left(\frac{1}{8}\right) = \frac{1}{2}$.

We may well prove that $\mathrm{I}^n a \to \frac{1}{4}$, as $n \to \infty$ for all $a \in X$.

$\lim_{m,n \to \infty} \Omega\left(\mathrm{I}^m x, \mathrm{I}^n x\right) = \frac{1}{4} + \frac{1}{4} + 1 = \frac{3}{2} < \frac{1}{\lambda} = \frac{12}{7}$.

$\Omega\left(\frac{1}{2}, \frac{1}{4}\right) = \frac{1}{2} + \frac{1}{4} + 1 = \frac{7}{4}$, $\Omega\left(\frac{1}{2}, \frac{1}{8}\right) = \frac{1}{2} + \frac{1}{8} + 1 = \frac{13}{4}$, $\Omega\left(\frac{1}{8}, \frac{1}{4}\right) = \frac{1}{8} + \frac{1}{4} + 1 = \frac{11}{8}$.

$1 = d_\Omega\left(\frac{1}{2}, \frac{1}{4}\right) \le \Omega\left(\frac{1}{2}, \frac{1}{4}\right)\left\{d_\Omega\left(\frac{1}{2}, \frac{1}{8}\right) + d_\Omega\left(\frac{1}{8}, \frac{1}{4}\right)\right\} = \frac{7}{4}(2+3) = \frac{35}{4}$,

$2 = d_\Omega\left(\frac{1}{2}, \frac{1}{8}\right) \le \Omega\left(\frac{1}{2}, \frac{1}{8}\right)\left\{d_\Omega\left(\frac{1}{2}, \frac{1}{4}\right) + d_\Omega\left(\frac{1}{4}, \frac{1}{8}\right)\right\} = \frac{13}{8}(1+3) = \frac{13}{2}$,

$3 = d_\Omega\left(\frac{1}{4}, \frac{1}{8}\right) \le \Omega\left(\frac{1}{4}, \frac{1}{8}\right)\left\{d_\Omega\left(\frac{1}{4}, \frac{1}{2}\right) + d_\Omega\left(\frac{1}{2}, \frac{1}{8}\right)\right\} = \frac{11}{8}(1+2) = \frac{33}{8}$,

Hence it is proved that d_Ω is an extended b-metric space.

Case-I: If $a = \frac{1}{2}, b = \frac{1}{4}$,

$LHS = d_\Omega\left(\mathrm{I}\frac{1}{2}, \mathrm{I}\frac{1}{4}\right) = 0,$

$$RHS = \lambda N\left(\frac{1}{2},\frac{1}{4}\right) = \frac{7}{12}\max\left\{\begin{array}{l} d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{2}\right)\frac{\left[1+d_\Omega\left(\frac{1}{4},\mathrm{I}\frac{1}{4}\right)\right]}{1+d_\Omega\left(\frac{1}{2},\frac{1}{4}\right)}, d_\Omega\left(\frac{1}{4},\mathrm{I}\frac{1}{4}\right)\frac{\left[1+d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{2}\right)\right]}{1+d_\Omega\left(\frac{1}{2},\frac{1}{4}\right)}, \frac{d_\Omega\left(\frac{1}{4},\mathrm{I}\frac{1}{4}\right)d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{2}\right)}{d_\Omega\left(\frac{1}{2},\frac{1}{4}\right)} \\ d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{4}\right)\frac{\left[1+d_\Omega\left(\frac{1}{4},\mathrm{I}\frac{1}{2}\right)\right]}{\left[d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{4}\right)+d_\Omega\left(\frac{1}{4},\mathrm{I}\frac{1}{2}\right)\right]}, d_\Omega\left(\frac{1}{4},\mathrm{I}\frac{1}{2}\right)\frac{\left[1+d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{4}\right)\right]}{\left[d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{4}\right)+d_\Omega\left(\frac{1}{4},\mathrm{I}\frac{1}{2}\right)\right]} \\ \frac{d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{4}\right)d_\Omega\left(\frac{1}{4},\mathrm{I}\frac{1}{2}\right)}{1+d_\Omega\left(\frac{1}{2},\frac{1}{4}\right)}, \frac{d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{2}\right)d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{4}\right)+d_\Omega\left(\frac{1}{4},\mathrm{I}\frac{1}{4}\right)d_\Omega\left(\frac{1}{4},\mathrm{I}\frac{1}{2}\right)}{\left[d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{4}\right)+d_\Omega\left(\frac{1}{4},\mathrm{I}\frac{1}{2}\right)\right]}, d_\Omega\left(\frac{1}{2},\frac{1}{4}\right) \end{array}\right\}$$

$$= \frac{7}{12}\max\left\{\frac{1}{2},0,0,\frac{1}{2},0,0,1,1\right\} = \frac{7}{12}$$

$\therefore LHS \le RHS$

Case-II: If $a = \frac{1}{2}, b = \frac{1}{8}$,

$$LHS = d_\Omega\left(\mathrm{I}\frac{1}{2},\mathrm{I}\frac{1}{8}\right) = 1,$$

$$RHS = \lambda N\left(\frac{1}{2},\frac{1}{8}\right) = \frac{7}{12}\max\left\{\begin{array}{l} d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{2}\right)\frac{\left[1+d_\Omega\left(\frac{1}{8},\mathrm{I}\frac{1}{8}\right)\right]}{1+d_\Omega\left(\frac{1}{2},\frac{1}{8}\right)}, d_\Omega\left(\frac{1}{8},\mathrm{I}\frac{1}{8}\right)\frac{\left[1+d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{2}\right)\right]}{1+d_\Omega\left(\frac{1}{2},\frac{1}{8}\right)}, \\ \frac{d_\Omega\left(\frac{1}{8},\mathrm{I}\frac{1}{8}\right)d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{2}\right)}{d_\Omega\left(\frac{1}{2},\frac{1}{8}\right)}, d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{8}\right)\frac{\left[1+d_\Omega\left(\frac{1}{8},\mathrm{I}\frac{1}{2}\right)\right]}{\left[d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{8}\right)+d_\Omega\left(\frac{1}{8},\mathrm{I}\frac{1}{2}\right)\right]}, \\ d_\Omega\left(\frac{1}{8},\mathrm{I}\frac{1}{2}\right)\frac{\left[1+d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{8}\right)\right]}{\left[d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{8}\right)+d_\Omega\left(\frac{1}{8},\mathrm{I}\frac{1}{2}\right)\right]}, \frac{d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{8}\right)d_\Omega\left(\frac{1}{8},\mathrm{I}\frac{1}{2}\right)}{1+d_\Omega\left(\frac{1}{2},\frac{1}{8}\right)}, \\ \frac{d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{2}\right)d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{8}\right)+d_\Omega\left(\frac{1}{8},\mathrm{I}\frac{1}{8}\right)d_\Omega\left(\frac{1}{8},\mathrm{I}\frac{1}{2}\right)}{\left[d_\Omega\left(\frac{1}{2},\mathrm{I}\frac{1}{8}\right)+d_\Omega\left(\frac{1}{8},\mathrm{I}\frac{1}{2}\right)\right]}, d_\Omega\left(\frac{1}{2},\frac{1}{8}\right) \end{array}\right\}$$

$$= \frac{7}{12}\max\left\{3,\frac{4}{3},1,0,1,0,2,2\right\} = \frac{7}{6}$$

$\therefore LHS \le RHS$

Case-III: If $a = \frac{1}{4}, b = \frac{1}{8}$,

$$LHS = d_\Omega\left(\mathrm{I}\frac{1}{4}, \mathrm{I}\frac{1}{8}\right) = 1,$$

$$RHS = \lambda N\left(\frac{1}{4}, \frac{1}{8}\right) = \frac{7}{12}\max\left\{\begin{array}{l} d_\Omega\left(\frac{1}{4}, \mathrm{I}\frac{1}{4}\right)\frac{\left[1+d_\Omega\left(\frac{1}{8}, \mathrm{I}\frac{1}{8}\right)\right]}{1+d_\Omega\left(\frac{1}{4}, \frac{1}{8}\right)}, d_\Omega\left(\frac{1}{8}, \mathrm{I}\frac{1}{8}\right)\frac{\left[1+d_\Omega\left(\frac{1}{4}, \mathrm{I}\frac{1}{4}\right)\right]}{1+d_\Omega\left(\frac{1}{4}, \frac{1}{8}\right)}, \\ \frac{d_\Omega\left(\frac{1}{8}, \mathrm{I}\frac{1}{8}\right)d_\Omega\left(\frac{1}{4}, \mathrm{I}\frac{1}{4}\right)}{d_\Omega\left(\frac{1}{4}, \frac{1}{8}\right)}, d_\Omega\left(\frac{1}{4}, T\frac{1}{8}\right)\frac{\left[1+d_\Omega\left(\frac{1}{8}, T\frac{1}{4}\right)\right]}{\left[d_\Omega\left(\frac{1}{4}, T\frac{1}{8}\right)+d_\Omega\left(\frac{1}{8}, T\frac{1}{4}\right)\right]}, \\ d_\Omega\left(\frac{1}{8}, \mathrm{I}\frac{1}{4}\right)\frac{\left[1+d_\Omega\left(\frac{1}{4}, \mathrm{I}\frac{1}{8}\right)\right]}{\left[d_\Omega\left(\frac{1}{4}, \mathrm{I}\frac{1}{8}\right)+d_\Omega\left(\frac{1}{8}, \mathrm{I}\frac{1}{4}\right)\right]}, \frac{d_\Omega\left(\frac{1}{4}, \mathrm{I}\frac{1}{8}\right)d_\Omega\left(\frac{1}{8}, \mathrm{I}\frac{1}{4}\right)}{1+d_\Omega\left(\frac{1}{4}, \frac{1}{8}\right)}, \\ \frac{d_\Omega\left(\frac{1}{4}, \mathrm{I}\frac{1}{4}\right)d_\Omega\left(\frac{1}{4}, \mathrm{I}\frac{1}{8}\right)+d_\Omega\left(\frac{1}{8}, \mathrm{I}\frac{1}{8}\right)d_\Omega\left(\frac{1}{8}, \mathrm{I}\frac{1}{4}\right)}{\left[d_\Omega\left(\frac{1}{4}, \mathrm{I}\frac{1}{8}\right)+d_\Omega\left(\frac{1}{8}, \mathrm{I}\frac{1}{4}\right)\right]}, d_\Omega\left(\frac{1}{4}, \frac{1}{8}\right) \end{array}\right\}$$

$$= \frac{7}{12}\max\left\{0, \frac{1}{2}, 0, 1, 2, \frac{3}{4}, 3, 3\right\} = \frac{7}{4}$$

$\therefore LHS \leq RHS$

Thus all the conditions of theorem-3.2 are satisfied. Hence the fixed point is $a = \frac{1}{4}$.

CONCLUSION

A unique common fixed point theorem has been established in extended b-metric space satisfying rational type contractive condition, which extends and generalizes earlier results available in the literature.

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Applied Analysis, Computation and Mathematical Modelling in Engineering, pp 271–281

Numerical Solution of Laplace and Poisson Equations for Regular and Irregular Domain Using Five-Point Formula

Malabika Adak

Conference paper | First Online: 30 June 2022

Part of the Lecture Notes in Electrical Engineering book series (LNEE,volume 897)

Abstract

In many areas of science and engineering, to determine the steady-state temperature, potential distribution, electricity, gravitation, Laplace and Poisson elliptic partial differential equation is required to solve. It is difficult to obtain an analytical solution of most of the partial differential equations that arise in mathematical models of physical phenomena. So, five-point finite difference method (FDM) is used to solve the two-dimensional Laplace and Poisson equations on regular (square) and irregular (triangular) region. To solve partial differential equation, specific boundary conditions

No Access

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Malnutrition detection in infants using machine learning approach

AIP Conference Proceedings **2424**, 040006 (2022); https://doi.org/10.1063/5.0076876

Rakhi Wajgi[1,a] *and* Dipak Wajgi[2,b]

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healthy life of people. Healthy nutrients enable cells to perform their regular activities at pace. Deficiency of proper nutrition while birth causes various complications in further life. These complications include wasting, stunting, edema, mental illness, low immune system, ridged or spoon-shaped nails, brittle, dry hair, and underweight etc. Malnutrition is a condition that occurs when a person consumes a diet that is deficient in one or more major nutrients, or has too many of them. Marasmus, kwashiorkor and intermediate states of marasmus-kwashiorkor are included in the term Protein-Energy Malnutrition (PEM) disorders. PEM is the cause of underweight (low weight for age), stunting (low height for age), and wasting (low weight for height). In India, stunting affects 48% of infants under five years age, wasting affects 20%, and underweight affects 43%. Most children suffering from undernutrition in mild to moderate forms are unnoticed in India, which affects their growth at early ages. Detecting malnutrition at early stage reduces further healthcare cost and improve health outcome. To alleviate the problem of malnutrition, this paper describes a decision tree model for classification of infants being between the ages of 0 and 59 months as normal, acute malnourished or severely malnourished for three categories: Stunting, Wasting and Underweight. In decision tree model, Gini index is adopted as an impurity measure. The accuracy obtained using decision tree for stunting is 82.22%, for wasting 72.23 % and underweight 78.35% using Gini index.

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Smart Intelligent Computing and Applications, Volume 2 pp 339–347

Deep Neural Network for Generation and Detection of an Image

Roshni S. Khedgaonkar, Kavita Singh, Pravinkumar M. Sonsare ✉ & Sabiha Zamir

Conference paper | First Online: 22 May 2022

Part of the Smart Innovation, Systems and Technologies book series (SIST,volume 283)

Abstract

Deep learning is a boon for the industry in today's era. Deep learning comes up with powerful algorithms like generative adversarial network (GAN) and convolutional neural network (CNN) for synthetic image generation and to detect different objects from an image. In this paper, both GAN and CNN were demonstrated in a consecutive manner so the objective of generation and detection will be figured out in a single implementation. In essence, the GAN will induce synthetic images from the real image dataset, and the output of GAN will dispense

ICT Analysis and Applications pp 47–55

Efficient Strategies to Manage Road Traffic Using Big Data Analytics

Yogesh Golhar & Manali Kshirsagar

Conference paper | First Online: 07 January 2022

Part of the Lecture Notes in Networks and Systems book series (LNNS,volume 314)

Abstract

The on-road traffic increases due to the exponential growth of the number of vehicles on the road. That leads to undesirable road conditions and makes urban population life uncomfortable. It includes traffic
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that makes humans seriously injured and even loss

ICT Analysis and Applications pp 47–55

Efficient Strategies to Manage Road Traffic Using Big Data Analytics

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Investigation of the Lung, Hospice Care, and Standard of Living of Patients with Chronic Obstructive Pulmonary Disease who are Nearing the Final Stages of their Lives

Anchal Batham[1], Rakesh Kunar Jha[1], Pratibha Dawande[1], Nandkishor Bankar[2] and S.R. Kapse[3]

ECS Transactions, Volume 107, Number 1

Citation Anchal Batham *et al* 2022 *ECS Trans.* **107** 15273

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https://doi.org/10.1149/10701.15273ecst

Abstract

Chronic obstructive pulmonary disease is a significant source of illness and death across the world. For several patients, maximum COPD treatment provides only little or no comfort from debilitating symptoms, resulting in a substantially decreased quality of life. Many patients receive little palliative care, despite the substantial morbidity and death associated with severe COPD. This is due to a number of factors. First, communication between patients and physicians concerning palliative and end-of-life care is rare and sometimes of low quality. Second, the difficulty in communicating about end-of-life care for COPD patients is exacerbated by the ambiguity in estimating prognosis. So, many patients and their relatives are unaware that severe COPD is usually a progressive and fatal condition. Improving communication is a critical step toward improved palliative and end-of-life care for these individuals. Conclusion: The needs of patients of COPD are still unanswered and

Published Online: 21 March 2022

Overview on spatial analysis framework to examine land use and flooded zone

AIP Conference Proceedings **2424**, 050001 (2022);
https://doi.org/10.1063/5.0077923

Sabiha M.Zamir[1),a)], Roshni S. Khedgaonkar[1),b)], *and* Mr. Ajit Dharmik[2),c)]

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ABSTRACT

Natural disasters can adversely influence the life of living beings. Flood has global evidence that causes massive destruction of land use areas. This literature review has all the related papers which use various algorithms such as GIS-based frameworks, multi-criteria, Analytical Hierarchical Process, Hydraulic methods, Synthetic Aperture Radar data with GIS data, logistic regression, cellular automata, Markov Chain models, 1D and 2D models of flood hydraulics, Naïve Bayes and so on to get the blend for examine the land use and evaluate the damages and destructions after flood hazard. Different authors have implemented different techniques in their specific areas. We also proposed our algorithm to calculate the flood hazard losses, the Governments, Disaster Management, Insurance companies can take benefits out of it

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Android Forensic Tool

Linta Bawankar, Manasi Bongirwar, Prerna Sharma, Shrawan Bhojane, and Nikhil Mangrulkar

Abstract With the increase in use of mobiles, the smartphone has become a storehouse of data and can be a hub for criminal evidences. Nowadays data is very important and precious also it may be confidential and based upon it we can do many things. Data plays a crucial role in day-to-day life of every person. So, to deal with this, mobile forensic tools are used. In this paper we are presenting an application for extracting mobile contents like contacts, call logs and SMS using android app. So, if we lose data for any reason, we will be able to quickly access it. Our desktop application will show the data after backup in a user-friendly format (e.g., doc, pdf) so it is very convenient and easy for user. We have used .Net for desktop software and android studio for mobile application.

Keywords Mobile forensic · Smartphone backup · Android data · Backup application · Backup software · Forensic tools

1 Introduction

Nowadays smart phone is used by almost every person. It has become a very common and necessary device in daily life. There are 5.20 billion smart phone users in the world, according to the latest data from GSMA Intelligence. The total number of smartphone users around the world grew by 93 million in the last year [1]. Smartphone use is currently growing at a rate of 7%, with more than an average of 1 million new smartphones coming into use every day [2]. With the increase in use of smartphone the crime rate is also increasing. So, there is need of forensic application.

As smartphone contain important data, having its backup is important so incase data is lost, we can retrieve it. If data is backed up and organized properly, it is very easy and convenient to access, so this application shows data in user friendly (like doc, pdf etc.) way. Data Stored on smartphones can be extremely useful for investigation. The source of information residing on phone can be contact, SMS,

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Parsing Expression Grammar and Packrat Parsing—A Review

Nikhil S. Mangrulkar, Kavita R. Singh, and Mukesh M. Raghuwanshi

Abstract Ford presented Parsing Expression Grammars (PEGs) as an alternative to specify rules for programming language, along with a Packrat parser, based on an idea of memoization. The idea proposed by Ford guarantees parsing of grammar written using PEGs in linear time in spite of backtracking. The primary aim of the paper is to highlight the details of PEGs followed by various challenges existing for a better understanding of the readers. From the entire overview presented, it has been observed that PEGs address the issue of undesired ambiguity in grammar for computer-oriented programming language, by not allowing any ambiguity in rules itself at the first place. However, the guarantee of linear time execution comes with a cost of large heap consumption, making it infeasible to implement for large inputs. Optimizing the resources required for memoization, may allow us to utilize the benefits offered by PEGs.

Keywords Parsing · Packrat parsing · Parsing expression grammar · PEGs · Memoization · Liner time parsing

1 Introduction

All languages that we commonly use today are originated from the idea of communicating the information as an arrangement of written signs or symbols, and which is true for both human-readable and machine-readable languages. To represent the

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Segregation and User Interactive Visualization of Covid-19 Tweets Using Text Mining Techniques

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Abstract. One of the worst calamities the world is facing since early 2020 is corona virus or Covid-19 disease which has turned into a pandemic claiming millions of lives across the globe. Twitter sources huge number of tweets related to this disease from users globally. This research focuses on mining Covid-19 tweets using machine learning techniques. The tweets are first pre-processed and converted to a form suitable for applying clustering algorithms. Principal Components Analysis is used to separate most significant components. Similar tweets are categorized using Hierarchical agglomerative clustering. The segregated tweets are visualized on novel and interactive cluster plots, members of which can be identified on user interface interactively by user for easy interpretation. The implementation is done using R programming. Clusters of similar tweets can be used to analyze the response of people to the pandemic across countries, compare and adopt best practices across countries to address the pandemic based on people views, combat spread of rumors and other such applications.

Keywords: Text mining · Document clustering · Visualization · Covid-19 · Hierarchical clustering · Tweets

1 Introduction

With the increased usage of social media sites, Twitter has emerged one of the most popular platforms for disseminating and sharing information across the globe. It is one of the most liked mediums by communities at large to interact, communicate, share their ideas, views, news, knowledge etc. thus producing huge real-time data in the form of tweets which if mined effectively can provide truly valuable insights into the information. Previously published research in this area shows that tweets about a particular calamity provide better insights about the specific crisis by building, implementing and evaluating appropriate machine learning algorithms [1].

The candidate tweets chosen for this study are Covid-19 tweets. Covid-19 disease outbreak was observed in early 2020 with few countries to start with and over the time has spread rapidly across the world in an ugly fashion taking the form of a pandemic [2]. This disease which has claimed the life of millions and has created havoc is the most

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https://doi.org/10.1007/978-3-030-82469-3_24

An Open Randomized Clinical Trial Of Rasona Taila Uttarbasti And Rasona Sidhha Kshirpan In Infertility W.S.R. To Anovulatory Cycle

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Abstract

Nowadays, polycystic ovarian syndrome (PCOS) is increasingly alarming. Consequently, anovulation and delayed ovulation are the main reasons for patients to seek doctor's help for conception. Anovulation is one of the most important cause of female infertility. *Ayurveda* has very good treatment options for the entity in the form of *Rasona* and *Uttarbasti*. *Rasona* is the herbal drug which induces ovulation and hence helpful in treatment of infertility. *Rasona* can be used in various forms like oil for *uttarbasti* and milk for oral administration. *Uttarbasti* is a specialized gynaecological procedure whereby medicated oil or *ghrita* is instilled in uterine cavity. *Uttarbasti* is one such type of therapy being indicated for infertility. In our classics and is well practiced with substantial results. It helps in detoxification of reproductive tract like the uterus and fallopian tube.

E-Learning: A Boon in Pandemic

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Abstract

The onset of COVID-19 brought with itself many revolutionary changes in the whole world circuit, be it entertainment, research, education, or medical practice. The quarantine mode made unique challenges for the medical education, and thanks to the ever-inquisitive minds of the technical people, various e-learning tools were developed for the students and the teachers to help bridge the gap between them through technology. This study was done in a tertiary medical college in central India where the students were asked to rate the e-learning provided by the teachers in the medical college. Methodology: About 100 medical students from a tertiary medical teaching college in Central India were randomly selected from first to final year, and an online questionnaire was provided to them to answer the questions. The answers were organized, tabulated, and inferences were drawn. The study took place from January 2021 to April 2021. It was a descriptive study. Appropriate tests were applied accordingly. Observations: Out of a total of 100 medical students studied, 30 belonged to 1st year, 25 belonged to 2nd year, 25 belonged to 3rd year, and 20 students belonged to final year MBBS. 65% were female students and 35% were male students.

Operation of Circuit Breaker with Authentication

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***Abstract*—As the world is becoming technosavy, heading towards invention of advance electronic devices so is the safety factor of technicians becoming an important trouble of worry. The life of operators is in danger as they work on these electrical appliances. They work by changing off the circuit breakers but sometimes someone can unknowingly on the circuit breaker while they are working and this could result in massive accidents sometimes it can even result in fatal accidents. To avoid such accidents there must be system for ensuring security of technicians. Also, if sometimes the current of a particular electronic device exceeds its rated current, the device may get damaged. To resolve all these difficulties, we derived up with a solution of Circuit Breaker that is authenticated i.e., password based and a current sensor which produces an alarming sound as the current of particular device exceeds its rated value. When the Circuit Breaker is authenticated, it also has high security that no one can operate it without knowing the password.**

Index Terms- Arduino UNO, 4x4 Matrix Keypad, Relay, LCD Display, Battery.

I. INTRODUCTION

Along with the continuous upgrading of altered electronic devices, Operators, Workers, Engineers, Contractors, etc which work in the industry needs to encouraged that they are working in a Safe Environment. Their Safety is a major area of importance since technicians are always at risk during their work around circuits even if the circuit is switched off. That is because many a times technicians can be still on job on circuit breakers while someone has accidentally switched on the circuit [1].

Due to above reason Communication and co-ordination between the staff around circuit is very important since majority of the accidents happen due to miscommunications between the maintenance staff and electric substation staff. Such faults not only kill one but can also kill many and can affect the working environment of Industry. It is difficult for people to work in such High-Risk areas. The main aim of our project is to reduce the chances of such fatal accidents that happened due to human error. These kinds of accidents take place due to large distance between main supply station and maintenance area [2]. To prevent this password control system will be used to stop sudden power supply that will ensure that until the password from both end (main supply station and maintenance area) is same till then power supply will not start. This will prevent death of technician due to electric shock. Thus, the entire charge of the maintenance line is on a single person or say Group of Authority who is leading that particular job. He takes the charge of operating the Circuit Breaker, As a result the chances of Faulty Operation, Imposters or Human error in operation are eliminated and thus the maintenance of the line can be done in safer way [3].

II. EXISTING SYSTEM

The existing technology for power regulation and protection contain various features. The current tech used electronic circuit is connected to circuit breaker along with an electrical power circuit, communication device and monitoring devices. The electronic circuit is used to determine electric supply to send to electric circuit with feedback provided by circuit breaker and other connected devices. If power is supplied to circuit then circuit can be operated by other connected devices, charge the account and activates circuit if monitoring devices detects any fault.

To make better communication in commercial and residential areas, a system associated with intelligent circuit breaker is now used to communicate, monitor and control devices. It also uses information relating to current state and

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Fuel Cell Based DC-AC Single Phase QZSI for Low Voltage Grid Utility

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***Abstract*—1ϕ qZSI inverter is most popular for renewable energy sources like PV and fuel cell due to its unique shoot through large boost voltage capability. A fuel cell is a clean and efficient source of electricity. Fuel cell needs fuel for continuous production of electricity but it can give good performance irrespective of seasonal changes, unlike PV cell. In this paper, proton exchange membrane fuel cell (PEMFC) based 1ϕ qZSI is interfaced to a low voltage grid. PEMFC is operated with low temperature and has lower emission of carbon dioxide. This paper focuses on the performance of PEMFC based 1ϕ qZSI on low voltage grid utility in the presence of 100Hz ripple. As in single-phase circuit, 100Hz ripple is more dominant; it causes more energy loss and shortens the lifetime of renewable source like a fuel cell. Hence, this article will also discuss how much percentage of 100Hz ripple present in qZS inductor current and capacitor voltage using proper calculation. The simulation results are found using MATLAB/SIMULINK.**

***Index Terms*— PEM fuel cell (PEMFC), single -phase qZSI, 100Hz ripples, shoot through carrier PWM control scheme.**

I. INTRODUCTION

In today's era the non-conventional energy sources becomes more popular due to limited availability of fossil fuel and pollution free environment. The difference between PV and fuel cell is that PV is uncontrollable source where its output power is controlled by solar irradiance and not by the plant operation. The fuel cell is controllable source that can produce power when needed as long as the fuel is supplied. Similarly the comparison between the battery and fuel cell shows that comparative to battery, fuel cell supply uninterrupted energy as long as hydrogen fuel and oxidants are provided. Due to this property and its broad size range, fuel cell is popular to use for many application such as transportation/automation [1], motor drive application[2], grid connected residential application[3]-[4], standalone power system[5],and micro grid [6] in spite of its expensiveness[7]. The PEMFC is popular in small scale power generation due to its minimum operating temperature and minimum discharge of greenhouse gases. The power is generated at low voltage (230V RMS, 50Hz) which can be mostly used for single phase grid application [8]. Most of the fuel cell interfaced to grid application through two stage inverter topology. In this topology separate dc to dc booster are required which not only increases the size of the system but also increases its cost. Hence to overcome this issue the focus is given on single stage inverter topology [9].

QZSI has merits over ZSI like continuous input current & reduced passive component count [10]. Recently ZSI/qZSI has been considered mostly for single phase & three phase grid fed applications. But in the single phase application like dc to ac, the input source like PV/Fuel cell is hampered due to the low frequency ripples (100Hz). These ripples are transferred from ac side to dc side. It increases the stress on the input source and shortens its lifetime. The ripple due to 100Hz also enhances the THD level in grid current by increasing distortion in the output current. To reduce these ripples, the size of the qZS passive components has to be increased that makes the system costlier. The backup battery is used to minimize the low frequency ripples but the additional battery increases the system cost[11],[12]. Various control and topologies used to mitigate the 100Hz ripple but the systematic calculations of 100Hz ripple ripples are not yet provided [13]-[17].So it is important to study the low frequency (100Hz) ripple calculations in proper way in the presence of PEMFC.

The main goal of this paper is to investigate the impact of 100Hz ripple on supply voltage, qZS inductor current and capacitor voltage in presence of PEMFC. It will also study the performance of grid current THD under the influence of 100Hz ripple. In figure 3, shoot through carrier PWM control scheme is implemented for 1ϕ qZSI. The gate pulses are provided to the inverter switches which is obtained through PWM control technique. The block diagram of PEM fuel cell based interfaced to LV grid via 1ϕ qZSI shown in following block diagram figure1.

In figure 1, the close loop control is applied to generate shoot through pulses. In this close loop control, phase locked loop is used to measure the grid voltage Vg and synchronized the grid voltage by calculating the sine function. This sign function multiplied with grid reference current $i_{g_{ref}}$ produces

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DSTATCOM under Unbalanced and Distorted Load Conditions: A Comparison of Different Formulations

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***Abstract*— The behavior of several control algorithms used to create reference currents for the Distribution Static Compensator (DSTATCOM) in a 3-ph, 4-wire system is investigated in this work. A three level Neutral Point Clamped (NPC) inverter topology is considered for DSTATCOM operation in order to attain load compensation. For unbalanced and non-linear load conditions, the Instantaneous active and reactive power (PQ) theory, Synchronous Reference Frame (SRF) theory, Averaged Global Control (AGC) theory, and Instantaneous Symmetrical Component (ISC) theory are graphically and analytically studied. The major goal of these control schemes under balanced source and various load situations is to create completely balanced and ripple-free source currents. On the basis of compensation parameters and performance metrics, a comparative assessment of the aforementioned algorithms is carried out. Under unbalanced and distorted load conditions, a comprehensive simulation was done utilizing the MATLAB environment to validate the proficiency of the ISC theory in comparison to the other schemes.**

Keywords*— DSTATCOM, balanced source, NPC, Unbalanced & distorted load.

I. INTRODUCTION

DSTATCOM, a shunt connected special power device, can boost the effectiveness of a distribution network [1]. It is the best suitable solution for the mitigation of power quality issues now a day. The key component of DSTATCOM is the Voltage Source Inverter (VSI) [2]-[3]. Multilevel converter topologies [4], [5] have recently demonstrated the capacity to tackle the issues associated with two-level topologies. Multilevel inverter topology are gaining significant importance in shunt applications because to their efficient characteristics. The three-level NPC inverter [6] is gaining popularity among the many multilevel topologies because to its resilience.

The shunt compensator's performance is influenced not only by the dc link or interface inductor, but also by the control approach employed. A variety of control algorithms are proposed in the literature [7]. Some of these algorithms are named as - Instantaneous PQ theory, SRF theory, AGC theory and ISC theory. All of the preceding algorithms have well-established basic approaches for operating under unbalanced and distorted load situations. Unbalanced and distorted sources are not considered in this paper, for which the above-mentioned algorithms are unable to work; as a consequence, a synchronous detection method (SDM) [8]-[9] has been established to work under such circumstances. According to the simulation results, AGCT and ISC theory are able to operate effectively to increase system performance over the other algorithms while dealing with load unbalance and distortions.

This paper examines the four algorithms stated above in depth, taking into account several key considerations discussed in the following sections. The theoretical benefits as well as a comparison of various methods under unbalanced and distorted load conditions are presented. A comprehensive simulation is also performed to showcase the effectiveness of the various methods.

II. SYSTEM CONFIGURATION

Figure 1 depicts a three-phase, four-wire system with a three-level NPC-based DSTATCOM structure [10]-[11]. The interface reactor, $R_f + jX_f$, connects the compensator in shunt at the Point of Common Coupling (PCC). The source and loads are connected at PCC, along with the compensator. The load causes unbalance in the stiff system under consideration, as well as non-linearity, due to the three-phase unregulated rectifier drawing 1.83 A. The hysteresis current regulated Pulse Width Modulation (PWM) approach is employed to generate the switching pulses required for the 3-level NPC inverter [12].

By introducing a dead band (δ) between the hysteresis bands, this control aids in achieving the desired three levels (V_{dc}, 0,$-V_{dc}$) (h). Table 1 lists the parameters [13] that are required to mimic the system.

III. REFERENCE CURRENT CONTROL ALGORITHMS

To increase system performance, a control technique was used to extract reference compensator currents and is solely accountable for DSTATCOM's control. Various control strategies, such as PQ, SRF, AGC, and ISC theories, are briefly reviewed in the following section.

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Solar radiation forecasting using random forest

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ABSTRACT

Power generation from renewable energy sources is key to a clean energy future and solar energy is world's fastest growing energy sector. Solar energy is renewable, CO2-free and with low operational cost. There are several advantages of using solar energy; however, it does have a few drawbacks such as hefty initial cost, high-priced storage, weather dependency, sizable space requirement, etc. As such, it is critical to predict solar radiation (SR) in an accurate and efficient way to install solar plants in optimal locations. Factors like global horizontal irradiance (GHI), temperature, humidity, cloud cover, wind speed, etc. make SR highly intermittent and variable. Accurate forecasting of SR is vital to finalize installed capacity of the proposed power plant but is extremely challenging due to unpredictability of sunlight. Even the world's best organizations such as the International Energy Agency (IEA) finds it difficult to accurately predict SR. In this work, we analyze global and diffuse SR data gathered from India Meteorological Department (IMD) Pune. This data is

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Spontaneous Detection of Potholes and Humps

Swati K. Mohod, Anjula Wararkar, Swaranjali Bokade, Rupali Lende, Rahul Lichade, Yash Mahure & Sagar Fartode

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Abstract

Roads are the major means of transportation and it supports the nation's economy only if they are well maintained. It is necessary to identify holes and potholes so the accidents can be avoided and the damage caused to the vehicle is less. It also contributes in saving fuel. Here is a simple and effective solution regarding the problem of accidents by detection of potholes and humps and help drivers. Detection of potholes will be done by image processing technique and humps would be detected by ultrasonic sensor. Raspberry Pi is the controlling device. Wi-Fi will be used to acquire

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Remote Sensing Application for Analysis of Forest Change Detection

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Abstract: **Forest cover is generally defined as the relative in percent or square kilometers/square miles of land area which is occupied by forests. And the coverage of global forest cover is most essential for soil health, climate, water cycle and air quality. The condition can be improved by reforestation and afforestation to some extent but cannot be restored to full range. Once the natural forests are converted to various lands uses it's impossible to restore these ecological services. The terms "deforestation" and "forest area net change" are different as deforestation is defined as the forest losses while forest net change may possess some expansion and degradation of forests in a given period. The rate of deforestation has increased the loss of forests and due to this environmental misbalance is occurring. So if this continued then various parameters of environment like climate, quality of soil etc. can be degraded and may not be cured. Therefore, the following research is geared towards analyzing the parts of deforestation using remote sensing technology of a particular Yavatmal district of Maharashtra state, India. The satellite images used for this analysis of forest change detection are of planet scope having 3 m resolution. The target of this research is to detect the forest cover change using remote sensing and GIS. For the identification of forest covers various techniques like segmentation and classification are used. The best classification is by Normalized Difference Vegetation Index (NDVI) which identifies the health of vegetation along with the changes in the different parameters. After using NDVI some values generated will detect the areas of forest changes with the amount of change. And with the help of this research it is observed that out of total forest area i.e. 76740.32 hectares, the negative forest change is reduced to 29.44% due to degradation of forests maybe due to fires, deforestation, leaf shedding etc.**

Keywords: Remote sensing, forest change, image enhancement, image segmentation, image classification, K means, Normalized difference vegetation

I. INTRODUCTION

Remote sensing is a method which acquires information of an object on land without having physical contact with that object. It is mainly used to acquire the information about Earth and its various parameters [1] Remote sensing plays a vital role for forest ecology. The most important part for this study is monitoring the land parameters, vegetation, and land cover changes with various properties of forests [2]. The multispectral remote sensing is used to obtain the information of these parameters of environment. Here, the information is acquired and features are extracted depending on certain things, areas of vegetation, agriculture and water bodies' [3]. Remote sensing along with GIS will manage the information and provide various tools for forest analysis and statistics [4].

Deforestation is the loss of forests.The reason for this degradation may be due to loss in mining, road construction etc. If we consider deforestation rate in India, it stands at the 10^{th} position worldwide as per 2009 survey [5]. Likewise, the world estimates 13.7 million hectares (i.e. $34x10^6$ acres) of deforestation per year. From this we get to know how deforestation has become a serious topic of discussion throughout the world. Depending on the statistics of forest report 2019 the cover of forest is 712,249 sq.km.

Digital satellite image processing of satellite images provides a numerous operations for doing the image analysis efficiently with the help of different algorithms and different math's index [6].Generally, features of these are based on reflectance parameters while the indices help in highlighting the areas of interest. But for this study we have considered vegetation indices in which NDVI is the most common index [7]. Thus, remote sensing with satellite image processing has numerous applications in fields like astronomy; cloud computing and various research and development. And python along with various packages will play an essential role in this processing.

II. LITERATURE REVIEW

Remote sensing is a great technique having number of applications in forest ecology. It monitors and manages many parameters of species and habitat, different characteristics of land and forest with changes and mitigation of people. It is the most important and essential technique which helps in forest ecology with several other applications like monitoring land cover changes, their species, fragmentation of habitat and numerous other properties of forest[6].

Remote sensing uses multispectral images which are most efficient in obtaining the information of an environment. It will acquire the images in the form of information and extract essential features based on various aspects like vegetation objects, land covers, water, agriculture etc. it has numerous applications in forest classification, snow mapping, land cover classification, water classification etc. [7]

The excessive use of forest in the form of technological and industrial growth leads to major factors responsible in

Development of Fuzzy Controller Using 8-Bit Microcontroller for Switch Mode DC Servo Motor Control

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***Abstract*— This paper describes the challenges and solutions for low cost control of DC-DC converter with robust fuzzy logic based controller for robotic/servo applications. Robotic applications need design of compact and versatile controllers for its manipulator. Control of the DC servomotors as actuators for robotic arm is done recently by DC-DC converters with PWM control methods as a single processor multi-motor system. Design approaches for PWM controller is often investigated because of its nonlinear nature due to inherent switching in DC-DC converters. Robust controller for this system can be designed using fuzzy logic which is difficult to implement on low cost digital processors. The proposed approach makes it possible to design the fuzzy controller with low cost microcontroller for PWM based control of DC servomotor.**

Keywords—fuzzy logic, robotic, switch mode dc servo motor, microcontroller, speed control.

I. INTRODUCTION

PD controller is often used for the control of DC servomotors in most of the commercial applications like robotic arm manipulator. Many control strategies like variable structure control and sliding mode control for DC motor have already been suggested in literature [1]. because of the convenience of production of PWM and benefits of digital processors over analog counterparts, servomotors can be controlled via DC-DC converters as single processor multi-motor system that is often needed in robotic applications. However, DC-DC converters are nonlinear system due to nonlinear components and inherent switching [2] [25]. for that reason, traditional design strategies frequently fail to give satisfactory results in these instances in which intrinsic nonlinear time changing characteristics of continuous conduction mode power converters impose problems in obtaining correct mathematical model required for design.

Fuzzy logic has immerged as a powerful approach to cope up the nonlinearity and uncertainty over past decade [3]. Fuzzy based controller for DC-DC converters have proved to be superior over conventional PD control techniques [4-6], [8]. The implementation of fuzzy controller through digital signal processors (DSP) is provided through application notes by way of some leading manufactures [7]. With the use of nonlinear state-space model, power electronic converters analysis, modelling and simulation is described in [10-11], [13] have made significant enhancements in traditional design strategies and simulations. Implementation of PI like fuzzy controller for DC-DC converter is provided these days in [14-16], [20-21] using digital signal processor. The foremost obstacle about this work is the increased cost of the overall system due to the use of DSP processors. stability analysis [22] is another matter of challenge for implementing fuzzy controller. Researchers have been investigating the application of fuzzy logic principles to control the switching-mode power converters, however, the logic and arithmetic calculations of the fuzzy logic algorithm can be tough to apply on several microcontrollers [9], [22-23]. Alternatively, higher cost of DSPs and associated hardware limit their utility. Low cost microcontrollers frequently include a means of control and communication functions in hardware, but computational power and resolution of processor are limited in general. thus, in this paper, a few demanding situations of imposing fairly complex fuzzy logic based algorithm on microcontroller were addressed. A small experimental prototype for real time DC servomotor speed control with the aid of fuzzy sliding mode controller using low cost 89C51RD2 microcontroller is investigated for improving the dynamic response. This control scheme ensures accurate response in terms of rejection of load variations, input voltage changes and even parameter uncertainties having low cost implementation as its constraint. The paper is prepared as follows. section II confers the system overview wherein the overall proposed scheme is discussed. section III covers the implementation of PID controller with microcontroller. section IV covers the implementation of PD like fuzzy controller with it challenges and solutions with five membership functions and nine membership functions. section V covers the hardware configuration and test setup specifications. subsequent section discusses the experimental responses and analysis with the proposed scheme. Conclusions are summarized in section VII.

II. SYSTEM OVERVIEW

The speed control scheme is shown in Fig. 1. Here we have eliminated the capacitor across the load of buck converter. The reason is for eliminating this capacitor in parallel with load is that DC servomotor itself is an inductive load that has a characteristic of low-pass filtering the armature voltage. Additionally, this extra capacitor which is in parallel with load will increase the system order by means of, which in addition complicates the plant's dynamics and the following controller layout and system analysis. an additional inductor in series with the armature coil could similarly assist to alleviate speed variations because of

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DC Microgrids: Advances, Challenges, and Applications

Chapter 14

Passive Islanding Detection Method Using Static Transfer Switch for Multi-DGs Microgrid

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Book Editor(s):Nikita Gupta, Mahajan Sagar Bhaskar, Sanjeevikumar Padmanaban, Dhafer Almakhles

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Summary

The designing and controlling of the microgrid in both modes, stand-alone mode and utility-connected mode, is a central concern. After main grid interruption and resynchronization with the grid, the power sharing is an interesting task. Similarly, in a single-phase inverter-based microgrid, the islanding occurs during grid dis-connection, which is one of the important aspects.

In this paper, appropriate relay management in a single-phase system is projected for islanding and active power allocation in between multi-distribution generations (DGs) units. Micro-switch acting as a relay is used here for disconnection and synchronization of DGs by using Static Transfer Switch (STS). There are several types of islanding detection methods (IDM) out of these passive islanding methods that are competent, financially cheaper and easily implemented; however, they have large non-detection zones (NDZ). The conventional passive islanding methods are unable to sense islanding conditions when the generating power is approximately equal to load power. In this paper, various passive and active islanding methods are discussed along with their merits and demerits, and individual lower-order harmonics are investigated along with STS, which, as a new effective passive islanding method, is proposed for the inverter centered utility connected system. This scheme can be properly useful along with the existing passive methods. The proposed method overcomes the limitation of the passive method and has a benefit that it is able to reduce the Non-Detection Zone (NDZ). The test result of simulation and experimental set up is analyzed, which fulfills the requirement of IEEE 1547 standards.

Exploring the Fallacies in the Overcurrent Relay Coordination Optimization Problem with Simple Cases

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***Abstract* – Overcurrent relays are used in distribution systems for providing primary and back up overcurrent protection. They have two adjustments: the Plug setting (PS) and the Time multiplier Setting (TMS). Their optimal coordination is necessary to safeguard the system and hence it is stated as an optimization problem.**

The sum of the operating time of all the relays in the system has been chosen as the index of optimization by researchers all over the world. This paper through simple elementary cases analyzes the overcurrent relay coordination problem, and demonstrates that the PS is more efficient than the TMS, for minimizing the index of optimization The paper then argues that: as it is the PS element responds to the fault current and the TMS was and is merely used to extend the range of the PS, hence it is no wonder that all the optimization algorithms report better and better results by using more of the plug setting than the TMS. It tries to modestly point that researchers have overlooked this reality and drifted away from basic fundamentals.

Index Terms - Overcurrent relay coordination, Plug setting multiplier, Time Multiplier Setting, Optimization

I. INTRODUCTION

Since the day the first transmission line was laid in the late 19th century, power systems have today evolved into intricate networks spanning miles of distance. These networks are interconnected to form grids of various voltage levels. This structure is getting complicated further by the penetration of distributed generation and FACTS devices into them. At the same time the demands of uninterrupted power with excellent power quality have made the protection of these systems formidable. As a result the task of the electrical engineer has become more than difficult.

The majority of the protection principles, like directional overcurrent protection, distance protection and differential protection, were developed within the first three decades of the 20th century [1]. The technology used then was electromechanical.

Today the protection schemes are expected to operate within a few cycles of the supply. The development of fast acting circuit breakers, use of computers and the shift in relaying technology from electromechanical to digital has aided this. The idea of digital relaying was contemplated during the late 1960s [2]. Rockefeller suggested that digital computers can be used to protect power system equipment [3, 4].

Directional overcurrent relays have been at the center stage for protecting distribution systems [5]. They are specially used in ring distribution systems as fault current that flows in either direction is the same. They are also used for back-up protection in transmission lines. The factor that aids them in this is their inverse time current characteristics [6]. Due to this they can be made to operate selectively. Back up protection can be provided using them because their operating time can be varied with the severity of the fault current.

The primary aim of the plug setting is to decide the threshold above which the relay operates. As the name itself suggests the time multiplier setting was used to extend the range provided by the induction disc element, and create greater time lags between the initiation of the fault and the opening of the relay contacts.

The optimal time coordination of these relays is a major topic of interest amongst researchers. In the 80's the analytical approaches towards optimization were used. However finding the optimal solution was difficult for large systems because of the huge number of constraints and the multidimensional nature of the problem. Time consuming manual calculations had to be done. Breakpoints [7] had to be found. Also finding the global minimum was difficult as the solution used to get trapped in local minima.

With the development of genetic algorithms (GA) by Goldberg [8] the picture changed. There was no need of finding the breakaway point. After the year 2000 various population based metaheuristic algorithms were developed. Prominent among them are Genetic algorithm [9], Particle swarm optimization (PSO) [10], the Ant colony optimization algorithm [11], the Honey bee mating algorithm [12], Firefly algorithm [13] and the Biogeography algorithm [14]. Researchers applied these to obtain better solutions. There was a diminished possibility of these algorithms getting trapped in local minimum was.

However it is found that in the research papers of all the researchers, the TMS values of all the relays approach the lower bound [15, 16] as shown in Table 1. This is a striking feature because after all, the TMS were supposed to be used for creating the time delays. With this observation the question comes to the mind: Is the optimal solution obtained when we make the PS as the only variable and the time multiplier setting fixed at lower bound?

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IoT based Monitoring of Lathe Machine Motor in Metal Industry

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***Abstract*— Optimized use of electrical energy is prime objective of various metalworking Industry. The problem definition for this work is considered from the industry located in Hingna MIDC, Nagpur, Maharashtra, India. It is conveyed that during operational hours most of the operator working on lathe machine keeps the motor of lathe machine in running condition even when they are not performing any metal job on the machine. Leads to wastage of electrical energy and increased electricity bill. As per the guidelines issued by bureau of energy efficiency industry should conserve the electrical energy in every energy conversion process. This research work deals with IoT based monitoring of lathe machine operator so as to cut down the idle running of the lathe machine which benefits in conservation of electrical energy and reduced electricity bill. This work is also extended to monitor the various parameters of electric motor. System design consists of low budget sensors and microcontroller. A open source Thing Speak IoT based cloud service is used for data analytics and data storage purpose. Experimental results reveal the effectiveness of implemented prototype.**

***Index Terms*— Internet of Things, Energy Conservation, Induction Motor.**

I. INTRODUCTION

Induction motors is commonly used in various Industries to achieve certain objective. This motor has several advantages such as robust, low cost, easy to operate and highly reliable. [1- 3] generally rotating machine required more attention and maintenance as compared to static electrical machine. Regular maintenance is carried out in industries of various auxiliaries installed. Predictive maintenance and preventive maintenance is regularly carried out in industries so as to reduce the down time of manufacturing process. Predictive maintenance is carried out by analysing the performance of machine. To judge the performance of machine data of certain set of motor parameter is required e.g. motor voltage, current, motor speed in rpm, temperature of winding, rotor eccentricity and motor assembly vibration. These values then compared with standard values if there is any deviation found in value accordingly maintenance of that machine is initiated. [4-5] conventionally predictive maintenance data is monitored by on site methods using analog or digital measuring instruments [6] now a days with the evolution of technology any data can be monitor remotely with the help of Internet of things [7]

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A Simulation of Different Characteristics of Solar PV Grid Connected System

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***Abstract*— Solar energy is one of the most important non-conventional resources that can be used to produce electric energy through the solar photovoltaic process. A powerful advantage of solar photovoltaic (PV) systems is the use of comfortable and free energy from the sun. The characteristic of photovoltaic cell/array/module solar systems is necessary to gain a good show of structure under various conditions. The characteristics permit the simulation of photovoltaic cell/array/module systems that receive various solar temperatures and illumination levels. The solar array for a PV array turns on the unspecified variable, sometimes they turn on meteorological. This research paper expands the algebraic model in MATLAB/ Simulink environment of solar PV array system and plots different characteristics like Io - VO, Po-Vo, and Po- Io of solar array photovoltaic cell/array/module System**

Keywords—***Solar PV modeling, Solar cell characteristics, PV systems, MATLAB/ Simulink***

I. INTRODUCTION

Energy requirements of the customers achieved through the conventional power plant (TPS,HEPS,NPS) grid have become obsolete to meet the utilities. Further awareness of customers about green technologies, environmental concerns, and depletion of the stock of fossil fuel has forced planners and grid designers to explore the various renewable energy sources and alternative sources. PV-module and wind power generators, now, have become the standard renewable sources of electrical energy generation. PV Modules, which convert solar light photon energy to electrical energy. PV Modules is one of the best renewable energy and environmentally friendly solar energy sources. The main purposes of PV modules generate DC voltage [1-6]. Recently, PV array systems have been used in several electric power applications. Despite the high initial cost and low efficiency, the PV system has small operation and maintenance costs as it is a stationary source of energy fabricated from semiconductor material. Compared with oil prices, solar energy is a feasible energy supply with great long-term benefits. PV cell is considered the fundamental power conversion unit of a PV-based power system [1-6]. Temperature, solar isolating and voltage output of photovoltaic cell/array/module are the important factors that affect the output characteristics of a photovoltaic cell/array/module. Since the PV has a nonlinear current-voltage (I-V) characteristic, it is vital to model the PV unit for MPPT (maximum power point tracking) in PV- based power systems [1-5].The characteristic of PV solar systems is a condition to get a good result of systems under different situations. The solar PV characteristic permits the Matlab simulation of solar PV systems under various temperatures and Irradiances level. The solar models turn on the unknown parameters, sometimes, they turn on atmospheric Conditions. Therefore, the characterization and simulation of PV modules using models are important to determine the performance. Generally, as we know that the performance of solar PV cells, modules, and array systems depends on the I-V (current-voltage) curve of each cell, module, and array. The main purpose of an inverter is to get a DC from DC-DC Converter and convert it into AC and MPPT (maximum power point tracker) to show maximum power from the solar PV system.

In solar system there are different generations of PV technologies are available for electricity generation . But only three main generations of PV technologies are use .

1. Semiconductors materials- semiconductors materials as crystalline silicon are used.
2. Solar cell- In solar cell thin films made of Cadmium-Telluride (CdTe), Cu (In,Ga) are used for power generation
3. Hybrid cells-In this generation system organic and inorganic materials are used. [7-9]

The PV models developed so far describe output characteristics with solar insulations and cell temperature as input parameters whereas in this paper cell temperature is determined by taking into account ambient temperature, solar insolation, and wind speed [10-11].

This paper proposes a study of different characteristic of solar PV System. Section II deals with the solar system hierarchy. These equations are implemented for simulation purpose. Mathematical equivalent circuit for photovoltaic array is illustrating in section no. III and in Section no. IV simulation of system and output of solar PV system is given. Finally, Section no. V gives the conclusion.

II. PV SYSTEM HIERACHY

A. Phovoltaic Cell

In Fig. 1, the PV cell is a semi-conductor P-N junction-based photodiode. The main purpose of solar PV cell solar energy convert into electrical power. The photovoltaic cell can be manufactured in a variety of ways and from many different materials. The most common material for commercial solar cell construction is silicon (Si), but others include gallium arsenide (GaAs), Cadmium Telluride (CdTe), and Copper Indium Gallium Selenide (CIGS). Solar cells can be constructed from brittle crystalline structures(Si,