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2022-23

PERFORMANCE AND EMISSION EVALUATION OF BLENDS OF DIESEL FUEL WITH WASTE COOKING OIL IN A CI ENGINE WITH EGR.

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Abstract

The depletion of fossil fuel resources and strict regulation on emission parameters, it is essential to search for improved diesel engine performance and cleaner combustion. Alternative fuels are the candidate fuels of the present and the future. More number of vehicles using alternative fuels worldwide indicates a sure sign of their need. It is clear that without alternative fuels, mankind will not have sustained eco-mobility in the future. Using additives will play a very good role in improving the performance and emissions. The effect of waste cooking oil biodiesel with ethanol additives on the performance and emission of diesel engines were clearly discussed in this article. In this article mainly focused on waste cooking Oil and effect of ethanol and EGR. The different properties of this fuel are evaluated using ASTM test standard and compared in relation to that of conventional diesel oil. All experimentation carried out on TV2, Kirloskar, Single acting, 4-stroke, water cooled diesel engine having a rated output of 16HP at 1800 rpm and a compression ratio of 17.5:1, with varied load 0% to 100% of full load with increment of 20%. Waste cooking oil biodiesel and ethanol additives shows marginal variation in performance, combustion and emission characteristic like (UBHC, CO, NOx) are have been evaluated and compared with diesel.

Keywords: CI Engine, Waste cooking oil, Ethanol, EGR, Performance, Emissions and Combustion Characteristics.

I. INTRODUCTION

Over the last two decades in India, there has been a tremendous increase in number of automobiles. Currently the motor vehicle population in India is about hundred millions. The economic progress of a country will be decided by the amount of fuel consumption per capita. India is home to more than billion people, about "one sixth" of the world human population. One factor that has decelerated India's rate of economic development is the need to import of about 70% of petroleum demand which costs approximately

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Artificial Intelligence based Algorithms used for Solving Personalized Medicine Problems in Personalized Medicine Application

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Abstract: Artificial Intelligence consciousness has altogether acquired grounds in our everyday vocation in this time of data and innovation. Similarly as with any field of study, advancement happens as far as forward leap or formative exploration prompting headway and well-disposed ease of use of that particular innovation. Issues from various regions have been effectively tackled utilizing Artificial Intelligence algorithms. To involve AI algorithms in taking care of Personalized Medicine issues, for example, illness recognition or forecast, precise infection finding, and treatment improvement, the decision of the algorithm impacted by its capacity and pertinence matters. This paper surveys the application and capacity of counterfeit brain organization (ANN), support vector machines (SVM), Naïve Bayes, and fluffy rationale in taking care of customized medication issues and shows that the acquired outcomes live up to assumptions. Additionally, the accomplishment from the past investigations urges designers and analysts to involve these algorithms in tackling Medical and Personalized Medicine issues.

Keywords: Artificial Intelligence; Brain organization; Naïve Bayes; Personalized Medicine issues; Support Vector Machine

I. INTRODUCTION

It is generally an astonishing issue seeing a medication works for certain individuals and be less viable on others or causing aftereffects in another. One more issue is the topic of why certain individuals foster a few sicknesses for example diseases, while others don't. Hereditary make-up and other differential factors like age; way of life could be explanations behind these issues. In that capacity, accepts medication should move toward each patient's sickness as remarkable, with drug custom fitted to the person's history and science. This way to deal with clinical practice is known as Personalized or Precision Medicine.

Patients with same diagnostics result should not be dealt with the same way; they can get different treatment to accomplish proficient treatment as represented in Fig. 1. Customized medication as a branch or expansion of Medical Sciences utilizes practice and clinical choices to convey altered medical services administration to patients. The significant job of customized medication as placed by is to foresee the chance of a singular fostering an illness, accomplish exact analysis, and upgrade the best treatment accessible.

This is achieved with the assistance of hereditary data, which is utilized as a feature of the benchmark information in fitting or modifying clinical treatment or organization. Yet, most of replicable discoveries don't pinpoint normal qualities fundamental weakness or assurance from sickness; all things considered, current arrangement focuses essentially on interesting hereditary variations, albeit various normal variations have facilitated understanding also.

The field of medication has fundamentally developed throughout the long term and accentuation is placed on thinking about forestalling infections by the utilization of current advancements to figure out the chance of individual having a sickness and giving the individual therapies (perhaps sedates) to control the event of the anticipated illness. Likewise with the utilization of innovation, clinical staff (for example specialists and drug specialist) can convey a particularly effective medical care administration rather than customary strategies.

The utilization of Artificial Intelligence strategies in setting up or building customized medication is significant as far as accuracy and precision of infection revelation, treatment, and medication organization. The control of antagonistic medication responses and compounds digestion which brings about certain individuals having issues dispensing with drugs from their bodies, thus prompting glut; while others wipe out the medication from the body before it finds the opportunity to work. The utilization of PC's in clinics and clinic to record clinical exercises or utilization of electronic wellbeing record (EHR) frameworks these days gives clinical information and information that can be utilized as a benchmark to improve clinical benefit conveyance.

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"Mamatheya Thottilu" Real Time Baby Cradle with Smart Assistance using IoT

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Abstract— Baby care has become more crucial and difficult for working women in recent years. Working mothers will not have enough time to continuously monitor their children even at home. They either send their child to live with their grandparents or give the baby to a baby caretaker. A smart cradle with an automated baby monitoring system was developed in the proposed work. The essential infant parameters, such as temperature, heart rate, gas molecules, and the baby's motion and position, were measured and monitored in the baby monitoring system. The RaspberryPi board is used to connect the actuators and sensors together. The baby monitoring system will provide an incubator-like atmosphere for the infant. system is attached to the cradle. The baby is monitored round-the-clock by the baby monitoring system. The Internet of Things (IoT) aims to make life easier, and people are more likely to invest in things that make their lives easier. As a result, the number of IoT applications in various fields continues to rise. In order to speed up response times and provide parents with a greater sense of security, the Internet of Things (IoT) is incorporated into our baby monitoring system in this research work.

Keywords: Smart Baby Cradle, Feature extraction, Face recognition, Sensors, Local binary patterns,

1. INRODUCTION

The number of working mothers in Industry and work from Home has skyrocketed in recent years. As a result, taking care of children has become a daily struggle for many families. As a result, the majority of parents send their children [1] to baby care homes or the homes of their grandparents. However, in either normal or abnormal circumstances, the parents are unable to continuously monitor their infants' health.if the sound of baby's cry is greater than a given present value, the baby will swing. For the value of y, the threshold level of a baby's cry is typically set at 35 decibels. The decibel level of the child's scream is between 30 and 40. Calculations are made for the amplified signal based on the voice input. After that, a digital signal is created from the amplified signal.

An automated baby monitoring system and smart cradle were developed. The essential infant parameters, The baby monitoring system measured and tracked things like the baby's temperature, heart rate, gas molecules, and movement and position. For connecting, the RaspberryPi [2] board is used. the actuators and sensors. In order to provide the baby with an incubator-like environment, The cradle is where the baby monitoring system is attached. The baby is watched round-the-clock by the baby monitoring system.

The level of Noise exceeds the threshold value as normal, the sensor detects cry noise. The proposed cradle structure allows parents to give their children their full attention and bridges the gap between them and their child. The child receives sound, fundamental, and efficient support from the proposed framework[3]. The proposed system makes use of a sensor that detects the infant's movement by estimating infrared light from objects in its perspective. The temperature sensor can measure the temperature and send the information to the cloud, while the noise sensor can distinguish between noise and cry.

Due to the high cost of living, both parents are required to work at the moment. However, they must still look after their children, which add to their workload and stress. Parents who work can't always look after their kids. They either leave their children with their parents [4]or hire someone to look after them while they work. Because of safety concerns and costs, some parents do not want to hire a caretaker. Therefore, an IOT-based baby monitoring system and automatic swing system that can monitor the condition of the baby in real time are proposed solutions. The programmed child support can be used at home or in medical facilities. Infant care is beneficial for working guardians and medical clinics.

OBJECTIVES:

- To design a prototype of a smart cradle where it aims at monitoring the vital signs (cry detection, foul smell detection etc) of the baby by the data is obtained from the sensors.
- To keep track of the baby's activities and health conditions using appropriate sensors.
- To develop a mobile application that sends a notification to the parents with alarm and message.

2. LITERATURE STUDY

The main purpose of this study is to overcome the difficulties experienced by the mothers during the sleeping period of the babies and to put the babies to sleep in a comfortable and peaceful way as if the babies were in the mother's lap. In this direction, the motion that the mother made while sleeping her baby on the lap was modelled , and a cradle designed to repeat mother movements based on this model. In the modeling phase, ten subjects were experimented. A doll was given to the subjects and it was requested that to perform a baby rocking motion on their

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Prediction of Cardiac Arrhythmia using Machine Learning

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Abstract - Cardiac arrhythmia is an irregular heartbeat that might be excessively fast, too slow, or unstable. Electrocardiography (ECG) is a test that identifies heart arrhythmia. It uses electrodes placed on the chest to record the neural signals of a patient's heart across a long period. Doctors often examine ECG signals to identify cardiac arrhythmias because they reflect the physiological state of the heart. A crucial medical skill specialist is the ability to recognize harmful types of heart arrhythmias from ECG data. However, a doctor's manual interpretation of ECG waveforms is tedious and time-consuming. As a result, developing automatic approaches to identify abnormal circumstances from routinely collected ECG data is critical. Furthermore, if cardiac problems can be diagnosed automatically through health monitoring, prompt first aid procedures can be applied quickly. Machine learning algorithms are used inside by the equipment. In this case, machine learning will be crucial. While increasing cardiovascular disease (CVD) risk factors are linked to an increased likelihood of developing heart issues in humans, CVD is caused by ECG fluctuation signals and certain clinical situations. The algorithm Random Forest (RF) is implemented in the proposed work and obtained an accuracy of 98%.

Keywords:- Electrocardiograph), Cardiovascular Disease (CVD), Random Forest (RF) ,Machine Learning algorithm.

I. INTRODUCTION

Cardiac arrhythmia is a phrase used to refer a range of cardiac arrhythmia problems for which the heartbeat is irregular, rapid, or slow. Arrhythmias come in a variety of forms, some of which have no symptoms. When symptoms do occur, tremors or a sense of a pause in heartbeats may be noticeable. In more extreme situations, light-headedness, fainting, chest tightness, or chest pain may develop. indicate an underlying heart condition or disease, such as heart disease or cardiomyopathy. Therefore, it is important to consult a healthcare professional if you suspect you have an arrhythmia or if you experience symptoms such as palpitations, chest pain, shortness of breath, or fainting. Depending on the type and severity of the arrhythmia, treatment options may include medication, lifestyle changes, or procedures such as ablation or implantation of a pacemaker or defibrillator. In some cases, surgery may be necessary to correct the underlying problem.

Approximately 80% of due to heart deaths are caused by ventricular arrhythmias. Arrhythmias can strike anyone at any age, but they are more common in the elderly. Arrhythmia is triggered by a disturbance in heart rate abnormalities, but certain conditions such as hypothyroidism, anemia, or chronic obstructive pulmonary disease (COPD) can cause a slower heart rate (bradycardia). On the other hand, conditions such as hyperthyroidism, caffeine or alcohol consum... and certain medications can cause a faster heart rate (tachycardia). A heart rate that is consistently above or below the normal range may be a sign of an underlying health problem and should be evaluated by a healthcare professional. Arrhythmia until there is an exogenous trigger, such as drug abuse or an electric shock. Pulses may not be able to flow through the heart adequately if there is a root problem, increasing the risk of arrhythmia. This means that the electrical impulses that control the heartbeat originate from the sinoatrial (SA) node, which is located in the right atrium of the heart, and are conducted in a regular pattern through the atria and ventricles. A normal sinus rhythm typically associated with a heart rate of sixty to one hundred beats per minute and is considered a sign of a healthy heart.

A cardiac arrhythmia (abnormal heart rhythm) is one of the most frequent heart illnesses. It occurs when your pulse is too rapid, too slow, or beats in an irregular rhythm. In fact, most people experience heart arrhythmias on a regular basis. The electrical activity in the heartbeat follows the normal pattern in a normal heart rhythm (normal sinus rhythm).

- The cluster and the pulse can both be continuous (about 50 to 100 beats per minute).
- Tachycardia is characterised by a fast heartbeat (greater than 100 beats per minute)
- A sluggish heartbeat is known as bradycardia (less than 60 beats per minute)

II. HISTORICAL PERSPECTIVES AND CURRENT TRENDS

The machine learning network has made significant progress in recent years in using ECG signals to help diagnose heart diseases [1-6]. With the advancement of technology for artificial intelligence (AI), numerous techniques from the field of machine learning are utilized in the process of feature detection of the electrocardiogram (ECG) signal to address issues related to a large number of signal features and the challenging task of manual intervention. Past two years there is research proposed by researches and they find the optimization-based deep learning approach to classify five distinct heartbeats.

The following machine learning algorithms are used to classify arrhythmias: Support vector machines (SVMs) (11-15), artificial neural networks (16–19), optimal path forests (20), and Independent Component Correlation (ICA) Algorithm [21]. Recurrent neural networks (RNN) or long

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PERFORMANCE AND EMISSION CHARACTERISTICS OF CI ENGINE USING WASTE COOKING OIL BIODIESEL BLENDS WITH ADDITION OF Al2O3 NANO-PARTICLES

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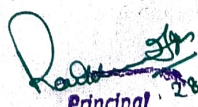
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Abstract

The renewable energy sources have gained their importance from last few decades. The enhanced environmental concerns & exhaustion of fossil fuels reserves has inspired the researcher to find alternative energy sources. The biodiesel obtained from Vegetable oil & animal fat is recommended for replacement of conventional fuels. The use of Waste Cooking Oil is economical and makes the biodiesel competitive in price with petroleum based fuels. The current study is aimed to study the influence of Aluminium oxide nano additives on the performance and emissions characteristics of compression ignition engine fueled with waste cooking oil bio-diesel. In the experimentation, 50ppm & 100ppm of Aluminium oxide nano-particles were mixed in waste Cooking Oil biodiesel. Experiments were carried out with B20WCOME and adding Aluminium oxide nano particles in the proportion of 50ppm & 100ppm respectively to B20WCOME biodiesel blend. The results revealed that, the brake thermal efficiency increased and specific fuel consumption has reduced for B20WCOME & B20WCOME nano additive blends. When compared with diesel, there is a significant reductions in the parameters like UBHC, NO_x and CO emissions for B20WCOME in conjunction with 50ppm &100ppm Aluminium oxide nano-additive blends. However, there is a slight increase in NO_x emissions for B20WCOME & B20WCOME nano additive blends.

Keywords: CI Engine, Waste Cooking oil Biodiesel, Aluminium Oxide nano particles

1. Introduction

Globally, the fossil fuels have been considered as main energy resources from last several decades. The petroleum based fuels are non-renewable sources & these sources will be depleted soon due to growing population and increased industrialization. The extreme use of these non-renewable sources has caused many negative implications to the environment. This has made us to

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Effect of Al$_2$O$_3$ and CeO$_2$ Nano-Additives on Performance and Emission Characteristics of Diesel Engine Fueled with Neem Oil-Biodiesel

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Abstract

Due to the rapid depletion of petroleum reserves, many countries recommended the use of vegetable oils as diesel engine fuel. The best way to use edible and non-edible oil as a diesel fuel is to convert it into biodiesel. Biodiesel is a fuel which can be used instead of diesel fuel as an alternative for the existing system of CI engines. The usage of biodiesel causes a few disadvantages like high nitrogen oxides, utilization of high fuel and higher density. To conquer these problems some promising nano-additives are identified for having been used in the production of biodiesel. However, the addition of Nanoparticles will possibly enhance the performance and reduce the emissions. Therefore, the present investigation focuses on the influence of Al$_2$O$_3$ and CeO$_2$ nano-additives on the performance and emissions characteristics of CI engine fueled with methyl esters of Neem. As nano-additives Al$_2$O$_3$ and CeO$_2$ contain high oxygen content, it leads to complete combustion of fuel thereby increasing performance and reducing the oxide formation. In the experimentation, 50ppm, 100ppm of Al$_2$O$_3$ and CeO$_2$ nano-additives were mixed in methyl esters of Neem. Subsequently, the fuel blends of Neem biodiesel (B20N) alone and Neem biodiesel with 50ppm, 100ppm of Al$_2$O$_3$ and CeO$_2$ nano additives in CI engine were employed. The results revealed that, there is a increase in the break thermal efficiency and decrease in specific fuel consumption for B20N and B20N additive blends. Significant reductions in the parameters like CO, UBHC and NO$_x$ emissions are attained at B20N in conjunction with 50ppm, 100ppm of Al$_2$O$_3$ and CeO$_2$ Nano-additives blends as compared with diesel. However, there is a slight increase in NO$_x$ emissions for B20N and and additive blends.
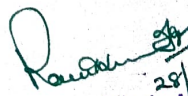
Keywords: Al$_2$O$_3$ Nano-Additive, CeO2 Nano-Additive, CI Engine, Neem Biodiesel

1. Introduction

Internationally, there has been a tremendous establishing over the Globe in last two decades. The population of motor vehicles in India is about one hundred million. This has increased the need for fossil fuel. Due to the exhaustion of fossil fuel, the world is facing the inadequacy of energy and rise of petroleum price. 'Transportation' section is distinct and is mainly depending upon the petroleum fuel. This will greatly affect the country's economy. Petroleum based fuels are non-renewable energy sources and cannot be restored again. Because of ever growing population,

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A Hybrid Optimization Algorithm and Shamir Secret Sharing Based Secure Data Transmission for IoT based WSN

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Abstract: Nowadays, Wireless Sensor Networks (WSNs) are extensively utilized as the communication system in the Internet of Things (IoT). Security of the sensor nodes is considered as one of the important aspects of the IoT-based WSN because the nodes in the network are susceptible to malicious attackers. The main objective of this investigation is to generate secure routing and mutual authentication over the IoT-based WSN. In this paper, the Hybrid Optimization Algorithm (HOA) based secure Cluster Head (CH) selection and routing path generation is obtained for secure data transmission. The HOA is the combination of the Grey wolf optimization (GWO) and Moth Flame Optimization (MFO) whereas the fitness functions are trusted value, residual energy, distance and node degree. Additionally, the Shamir Secret Sharing (SSS) method is used for providing mutual authentication between the nodes. The performance of the HOA-IoT-WSN is analyzed in terms of Packet Delivery Ratio (PDR), Packet Loss Ratio (PLR), Average End-to-End Delay (AEED) and network overhead. An existing method such as Energy-efficient and Secure Routing (ESR) protocol, Hybrid Harris Hawk and Salp Swarm (HHH-SS), and Light Weight Trust Sensing (LWTS) methods are used to evaluate the proposed HOA-IoT-WSN method. The PDR of the HOA-IoT-WSN method is 99.848% for 100 nodes, it is high when compared to the ESR, HHH-SS and LWTS.

Keywords: Hybrid optimization algorithm, Internet of things, Packet delivery ratio, Shamir secret sharing method, Wireless sensor networks.

1. Introduction

Sensor networks that use both wireless and wired technology have attracted a lot of academic attention during the last few decades. The internet of things (IoT) is enormously developed for a diverse variety of sensor network applications which includes military, smart sensing, pollution sensing, undersea sensing, industrial and farming applications. Specifically, the applications of leakage detection, target tracking, intrusion detection, and fall detection are performed using the IoT [1-3]. A huge amount of nodes are installed in the IoT paradigm where each node performs monitoring, sensing, and processing operation based on connection and coverage [4]. IoT-enabled devices, such as computers, tablets, and smartphones, can access data about the environment and other things without the need for human participation [5-7]. While the internet of things'

mission is to combine all types of sensing, communication, information management, and networking so that anybody may use any item or system. Sensors installed in a home, for example, may keep a person updated about any medical or security risks via mobile phone.

The wireless sensor network (WSN) is a critical component of IoT-enabled smart city applications. A WSN is a collection of wireless networks that are linked together to form a distributed network of autonomous devices [8, 9]. Sensors in WSN are movable, which means the sensor nodes can join or leave the network at any time. Because of the mobility nature of the sensor, security concerns related to malicious node intrusions are increased in the network [10]. There have been a number of technical problems with the WSN implementation for creating IoT applications, including battery life, transmission range, and processing capacity [11, 12].

ORIGINAL CONTRIBUTION

Performance Analysis of Probabilistic Encryption on FPGA for Wireless Sensor Nodes

G. Leelavathi[1] · K. Shaila[2] · K. R. Venugopal[3]

Abstract The public key cryptography processor with probabilistic encryption is designed, and its performance with area and execution speed is analyzed as throughput rate. The processor contents the 0.053% of device usage and speed of 968.9 MHz. Throughput of 158,914 Mbps is accomplished. An implementation outcome of proposed PKCP attains a substantial reduction in utilization of hardware. This makes it more suitable for implementations of public key cryptography in ultra-low power devices like Wireless Sensor Nodes.

Keywords FPGA · Probabilistic encryption ·
Quadratic residue problem (QRP) · TPS · TPL ·
Wireless sensor networks

Introduction

The potentials of FPGAs and their practice in wireless sensor node architectures and applications are discussed in the literature [1]. Wireless sensor networks contain a number of sensor nodes positioned arbitrarily in the region of interest. Security is the main issue while proposing dedicated sensor node hardware [1, 2]. Most security protocols are developed on the foundation of computation concentrated public-key cryptography, due to the under-privileged processing power of sensor nodes which are not directly adaptable to WSNs. The two main factors on which security of the encrypted data depends on are strength of the cryptographic algorithm and privacy of the key.

The design presented adopts the accelerator-based computing paradigm, together with acceleration of data encryption and decryption in WSNs. Major problem with the sensor nodes is their constrained resources in terms of time, power and space which bound the nodes ability to handle additional calculations required by cryptographic operations. The main objective of the work is to reduce area utilization along with processing time. At the cost of flexibility, chip area and power consumption field programmable gate array hardware-based solutions promise high performance and efficiency.

Literature Review

A summary of the fundamentals of WSNs, opportunities, challenges and issues are explored in the literature [3–6]. The security mechanisms and current states for WSNs are discussed in the researches [7]. Re-configurability is the feature to update and improve implemented security functions when necessary, [8] that makes the designed hardware, a viable tool in cryptographic applications. AES,

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Impact of Al$_2$O$_3$ nano-additives blended with biodiesel derived from chicken fat oil on performance and emission characteristics of a diesel engine

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Abstract- The experimental investigations on the influence of Aluminium Oxide Nanoparticles blended Chicken Fat Oil Biodiesel (Methyl Esters) on the Performance & Emission characteristics of CI engine is reported in this paper. In the experimentation, the proportion of 50ppm & 100ppm of Aluminium Oxide Nano-particles were mixed with Chicken Fat Oil Biodiesel. The analyses were progressed with a blending ratio of B20CFOME (Chicken fat Oil Methyl ester) individually and in combination of the blending ratio of B20CFOME with Aluminium Oxide Nano-particles in the proportion of 50ppm & 100ppm respectively. The results revealed that, there is a significant increase in brake thermal efficiency and reduction in brake specific fuel consumption for both B20CFOMEblending and the B20CFOMEwith Nano additive-blends. The Emission parameters like hydrocarbons & carbon monoxides are decreased whereas, the slight increase in nitrogen oxides for B20CFOME & B20CFOME with Nano additive blends were noticed when compared with diesel. In conclusion, all the parameters studied were displayed better performance at in combination of B20CFOME with Nano additive-blends compared with an individual blending ratio of B20CFOME.

Key words: CI Engine, Chicken FatMethyl Esters (Biodiesel), CFOME, Aluminium Oxide nano particles

INTRODUCTION

Due to fast increase in the growth of several industries and vehicles, the necessity for fossil fuels is increased in the current situations. As these fossil fuels are depleting sources of energy, there is a need for search of new alternative sources. Biofuels are the key source of alternative energy sources since they are sustainable & Eco friendly.[1] Bio diesel is produced from Vegetable oils & Animal fats. Because of less environmental impact, the use of fat oils &

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their methyl esters are became popular now a day. The viscosities of these oils are considered as limit to use in IC Engines, the transesterfication process is used to reduce the viscosity of fat oils. The inclusion of biodiesel & metal oxide nano-additives to diesel fuel enhances the performance and emission characteristics of the CI Engine. This could decrease some dependency on the fossil fuel & also using of biodiesel & nano additives does not need any Engine modification.[2] In the present study Chicken fat oil methyl esters are used to study the Performance & Emission characteristics of CI Engine.

Studies on Ruthenium and Rhodium Complexes Containing 1,2- bis (N-Methylbenzimidazolyl)Benzene and Catalytic Transfer Hydrogenation

Hunasekatte G Bheemanna[*], Virupaiah Gayathri[†] and Nadur M Nanje Gowda[‡]

Abstract

Reactions of ruthenium(III) chloride and rhodium(III) halides with 1,2-bis(N-methylbenzimidazolyl)benzene (N-N) in stoicheiometric amounts in methanol produced binuclear complexes of the compositions $[RuCl_2(\mu\text{-}Cl)(N\text{-}N)]_2$ and $[RhX_3(N\text{-}N)]_2 \cdot nH_2O$ (n = 0, X = Br ; n = 1, X = Cl). $[RhI_3(N\text{-}N)]_2$ was prepared by stirring a mixture of rhodium trichloride with fifteen fold excess of sodium iodide and the N-heterocycle, N-N in methanol. Ruthenium chloride and rhodium halides in 2-methoxyethanol/alcohol reacted with N-N in presence of CO to produce complexes of the types $[RuCl_2(CO)_2(N\text{-}N)]$, $[Rh_2Cl_2(CO)_2(N\text{-}N)]$ and $[Rh(CO)_2(N\text{-}N)]Br$. The

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Synthesis and Antioxidant Studies of Co(II), Ni(II) and Zn(II) Metal Complexes of 6-Pyridyl-5, 6-Dihydrobenzo[4,5]-Imidao[1,2-C] Quinazoline (N-N) Derivatives

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ABSTRACT

The major class of organic molecules synthesis involved by the various atoms in their molecules, and they are joined in rings containing at least one atom in any synthesized compound of an element other than that of carbon atom (C). The current study aimed to synthesize the heterocyclic compound as one of the derivative N-heterocycle (I) using various complex materials and to determine their biological property in *in vitro* antioxidant study. Synthesis and antioxidant activities of novel Co(II), Ni(II) and Zn(II) Metal Complexes of 6-Pyridyl-5,6-Dihydrobenzo[4,5]-Imidao[1,2-C] Quinazoline (N-N) derivatives were undertaken employing a convenient and easily accessible procedure. The structures of all the synthesized compounds were confirmed with elemental analysis, IR, C^{13} NMR and H^1NMR to know the probable structure of the molecules by stereochemistry. The synthesized five compounds were screened for *in vitro* antioxidant activity by 2, 2-Diphenyl-1-picrylhydrazyl (DPPH) method. In Antioxidant studies, compound C-2 exhibited maximum inhibition (77%) at 250μg/ml concentration showing satisfactory DPPH free radical scavenging potential with the IC_{50} concentration at 33.61μg/ml compared to the standard drug, ascorbic acid with 6ug/ml used for the study and other compounds were also exhibited minimum antioxidant property.

Key words: Heterocyclic compounds, DPPH, Ascorbic acid, Radical scavenging activity, Stereochemistry.
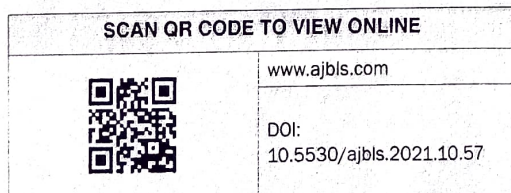
INTRODUCTION

From the last 4 decades, quinazoline and quinazalones skeleton have gained more attention in the class of heterocyclic compounds with due to their remarkable biological and synthetic application. The quinazoline and quinazalones derivatives with complexes are used as drugs in the form of anticancer, antiviral, antibacterial, anti-inflammatory as they exhibit broad range of pharmacological activity.[1-3]

Heterocyclic compounds are of greater value since they are used as key starting materials for synthesis of active pharmaceutical products. Synthesized compounds containing heterocyclic ring systems are of significant both medicinal and industrial applications. As an example, five membered ring heterocycles containing two carbon atoms, two nitrogen atoms and one oxygen atom, known as oxadiazoles, these are having various applications like medicinal, pesticide chemistry, polymer and material science.[4]

In view of wide range of biological activities of Imidao[1,2-C] Quinazoline (N-N) derivatives, a new series of metal complex analogues were synthesized.

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Fluid Flow in Composite Regions Past a Solid Sphere

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Abstract: A steady, 2-D, incompressible, viscous fluid flow past a stationary solid sphere of radius 'a' has been considered. The flow of fluid occurs in 3 regions, namely fluid, porous and fluid regions. The governing equations for fluid flow in the clear and porous regions are Stokes and Brinkman equations respectively. These governing equations are written in terms of stream function in the spherical coordinate system and solved using the similarity transformation method. The variation in flow patterns by means of streamlines has been analyzed for the obtained exact solution. The nature of the streamlines and the corresponding tangential and normal velocity profiles are observed graphically for different values of porous parameter 'σ'. From the obtained results, it is noticed that an increase in porous parameters suppresses the fluid flow in the porous region due to less permeability, as a result, the fluid moves away from the solid sphere. It also decreases the velocity of the fluid in the porous region due to the suppression of the fluid as 'σ' increases. Hence the parabolic velocity profile is noticed near the solid sphere.

Keywords: fluid flow, Brinkman equation; Stokes equation; interface boundary; permeability parameter.

1. Introduction

The fluid flow through the porous medium is of considerable interest as it is important in natural occurrence. It has great significance in the fields of industrial, geophysical, and biomedical uses. The porous medium is used in chemical industries to obtain a powerful mixing process, filtration, purification, and oil recovery. In nuclear industries, it has been used for effective insulation and emergency cooling of nuclear reactors. In the bio-medical field, to understand the transport process of lungs and kidneys, the flow of fluid through porous media is essential.

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Improved photoluminescence and spectroscopic features of Sm^{3+}–doped alkali borate glasses by embedding silver nanoparticles

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Abstract

Influence of Ag nanoparticles (NPs) on the improvement in photoluminescence and spectroscopic features of Sm^{3+}–doped alkali borate glass synthesized by the melt quenching process was systematically studied and analyzed. The increasing particle size of Ag NPs with the increase of AgCl concentration (0.1 – 0.5 mol%) causes the surface plasmon resonance peak to shift to a higher wavelength (red–shift) side. Electron microscopic investigation confirmed the presence of silver NPs in the SmLAB–1 glass sample with a median size of 4.57 nm. A significant enhancement in emission was noticed for 0.1 mol% AgCl concentration. Such improved emission was attributed to the enhanced local electric field by metallic NPs in the vicinity of Sm^{3+} ions and efficient energy transfer between Sm^{3+} ions and silver NPs. The Judd–Ofelt parameter, Ω_2 decreased as the concentration of Ag NPs increases, indicating increased symmetry and ionicity between the trivalent samarium ions and their ligands. These prepared glass compositions could have applications in solid–state devices such as LEDs and display applications.

Introduction

In recent years, borate–based oxide glass family has received relatively more interest than other glass families owing to its cost–effectiveness, low melting point, better thermal and chemical stability, better rare earth (RE^{3+}) ion solubility, and excellent transparency in the ultraviolet (UV) and near infrared (NIR) wavelength ranges [1,2]. However, pure borate hosts are extremely hygroscopic in nature which exaggerated in the functioning of glasses [3]. The hygroscopic nature, chemical and mechanical stability increases when lanthanum and alkali oxides are incorporated into the borate glass network [4,5]. Thus, alkali borate glass hosts are regarded as one of the best candidates for photonic device applications [6,7]. RE^{3+} ion–activated inorganic glass hosts have been widely accepted in the design of optoelectronic devices such as light converters, lasers, optical fibers, and high–density memory optical amplifiers [8]. It is well known that the fluorescence properties and excitation of RE ions are strongly correlated with the phonon energy of the host, symmetry, and structure of the surrounding environment. Among all the lanthanide ions, the tri–valent samarium (Sm^{3+}) ions are of interest for the investigation due to its strong emission in visible reddish-orange region due to f–f transitions. Therefore, the Sm^{3+}ions doped glass matrices have been widely investigated for color displays, plasma displays, undersea communication, solid-state devices, high-density optical memories, visible lasers etc. [9]. Of all the emission transitions of Sm^{3+}, the transition due to $^4G_{5/2} \rightarrow {}^6H_{7/2}$ gives the emission in the visible region owes strong emission intensity with excellent emission cross–section [9]. This emission from excited Sm^{3+}: $^4G_{5/2}$ state is of relatively high quantum efficiency; however, it depicts the quenching mechanisms at higher concentrations [10]. Recently, embedding metal nanoparticles (MNPs) into RE–routed glasses has emerged as a promising approach for enhancing the emission efficiency of RE^{3+} ions. MNPs may influence RE^{3+} ion emissions in a variety of ways. The local field enhancement stimulated by surface plasmon resonance (SPR) of MNPs has been attributed as a possible cause of luminescence improvement when the excitation or emission of MNPs is resonant or near the SPR. Furthermore, the energy transfer from MNPs to RE ions has also been reported [8]. In particular, noble MNPs such as Au, and Ag along with Cu are commonly utilized to improve the RE^{3+} ion emission efficiency and glass performance. In addition, when stimulated with electromagnetic radiation and constrained near the sharp boundaries of anisotropic nanostructures that serve as light–harvesting nano–optical channels to convert electromagnetic radiation into a huge localized electric field and there by local surface charge densities are enhanced significantly. Inorganic glasses have also been shown to

Improved near–infrared nonlinear optical properties of Sm³⁺ containing borate glasses: Effect of silver nanoparticles concentration

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ABSTRACT

Efficacy of silver nanoparticles on tuning the optical nonlinear characteristics of Sm³⁺ doped borate–based glasses has been investigated comprehensively and the outcomes are provided. The nonlinear optical (NLO) attributes were retrieved using the Z-scan technique under an ultrafast pulse excitation with the wavelength ranging from 700 nm to 1000 nm. Reverse saturable absorption (RSA), ascribed to two–photon absorption, was realized in open aperture Z-scan profiles whereas refraction nonlinearity of positive type due to the self-focusing was observed in closed aperture Z-scan data. Based on the Z-scan results along with the figure of merit condition (higher than unity), it was identified that the silver nanoparticles embedded Sm³⁺ containing glass hosts are competing materials for NLO device applications to function in near-infrared region.

1. Introduction

The nonlinear optical (NLO) properties of several materials (solids, liquids, nanomaterials, crystals etc.) have now been investigated for over 20 years. The assessment of NLO features of materials is beneficial for demonstrating their suitability to use in many applications such as frequency–up conversions, 3D microfabrication, optical limiters, passive mode locking, generation of pulses, high–speed electro–optic modulators, bioimaging, and optical switches [1,2]. The fast development in the communication and laser industry has urged the growing need for new materials that possess high optical nonlinearities for the effective functioning of devices. This has created a tremendous interest in NLO properties of materials [3]. Different materials possessing large

NLO coefficients have been investigated to date. However, the low thermal decomposition and difficulty in preparing them in large scale hinders their practical utility in the actual device fabrication. These limitations can be overcome in glasses [4]. In addition, the glasses are highly isotropic compared to different materials investigated to date. Therefore, glass systems possess high odd order optical nonlinearities which is also crucial for the practical use in the device fabrication. Interestingly, the NLO attributes of the glass matrices can be tuned significantly to meet the requirement of devices by merely modifying the composition without losing the glass formation [5].

Among all other glass families, the borate glasses are found to possess large optical nonlinearities along with high laser damage threshold [6]. Enhancement of NLO characteristics of the glassy materials can be

Near-infrared nonlinear optical characteristics of silver nanoparticles embedded borate glasses activated with Sm^{3+} ions: Effect of heat treatment

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ABSTRACT

The impact of heat treatment on the nonlinear optical (NLO) features of silver nanoparticle–embedded Sm^{3+} ion–containing glasses prepared by the melt–quench method has been investigated and discussed in detail. The NLO coefficients were assessed by the Z–scan method in the near-infrared spectral region using femtosecond, MHz laser pulses. The magnitude of different NLO coefficients, such as two–photon absorption (β) and nonlinear refractive index (n_2), have been shown to be elevated with the heat treatment. Typically, at 800 nm excitation, the two–photon absorption coefficient increased from 0.816×10^{-11} m/W to 1.282×10^{-11} m/W, and the n_2 values increased from 1.896×10^{-19} m²/W to 2.376×10^{-19} m²/W as the heat treatment duration was increased from 10 to 25 h. This improvement in the NLO properties was ascribed to the local field effects stimulated by the silver nanoparticles. The obtained results suggest that the investigated glasses serve as good hosts for fabricating devices such as optical switches and limiters.

1. Introduction

Rare earth (RE) ion–doped glass hosts have been investigated by material scientists over the past few decades to demonstrate their utility in many optoelectronic and photonic devices such as optical amplifiers, displays, LEDs, and solid–state lasers [1,2]. This is due to the fact that the light emitted by RE ions (due to 4f-4f transitions in RE ions) when excited by a suitable wavelength is intense. The intensity of the emitted radiation depends on several factors such as the structure of the glass, the host's phonon energy, the ligand field around the RE ions, and the surrounding network of the RE ions. Furthermore, the emission intensity also depends on the RE ion concentration. It is understood that the emission intensity cannot increase continuously with an increase in the RE ion concentration and displays quenching at higher doping levels [2]. In addition to photoluminescence (PL) investigations devoted to demonstrating RE–doped glasses for photonic devices, nonlinear optical (NLO) investigations on RE–doped glasses have received significant interest in the recent past [3,4]. Interestingly, the outer shell valence electrons and hyperpolarizability of RE ions enhance the NLO properties of the parent glasses [5]. Therefore, RE–doped glasses have been demonstrated for NLO device applications such as power optical limiters, optical switches, communication fiber optic systems, and passive mode locking applications [6].

Furthermore, metal nanoparticle embedded (MNP) glasses have been

Silver nanoparticles enhanced photoluminescence and the spectroscopic performances of Nd³⁺ ions in sodium lanthanum borate glass host: Effect of heat treatment

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ABSTRACT

Silver nanoparticles (NPs) impact on the emission attributes of Nd³⁺ activated $Na_2O–La_2O_3–B_2O_3$ vitreous host matrix has been studied and discussed in detail. The effect of nucleation and growth of Ag NPs occurred due to the different heat–treatment durations at the temperature of 450 °C has been discussed. Transmission electron microscopy measurement revealed the formation of spherically shaped Ag NPs in the studied samples. The median Ag NPs size was increased from 2 to 9 nm with heat–treatment durations. Utilizing the absorption spectra of Nd³⁺ ions, the phenomenological Judd–Ofelt (J–O) parameters ($\Omega_{\lambda= 2, 4, 6}$) were estimated. The optimized luminescence intensity at 1056 and 875 nm have realized for 10 h of annealing at 450 °C, with an enhancement factor of 160%. Moreover, the quantum efficiency for 1056 nm increased steadily with the heat–treatment duration. The stimulated emission cross–section and gain bandwidth for 1056 nm laser transition has shown to be 2.92×10^{-20} cm² and 9.19×10^{-26} cm³ for the Ag NPs embedded glass–composite. The results exemplifies the suitability of Ag NPs embedded glass–composites for the fabrication of compact solid–state infrared lasers.

1. Introduction

The studies on neodymium (Nd³⁺) doped oxide glass embedded with silver nanoparticles have received significant interest in recent past due to their utilizations in infrared (NIR) lasers, high–density optical storage devices, and medical diagnostics, etc., [1,2]. The advantage of the large emission cross–section of Nd³⁺: $^4F_{3/2} \rightarrow {}^4I_{11/2}$ transition at 1056 nm could be exploited by stimulating Nd³⁺ ions at 808 nm. Moreover, Nd³⁺–doped laser materials have interesting features such as higher gain cross–sections and 4–levels laser operation mode, in compare to Yb³⁺–doped solid state laser materials [3].

Studies have manifested the reduction process and ion exchange to explain the growth of Ag NPs in glass matrix [4,5]. Authors have

claimed that under the matching of ionic radius, the successful substitution of anions of the glass matrix by Ag⁺ ions; however, it has the challenge of meeting the requirements of technological demand [6]. Moreover, the occurrence of metal NPs embedded in glass host is of great curious owing to their improved optical properties and finds applications in photonic devices [7,8]. The glass systems embedded with Ag NPs are of particular interest because of their remarkable photonic attributes like the excellent emitting efficiency and transparency of the glass. The feasibility of controlled tailoring of size and structure of Ag NPs has offered the opportunity to tailor their optical properties, for various photonic–device–based applications [9,10]. Furthermore, the rare earth ions emission intensity in glasses can be

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Original research article

Influence of size of Ag NP on spectroscopic performances of Eu^{3+} ions in sodium borate glass host

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ARTICLE INFO

ABSTRACT

In this contemporary technological world, Eu^{3+} ions doped metal nanoparticles embedded amorphous materials are receiving overwhelming interest due to their potentiality in developing LEDs and solid-state lasers for photonic devices applications. Due to which, in the present investigation, we made an attempt to enhance the spectroscopic performance of Eu^{3+} ions in the proposed glasses. A new set of Eu^{3+} ions doped Ag NPs precipitated sodium borate glasses were fabricated using a simple conservative melt quenching method. The results of XRD support the glasses' amorphous phase by exhibiting a large diffuse ring at 20–40°. The optical absorption spectra results reveal that the observed absorption peaks originated from $^7F_0$ and $^7F_1$ ground states to various excited states of Eu^{3+} ions and as usual the observed SPR peak induced by Ag NPs underwent regular red-shift. The presence of spherical and well-dispersed Ag NPs in the glass matrix was confirmed by HR-TEM images. PL emission spectra of the studied glass samples showed that the highest peak emission intensity for NLE-1 glass, and also observed that the enhanced peak intensities for all NLE glasses with precipitation of Ag NPs. This PL intensity improvement is due to the transfer of energy from small clusters of Ag NPs to Eu^{3+} ions. The yield of the $^5D_0{\rightarrow}^7F_J$ emissions is demonstrated utilizing the 1931 CIE chromaticity diagram. In addition, the emission of Eu^{3+} ions has been analyzed using the Judd-Ofelt emission theory.

1. Introduction

In recent decades, rare earth (RE^{3+}) ions doped amorphous materials become one of the emerging fields in photonic devices applications due to their most important unique characteristic features such as tunable phosphors, favorable for lasing action, possess good optical nonlinear properties and varied index of refraction [1–3]. Which are beneficial for the development of LEDs, lasers, fiber-optic communications, display devices, etc. [4–7]. The glass hosts are found to have a significant influence on the spectroscopic performance of the RE^{3+} ions thanks to the perception of electronic excitations and relaxation mechanism with the contribution of two, and more active centers [8]. Electronic transitions of RE^{3+} ions have shown ample multicolored luminescence within $4f \rightarrow 4f$ transitions, which are usually found to be photostable, long-lived and sharp [9]. The coupling of metal nanoparticles (MNPs) with RE^{3+} ions has been extensively studied for the past few years and is an excellent technique for improving the emission efficiency of RE^{3+} ions. MNPs in the glass matrix may influence the luminescence properties of RE^{3+} ions in two distinct pathways. One way the local field

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DAACH: Data Aggregation via Accountable Cluster Head for Energy Conservation of IoT Enabled Wireless Sensor Network

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Abstract

IoT connects various wireless nodes by having embedded network comprising of sensors and other computational devices. Sensor nodes deployed in IoT devices are capable of performing sensing, collecting, aggregating and transferring functionalities. Energy conservation of sensor nodes in IoT device becomes a primary factor to achieve sustained communication. IoT applications demand effective routing methods like cluster-based among sensor nodes, which effectively transfers the information to the destination system. Data Aggregation via Accountable Cluster Head (DAACH) technique constructs clusters among nodes and monitoring of these nodes in transferring of information to the sink is carried out through Accountable Cluster Head (ACH). Data aggregation functionality is carried by ACH node. In this paper, routing path formed via tree structure is used to communicate the information and shows an improvement in network lifetime of IoT devices.

TCHCN: Trust Computation for Hierarchical Clustering Network to Improve Network Lifetime in Wireless Sensor Network

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Network Lifetime of sensor node plays a fundamental role in Wireless Sensor Networks, since they drain out energy during the communication. The hierarchical networks assist in hindering energy loss by exchanging the information at various levels. The Hierarchical levels formed avoid overburdening of single level cluster zones and helps the network to retain energy of cluster level heads. Malicious attack disturbs the regular functionality of a routing algorithm and deviates QoS performance in the network. The existing LEACH-Mobile protocol adopts low energy clustering techniques but, falls short in providing security of the network when there is malicious attack. The proposed Trust Computation for Hierarchical Clustering Network protocol proves itself to be trustworthy by having various trust measuring metrics. It enhances the lifetime by adopting low energy hierarchical protocol and shows improvement of 12% in terms of energy consumption.

Keywords: Hierarchical Networks, Malicious Attacks, Network Lifetime, Overhead, QoS, Security and Trust Measurement Techniques, Wireless Sensor Networks.

RESEARCH ARTICLE

1. INTRODUCTION

Wireless Sensor Networks (WSNs) abides random positioned sensor nodes. They are capable of examining and processing of information in order to study nature of environment at the expense of nodes battery life [1–3]. Formation of cluster among nodes deployed benefits the network by avoiding redundant data transmission. Clustering of arbitrary nodes involve grouping of nodes and choosing cluster head among the nodes present to achieve energy efficiency [4–5]. The responsibility of cluster head is to monitor all its cluster members. Based on energy densities of the nodes present, it balances using distributional mechanisms. Nodes in clustered network are exposed to the possibility of being attacked [6–7].

Black hole attack is one such malicious node activity that drains out the node battery life. Malicious behaviour of node can disrupt communication in the network [8]. The resultant of disruption of node from network and reduction of node's battery life deteriorates the Network lifetime [9–10]. Ad-hoc On-Demand Vector (AODV) is best suited for mobile and wireless networks. The protocol constructs routes between nodes only after getting message from source node. The routes constructed among nodes

are retained as per source requirements. Requirement of secure data delivery is not met effectively during the connection establishment in AODV protocol. Hence, AODV offers lesser trust intensity [11]. The proposed protocol (TCHCN) addresses cluster reformation techniques in order to achieve load balancing. It also offers higher trust levels by detecting and avoiding the black hole attacks. This proposed protocol is designed considering the mobile source and destination nodes.

1.1. Motivation

Hierarchical Networks take the responsibility of supervising network at different regional levels. During connection building of the network, nodes with lesser trust values are liable to network disruption. Hence, gaining higher trust values is much essential task for secure information delivery. Routing of information involving higher trust value nodes results is efficient QoS metrics in the network.

1.2. Contribution

To accomplish progress interms of Network Lifetime, TCHCN protocol proposes Hierarchical Clustering techniques. It establishes secure transmission path when the network is vulnerable to malicious activities. Trust

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VEDSDA: Voronoi Encryption and Decryption for Secure Data Aggregation in WSNs

S. Reshma[1] · K. Shaila[2] · K. R. Venugopal[3]

Abstract

The various application in Wireless Sensor Networks fascinated towards minimal and secure data transmission. In this paper, VEDSDA protocol is proposed to achieve reduction of data redundancy, data length and providing security for data transmission. The VEDSDA protocol used compression technique to reduce data length which helps to utilize less energy consumption. The data compression technique involves leveling, encoding and decoding phases. Levelling phase converts data to logical data where as encoding phase compress the data size at the source node and decoding phase decompress the data size at the destination. The voronoi diagram concept is used to encrypt and decrypt aggregated data. Thus, VEDSDA protocol is compared with existing protocol and proves better enhancement.

Keywords Decryption · Environmental monitoring · Encryption · Military surveillance · Voronoi diagram · Wireless sensor networks

1 Introduction

Sensor motes are limited resource reserved devices that are grouped together to form Sensor Networks. WSNs are applied in broad applications viz., military surveillance, environment monitoring, disaster recovery, etc. The VEDSDA protocol is focused on monitoring environment temperature and collectively transmits sensed data to BS In this scenario. WSNs are concerned about various challenges namely energy, limited bandwidth, node costs, deployment, security, time synchronization [1, 2].

The sensor node senses information and forward it to the destination via intermediate nodes. The intermediate node minimizes redundant data using max, min, avg and several aggregation functions before forwarding sensed data to the BS. In general, data aggregation strategies are classified into two categories i.e., structure based and
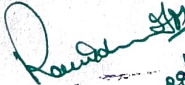
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Secure Data Aggregation Using Ranking Strategy and Intelligence Similarity Function (SDARIS) for Wireless Sensor Networks

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Abstract: The environmental monitoring application is widely used in agriculture, green house farming, floriculture to monitor temperature range in different zone. This application is an embedded application fabricated with wireless sensors, smart phones, protocols, etc. Therefore, with respect to sensor nodes, the battery lifetime and security are the greater challenge in Wireless Sensor Network. In our work, we have designed a protocol using ranking strategy and intelligence similarity function. Initially, the clusters are formed based on the radius range. The SDARIS protocol focused on training the outer nodes of the cluster to acquire balanced cluster. The outer nodes are trained using ranking strategy and are assigned based on Euclidian distance from outer node to cluster head's and node density of the clusters. This ranking strategy assist to balance cluster size by assigning nodes evenly among all clusters. In addition to balance a cluster size, the SDARIS concentrates on aggregates and secure data during transmission using intelligence similarity function and session keys. The session key is generated for every interval, so the intruder node fails to identify the session key and thus mitigates intruder intervention in the network. Thus, the collaboration of ranking strategy, intelligence similarity function and session key concept in SDARIS protocol improve the overall performance of the network. Hence, SDARIS protocol achieved greater performance with increment of 12% data accuracy, 10% of cluster accuracy, 15% network lifetime and 26% throughput when compared with existing protocol.

Keywords: Cluster accuracy, Communication costs, Data accuracy, Environmental monitoring, Machine learning.

1. Introduction

The emerging technologies are embedded with sensors to fabricate smart devices. The trade-off between battery energy and behaviour of the sensor nodes are of concern during fabrication. Sensor nodes are bounded with resource constrained parameters and possessed different challenges viz, security, data aggregation, energy, availability, operating system, etc. [1-3].

The energy and security challenges have been discussed various algorithms [4-7] based on cluster approach that balances energy resource uniformly among the network and achieves greater energy efficiency. The concept of aggregating data and guaranting data delivery to the base station are discussed in [8, 9]. These algorithms focused on clustering and security of the data, but are not connected on accurate data delivery.

Thus, in our work we have adapted ranking strategy and intelligence similarity function. The different types of training techniques in WSNs, viz, Node localization, high dimensionality reduction and Support vector machine (SVM) respectively [10-12].

1.1 Motivation

It is required to aggregate the data accurately so as to balance the energy discharged throughout network lifetime. Then, aggregated data is forwarded to the base station. Therefore, during data transmission security becomes a challenging task. The SDARIS protocol is proposed to increase data accuracy, cluster accuracy, network lifetime, throughput and packet delivery ratio.

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ORIGINAL RESEARCH

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SDAFPS: Secure Data Aggregation using Fuzzy Judgement, Pattern Category and SHAP Contribution

S. Reshma[1] · K. Shaila[2] · K. R. Venugopal[3]

Abstract

Secure data aggregation intends to reduce redundant data transmission and malicious node interference in the network. Therefore, designing secure data aggregation protocol is a crucial task in WSNs. In this paper, we have proposed a *Secure Data Aggregation using Fuzzy Judgement, Pattern Category and SHAP Contribution* (SDAFPS) protocol. The SDAFPS protocol involves three main phases. In the first phase, the protocol controls the topology with the selection of efficient aggregator node in every interval. The second phase uses category pattern code generation and utilization concept to reduce data size and to aggregate data. Finally, in third phase, the aggregated data are encrypted using partial equation of SHAP contribution and decrypted with SHAP contribution equation. The decrypted data are verified with dataset preserved at the sink node. The SDAFPS protocol is implemented using NS2 Simulator tool and performance of proposed protocol is compared with existing protocol and validated 18% improvement in network lifetime, 10% minimized End-to-End Delay and 14% improvement on Packet Delivery Ratio over protocol.

Keywords Data aggregation · End-to-end delay · Fuzzy judgement · Network lifetime · Packet delivery ratio · Pattern category · SHAP contribution

Introduction

In recent days, Wireless Sensor Network is emerging in a rapid manner in different fields, namely environment monitoring, military surveillance, health care industries, etc., [1–4]. WSN is composed of several tiny sensor nodes which are limited resource self-conscious devices. The resource restriction leads to various challenging issues via. security, data aggregation, congestion, etc. There are various secure data aggregation algorithms in WSNs. The data sensed from various sensor nodes are aggregated and forwarded to the

destination [5, 6]. The aggregated data are protected from several intruders such as Denial-of-Service attack, black-hole attack and worm-hole attack [7]. The unbalanced distribution of transmission load in the network causes shorter network connectivity and drains sensors energy which leads to energy hole problem [8]. The efficient routing algorithm in [9] minimizes energy consumption and number of hops during data transmission.

Several existing algorithms focus on topology control to maximize network lifetime in WSNs. These algorithms are categorized as power control [11] and cluster head selection [12]. In [13] the energy consumption for data transmission is reduced by minimizing data size.

Contribution: The proposed protocol identified both security and data aggregation issue and designed topology balanced secure data aggregation protocol. The fuzzy judgment matrix is used to control topology to select an appropriate parent node which helps to handle the network disconnectivity issue. In the proposed protocol, category pattern code concept is used to divide the temperature range for regular interval threshold and assigning it instead of forwarding an original temperature. Then, sink handles dataset using SHAP

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Cross Layer Design for Wi-Fi Sensor Network Handling Static and Dynamic Environment Using Local Automate Based Autonomic Network Architecture

K. N. Sanjay[1] · K. Shaila[1] · K. R. Venugopal[2]

Abstract

In social activities with shared Wi-Fi needs to accommodate large number of users and effectively handle congestion. These are critical issues due to the presence of larger density nodal activity at nearby access points involving inter-technology interference. An interference involves a statistical approach in monitoring access points with its received errors. The received errors vary with frame reception at their fields like PHY, MAC headers and payloads. Local automate-based Autonomic Network Architecture a cross layer approach algorithm is proposed to channelize a frame reception and can effectively avoid inter-technology interference. This results in P2P communication at initial stages and can accommodate multiple mobile devices with varying signal strengths. The algorithm is deployed for a dynamic environment along with static clusters. The throughput of the entire network is increased by 20% because of identifying multiple nodes with lesser latency avoiding congestion.

Introduction

The deployment and its popularity of Wireless Sensor Network provides users to think beyond its timeliness. The classification of WSN starts from few meters to several kilometers. With higher distance coverage Wireless Fidelity(Wi-Fi) is among the one with good reliability features in practical applications. Wi-Fi operating rages from 900MHz, 2.4 GHz, 3.6 GHz, 4.9 GHz, 5 GHz, 5.9 GHz and 60 GHz bands. The 2.4 GHz is considered as it can be found in most of the industrial applications handling a larger density of nodes. The process looks simple if the area is not set as a constraint in using Wi-Fi. The collision and congestion can be easily avoided with larger space and high bandwidth compared to UWB, Bluetooth or even ZigBee [1–5].

The sensor network data with large density nodes in a smaller area with lesser collisions and congestion is considered. The use of Wi-Fi includes both static and dynamic environments. While in a smaller network including 5–15 nodes can be made dynamic. One such example is Wi-Fi Hot-spot using cellular phones. While with industrial applications are concerned it involves Wi-Fi stations with routers and larger number of nodes in a wide spread environment. The support by each level of design in a combined static and dynamic environment if fulfilled at a certain level based on strength of a signal and receiving nodes capability.

The data transfer rate differs from node to station level. Capturing the various strengthen in signal and transmitting at a required data rate requires user attention. To fill this gap between a various data rate operation a local automate based autonomic network architecture is proposed [6]. Local automate chooses nodes, routers based on their probability of occurrence.

The architecture provides modeling information and processing is task driven with the collaborative neighborhood.

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Energy Concerned Clustering Mechanism to Ensure Reliable Data Transmission in Wireless Sensor Network

P. Manasa[1] · K. Shaila[2] · K. R. Venugopal[3]

Abstract

In wireless sensor networks, data reception capability along with higher QoS can be achieved by adapting clustering mechanisms in the network. Hierarchical networks increase data aggregation efficiently. The hierarchical network includes optimal cluster creation and cluster head (CH) selection that yield higher QoS in the network. Hybrid particle swarm optimization with firefly algorithm (HPSOFA) is proposed for CH selection to obtain optimal clustering in the network. Transmission overhead is reduced by 9% when compared with the existing method by applying a modified dynamic source routing (DSR) algorithm. The proposed algorithm addresses the adaptive congestion window size adjustment method to avoid congestion occurrences in the network. Thus, the proposed HPSOFA method improves QoS and establishes reliable communication in the network.

Keywords Clustering · Particle swarm optimization · Quality of service (QoS) · Routing and wireless sensor networks

Introduction

Wireless sensor network (WSN)s functionalities mainly depend on the sensor nodes deployed in the environment. Major applications of WSN include battlefield management and surveillance, disaster management, biomedical applications, industrial automation, security systems, weather sensing and monitoring. Retaining the battery life of nodes becomes the primary goal in obtaining higher lifetime for deployed network since battery replacement in some adverse environment may not be feasible. Providing efficient energy savings in the network is the vital role played

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when concerned with a reliable network [1–3]. Hierarchical networks will assist the network by presenting data to sink with lesser energy usage [4, 5]. This includes the formation of clusters by grouping a similar set of nodes and choosing one representative from each cluster for information exchange called CH. Choosing the optimal CH in the cluster will enhance the aggregation of data more efficiently. Optimal CHs present three main advantages: (i) it avoids redundant data communication, (ii) energy savings is achieved by utilizing only CHs for transmission and (iii) network's scalability is achieved by maintaining the local route set up by the CH node. The proposed hybrid particle swarm optimization with firefly algorithm (HPSOFA) is a hybrid method combining the methods of firefly algorithm and particle swarm optimization algorithm. HPSOFA is the amalgamation of PSO and FA and it uses the most suitable mechanisms in cluster selection. It avoids energy drain out of ineffective CH and uses a static sink for data collection. The energy savings can be further achieved in HPSOFA by avoiding retransmissions of congestion. It helps the routing in the selection of CH for data aggregation by adapting the most optimum election in the network. Fitness evaluation function and iteration carried out by considering the previously obtained solution in HPSOFA renders efficient routing entities. Further, dynamic source routing (DSR) is modified to reduce the overhead that is offered to the network during

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Minimal Block Knight's Tour and Edge with LSB Pixel Replacement Based Encrypted Image Steganography

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Abstract

The data security of an information is predominant in the digital world and gaining lot of importance. Cryptography and steganography are widely used in providing security to an information. In the proposed algorithm, the image encryption and steganography are performed using Knight's move in the game of chess called Knight's Tour Algorithm. Minimum block or square required for a knight's tour to reach all the squares is 5×5 block. The 5×5 blocks' pattern generated is used for image encryption. The encrypted image is then embedded into another image and block shuffling is performed to obtain a crypto-stego image. Proposed algorithm is robust and provides high data security with a good PSNR and SSIM.

Introduction

The incessant development and popularization of digital technology has changed the processing of secret images. The entire world is moving towards smart era driven by digital technology and all information is accessible at finger tips. Every second, more than a million information is exchanged across the internet in different formats, such as text, audio, image or video. Information in the image is sparkling and visually attractive than text information. Sensitive, personal information or defense information related to a country or medical information or documents related to an organization need to be protected from trespassers when it is distributed and shared over internet.

The recursive root cause analysis is carried out on trapping and attack of information by trespassers and data protective techniques are improved with new security

algorithms. There are many effective techniques that are available to protect the data from unauthorized access like cryptography and steganography. Image files are extensively used nowadays due to its high capacity and easy accessibility and protecting these image files are the top priority. Many cryptography, steganography and crypto-steganography algorithms are developed.

Chess is a game of adaptive strategy and intelligence. Each move of pieces in the chess ends with some pattern by the end of game. The pattern of each pieces has encouraged many combinatorial puzzles. The most interesting and popular patterns are obtained from Knight's Tour and Eight Queen puzzle.

Knight's tour [1–3] is an arrangement of moves of a knight on a chess board such that knight visits each square just once. If the knight tops on a same square where it started, then it is called closed tour, otherwise it is open. The knight's tour problem has become the mathematical puzzle and motivated open thoughts for many image processing and pattern-based research work. The moves of knight in chess game are very tactical to end the game with possible win. Knight's tour is not restricted only for a chess board size 8×8, but it can be extended for any size $M \times N$. To obtain a solution for Knight's tour, minimum size of the board should be 5×5. Figure 1a shows one of the patterns generated by knight's tour on 8×8 board and Fig. 1b shows one of the patterns generated by knight's tour on 5×5 board.

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Performance Anatomization of Routing Protocols in Wireless Sensor Network

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ABSTRACT

Wireless Sensor Network (WSN) is used in multifarious applications like environment monitor, battle based systems, enemy vehicle track determination and many more. It is also limited by various constraints like cost, bandwidth, and energy consumption patterns along with network lifetime. When the data packets have to be sent to the destination node or control center after detection, the path is established between the detected node and the destination node [1]. When the number of paths is more and nodes repeatedly participate in those paths then residual energy value is also reduced of the specific nodes which lead to holes in the network and reduces the network lifetime. This paper presents an overview of WSN, Lifetime ratio effects, a numerical survey of the energy-efficient routing protocol. The methods namely Destination Sequence Distance Vector (DSDV), Ad hoc On-Demand Distance Vector (AODV), Zone Routing Protocol (ZRP) and Energy Efficient Distance Routing (EEDR) are discussed in detail along with the implementation of these methods in MATLAB. Comparison is performed in terms of various parameters namely delay, hops, energy consumption, alive nodes, dead nodes, lifetime ratio, overhead ratio, residual energy as well as throughput [10] and it is proved that EEDR algorithm works in an optimized fashion.

Key words: AODV, DSDV, EEDR, Energy Efficiency, Lifetime Ratio, Wireless Sensor Network.

1. INTRODUCTION

Wireless Sensor Network (WSN) is a micro service based system which can be used for applications varying from commercial and industrial data. The features of WSN includes a processor, communication protocols, amount of power used and the path between the two nodes or between the base station and the node [2]. Each node can perform various tasks ranging from detecting temperature, humidity data and pressure data based transmissions between two endpoints. The WSN can be used in a wide variety of services namely Military, Industry, Health Care and many more [6].

WSN consists of a set of nodes which are spread in a given area of x*y meters. Each node is defined with a unique value of (xi, yi). xi is the ith position for the node, yi is the y position of the node in a two-dimensional space[9]. Each of the nodes is also identified with a unique id representing itself. Figure 1 shows the node placement strategy for the set of 100 nodes spread across 100*100 area. The node ids are varied from Node1 to Node100.
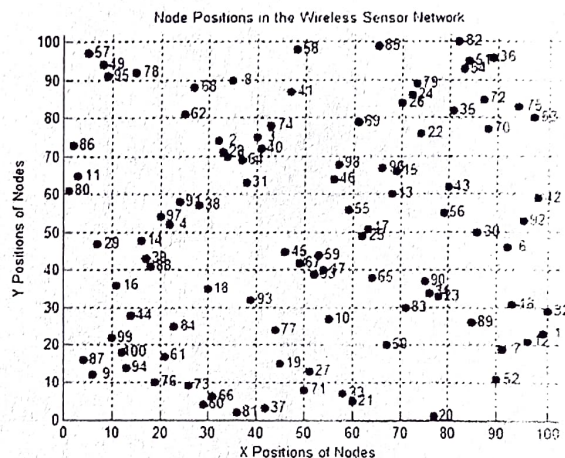
Figure 1: Node Placement Strategy

As shown in Figure.1, the following are the positions of a few of the nodes among the 100 nodes in the network.

Table 1: Node position in the network

Node ID	X Position of the Node	Y Position of the Node
11	9	67
9	7	11
37	42	4
31	39	65
84	22	27

One of the major challenges is maintaining the [4], [5] lifetime ratio for the network. If IE is the initial energy of the network then a node which has the threshold satisfying the equation as below is calculated.

$$k \cdot IE \ge 0.4$$

(1)

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PERFORMANCE OPTIMIZATION AND EMISSION CHARACTERISTICS OF CI ENGINE FUELLED WITH BLENDS OF WASTES CHICKEN FAT BIODIESEL WITH EXHAUST GAS RECIRCULATION

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ABSTRACT

Demand for fuel and the use of petroleum products are being increased gradually which causes serious problems such as petroleum depletion, energy crisis and environment degradation etc. Consequently, at this juncture, biodiesel is found to be a good alternative and a promising conventional diesel fuel. Subsequently, the application of biodiesel not only fulfilling the gap of energy catastrophe but, also proffers some shortcomings such as high oxides of nitrogen, high fuel consumption and higher density. Therefore, in order to prevail over this problems and reducing exhaust emission, the study has been undertaken to demonstrate the study on Emission Characteristics of a CI Engine fuelled with Wastes Chicken Fat Biodiesel (WCFB) blends with Exhaust Gas Recirculation (EGR). In the study, initially, Biodiesel is obtained from Chicken fat oil as a result of transesterification process. The experiment work was done on a CI-Engine using a biodiesel (trial with variable blends) achieved by Chicken fat oil with Exhaust Gas Recirculation (@30%). Further, the performance and emission characteristics of all the blends were carried-out and were compared decisively with petro-diesel. The experimental results shows that, the enhanced Performance and Emission characteristics with B20 biodiesel blend and the momentous reduction in NOX emission using Exhaust Gas Recirculation approach was observed. In addition, the thermal efficiency was increased and SFC (Specific fuel consumption) was found to be better in blending fraction of WCF Biodiesel. A noticeable approach on the parameters like, decrease in carbon monoxide reduced unburned hydrocarbon (UBHC) and decreases in nitrogen oxide emissions are attained at the blending-fraction of B20 biodiesel when compared with petro-diesel. Hence, there is a significant reduction in CO, UBHC and NOx emission parameters at B20 biodiesel blending ratio coupled with Exhaust Gas Recirculation (EGR) system. However, the EGR level was optimized (30%) with respect to the performance of CI Engine linking with significant reduction in the emission of NOX, minimum possible smoke, CO, HC emissions and corresponding with brake thermal efficiency.

KEYWORDS: Waste Chicken Fat Biodiesel, Performance Optimization, CI Engine & EGR

Original Article

LIST OF SYMBOLS

BTE: Brake Thermal Efficiency

SFC: Specific Fuel Consumption

CI Engine: Internal Combustion Engine

NOx: Oxides of Nitrogen

CO: Carbon Monoxide

HC: Hydrocarbon

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EFFECT OF ALUMINUM, ZIRCONIUM, AND FLY ASH COATING ON THE MICROSTRUCTURE OF THREE BODY ABRASIVE WEARS BEHAVIOR OF EN8 STEEL

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ABSTRACT

This study investigates the effect of Alumina, Zirconia, and fly ash particles coating on the microstructure and wear behavior of EN8 steel. The wear behavior of plain EN8 steel and different particles like Alumina, Zirconia, and fly ash coatings studied systematically with respect to load, sliding speed. The wear behavior of EN8steel studied by three body abrasive wear tester. The results show that with coatings Weight loss (specific wear rate) lower than that of plain EN8steel. It is also noted that weight loss increases with increase in load and speed. Meanwhile, the wear mechanisms of EN8 steel and with different coatings (like Al_2O_3, ZrO_2, fly-ash) percentage is described and analyzed.

Key words: Three body abrasive rubber wheel, Alumina, zirconia, EN8steel, wear mechanism.

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Three Body Abrasive Wear Studies on EN-8 Steel by Alumina - Zirconia - Fly Ash based Thermal Coating

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Abstract:- An investigation was made to evaluate the effect of the incorporation of alumina, zirconia and in combination with fly ash on the abrasive wear behavior of EN8 steel. The wear behavior of plain EN8 steel and different particles like Alumina, Zirconia, and fly ash coatings studied systematically with respect to load, sliding speed. The wear volume loss increases with increasing load. However the specific wear rate decreases with thermal coating of Alumina, Zirconia and fly ash on EN8 steel. It is revealed that the better wear resistance of the EN8 steel by using thermal coating. It is also noted that weight loss increases with increase in load and speed. Meanwhile, the wear mechanisms of EN8 steel and with different coatings (like Al_2O_3, ZrO_2, fly-ash) percentage is described and analyzed.

Key words: Three body abrasive rubber wheels, Alumina, zirconia, EN8steel, wear mechanism.

1. INTRODUCTION

Three-body abrasive wear is defined as "Wear triggered by free rolling and sliding of particles that are confined by two counter faces experiencing a relative sliding motion" [1]. The particles involved in three-body abrasive wear could be generated by wear debris or have an external source such as sand and soot. The role of lubricant-borne debris and their deformation and fracture on three body abrasive wear was investigated in Ref. [2]. Three-body abrasive wear originated from the presence of soot particles in lubricated contacts is a key contributor to wear in diesel engines [3, 4]. Elevated operating temperatures, higher friction, and intensified wear rates in gears as a result of lubricant contamination were also investigated [5]. Reza Gheisari.et.al[6] reported on three body abrasive wear of hard coatings. They concluded that ratio of abrasive hardness to bearing surface plays an important role in three body abrasive situations. JG Alotaibi.et.al [7] studied the wear behavior and wear mechanism of different metals sliding against stainless steel counter face. They concluded that specific wear rate versus sliding distance is almost same for all metals sliding stainless steel. It is divided into two regions, running in and steady state. In the later the specific wear rate is almost steady with increase in sliding distance. Boachao zheng and Zhifa Hang [8].et.al studied the three body abrasive wear behavior of cementite with different chromium concentrations. They concluded that when Cr content less than 6.03wt% single phase cementite was obtained by MA and SPA and increase in Cr led to improve hardness and wear resistance. When Cr content less than 8.22%, Cr atoms are distributed in Cementite to form Cr-rich zones of more hardness. These zones reduces the pit dept and roughness and improves the cementite abrasive resistance.S.Das Bakshi, P.H.Shipway.et.al [9] reported on the three body abrasive wear of fine pearalite, nanostrured bainite, and marten site. They concluded that hardest phase marten site has greater wear rate, whereas Pearlite better resistance abrasion. It also concluded that bainite wears by combination of grooving and small minor pitting, whereas in marten site cutting mechanism is dominant. Kaihong zhang,Yamin gao[10] et.al studied the three body abrasive wear resistance of iron matrix composites reinforced with ceramic particles. They concluded that wear resistance of the composite is mainly related to the fracture strength and bending strength of ceramic particles.

The ZTA (55-60ZRO2) reinforced Cr25 composite exhibit good wear resistance which 6 times more than that of Cast iron matrix. A.A cenna and J.Doyle [11] et.al investigated on wear mechanisms in polymer matrix composites abraded by bulk solids. They concluded that the abrasive resistance of reinforced composite material is a micro- mechanisms process that occurs during abrasive wear. Which in turn, are strongly depend upon the hardness of wear media. Both two body and three body wear patterns are possible by bulk solids sliding across polymer matrix composites.Antoriao.et.al [12] studied on wear resistance and wear mechanism of WC-12%CO thermal sprayed coatings in three–body abrasion. They concluded that micro-polishing and gradual degradation of the lamellae was predominant wear mechanism in tests with SiO2 abrasives. The wear mechanism with Al2O3 abrasives was plastic deformation .A.P Harsha .and U.S Tiwari. [13].et.al reported on three body abrasive wear behavior of Polyaryle ether ketone composites. They concluded that abrasive wear rate is higher in composites than the neat matrix at different loads.

2. EXPERIMENTAL DETAILS

2.1 Materials:

In this experiment metal subtratate (EN8) plate of thickness 20mm thickness length 5m purchased from Surya steels and alloys Peenya industrial area Bangalore. The metal substrate is grinded with surface grinding machine to obtain surface

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ANTIBACTERIAL AND ANTIFUNGAL STUDIES OF CO(II), NI(II) AND ZN(II) COMPLEXES OF 6-PYRIDYL-5,6-DIHYDROBENZO[4,5]-IMIDAO[1,2-C] QUINAZOLINE (N-N)

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ABSTRACT
Cobalt(II), Nickel(II), and Zinc(II) salts react with a bidentate N-heterocycle, 6-pyridyl-5,6-dihydrobenzo[4,5]-imidao[1,2-C] quinazoline (N-N) to yield complexes of the composition $MX_2(N-N)$. nH_2O (n = 0, M = Co, X = I or ClO_4; n =I, X = Cl or Br; n = 0, M = Ni, X = Br; n = 0, X = Cl or ClO_4; n = 0, M = Zn, X = Cl) and [{Zn $(OClO_3)(N-N)_{1.5}$}ClO_4]$_2$. The complexes are insoluble in common organic solvents but are soluble in dimethylformamide in which they behave as non-electrolytes excepting the chloro, bromo complexes of cobalt and the complex [{$Zn(OClO_3)(N-N)_{1.5}$}ClO_4]$_2$ which behave as uni-univalent electrolytes. The antimicrobial activity has been carried out using gram positive and gram-negative bacteria like Staphylococcus Aureus, Pseudomonas species, Bacillus species, E-Coli, Klebsiella at different concentration by Agar diffusion method and some fungus species like Aspergillus, Penicillium, Candida have been tested. The results are compared with the standard drug Amoxicillin 500 mg. The activity index was recorded using zone of inhibition.

KEYWORDS: Cobalt, nickel, zinc, quinazoline complexes, N-heterocycle, antimicrobial, antifungal, Agar diffusion.

1. INTRODUCTION

Quinazoline and its derivatives are widely known for their analgesic, antibacterial, antifungal, anti-convulsant, anti-inflammatory, anti-HIV, and anti-cancer activities, exhibited physiological and pharmacological interaction in targeting the receptors.[1-4] Herein, we describe the synthesis and characterization of the quinazoline ligand, 6-pyridyl-5,6dihydrobenzo[4,5]-imidao[1,2-C] quinazoline (I; N-N) and its reaction with cobalt, nickel and zinc halides and perchlorates. The synthesized ligand (I) was characterized by physical, spectral and single crystal x-ray structural analyses was reported.[5]
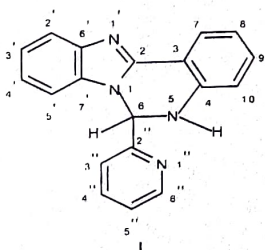
Bacterial resistance capacity increases with existing drugs due to enzyme susceptibility in their cell wall, the biological studies such as antimicrobial activity. These derivatives possess antibacterial activities especially against the gram-positive strains and with few fungal species by their interaction with the components present in cell wall and DNA molecules present in the nucleus.[6-8] Substitution of halogen atoms at 2, 6 and 8 positions showed the anti-microbial activity in addition to the substitution of -CH_3, -NH_2 group at position 3 and Thiol group at position 2. These substitutions are essential for biological assay of antimicrobial activity.[9]

2. MATERIALS AND METHODS
Experimental

Hydrated metal chlorides and metal bromides were procured from BDH. Metal iodide and hydrated perchlorates were prepared by dissolving metal carbonate in 1:1 or 1:2 aqueous hydroiodic acid and perchloric acid respectively and evaporating the resulting solution to almost dryness under reduced pressure. The N-heterocycle (I) was prepared following the procedure reported for related N- heterocycles.[10-12]

Measurements

C, H and N analyses of the complexes were carried out on a Heracus Carlo Erba 1108 microanalyser. Metal content was determined using a Spectra AA-30

Synthesis and Characterization of Co(II), Ni(II), Cu(II), Zn(II) and Cd(II) acetate complexes of 1,3-bis(benzimidazol-2-yl)benzene and their biological activities

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Abstract: Cobalt(II), Nickel(II), Copper(II), Zinc(II), and Cadmium(II) acetate salts react in a 1:1 molar ratio with a chelate bidentate ligand, 1,3-bis(benzimidazol-2-yl)benzene (N-N), to produce complexes with the formula $MX_2(N-N)$ (M = Co, Ni, Cu, Zn, and Cd; In typical organic solvents, the complexes are insoluble, but they are soluble in dimethyl formamide, where they behave as non-electrolytes. By using the zone of inhibition assay in the disc diffusion method, the complexes were tested for antibacterial activity against Gram-positive bacterial Streptococci strains and B. Subtilis, as well as streptomycin as a control. Against streptococci at 200mM concentration, the cadmium acetate complex had the strongest inhibitory effect. Elemental analyses, molar conductance measurements, magnetic moment, and IR, 1H, and 13C-NMR spectral studies were used to characterise the products.

Keywords: Cobalt, Nickel, Copper, Zinc, Cadmiumand 1,3-bis(benzimidazol-2-yl)benzene ligand. antibacterial.

Introduction: N-heterocycles are an important class of ligands[1] that function as chelating agents, forming mononuclear and polynuclear complexes with one or more metal ions. Because of their catalytic and biological activities, transition metal complexes containing N-heterocycles are extremely important[2-8]. Several transition metal complexes containing multidentate N-heterocycles (I) have been rediscovered.

Benzimidazole derivatives exhibit a wide range of biological activities including anti-bacterial, anti-fungal, anti-viral, anti-malarial, anti-helmintic, anti-inflammatory, anti-proliferative, anti-pyretic and antagonist[15] properties. Thus benzimidazoles have wide applications including pharmacological industry, biochemical models, active intermediates in non-enzymatic transaminations, catalysts in organic synthesis, and homogeneous catalysis.
Transition metal ions with monodentate and chelating bidentate ligands form stable complexes. More number of transition metal complexes have been synthesized including mono-, bi- and poly-nuclear complexes. Benzimidazole moieties show high stability, bioavailability and pharmacological activity.

Bis(benzimidazolyl)benzene ligands have been described as a coordination polymer by Li, Hu, Hong, and coworkers[16]. Laboratories have reported transition metal complexes of 1,3-bis(benzimidazolyl/N-methylbenzimidazolyl)benzene and 1,3,5-tris(benzimidazolyl/N-methylbenzimidazolyl)benzene[17-20]. Zinc and cadmium halide and perchlorate compounds with 1,2-bis(N-methylbenzimidazolyl)benzene have been reported[21]. Palladium halides, palladium perchlorates, and organopalladium complexes with 1,2-bis(N-methylbenzimidazolyl)benzene have previously been published[22]. Polymer supported iron(III) complex of 1,3 bis(benzimidazolyl)benzene has been described by V.Gayathri and colleagues. There have also been reports of

Biological studies and characterization of metal acetate complexes of p-hydroxy benzilidene phenyl benzimidazole

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Abstract

$MX_2(L)$ complexes were formed by reacting metal acetate salts with a ligand, p-hydroxy benzilidene phenyl benzimidazole (L), in a 1:1 molar ratio, where M = Co, Ni, Cu, Zn, and Cd; X = CH_3COO^-. In typical organic solvents, the compounds are not soluble, but they are soluble in DMF, where they behave as non-electrolytes. CHN analyses, conductivity measurements, magnetic moment, and Infrared, proton and C-13 NMR spectral studies were used to characterise the products. The antibacterial activity of the complexes was investigated for its zone of inhibition or sensitivity against *Staphylococcus aureus* and *E.Coli*. When compared to the ligand, the zinc complexes had the greatest inhibitory activity against streptococci at 10 mg/ml, but were less effective than regular Azithromycin. The antifungal activity was studied against *Aspergillus terreus* & *Penicillium brocae*, where complexes *shown* least inhibition.

Keywords: Cobalt, Nickel, Copper, Zinc, Cadmium, antibacterial and antifungal.

Introduction

Benzimidazoles have long been recognised as a significant group of heterocyclic chemical molecules[1,2], where phenyl and imidazole rings are fused together. Benzimidazoles and their derivatives have a wide range of applications in coordination chemistry, bioinorganic chemistry, medicinal chemistry, and photochemistry[3,4]. These compounds exhibit biological activities including antimicrobial[5,6], anti-inflammatory[7], antifungal[8], anti-tumour agents[9] and anthelmintic[10] properties. Schiff bases are generally used as ligands to form coordination

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Anticancer studies of Co(II), Ni(II) and Zn(II) complexes of 6-Pyridyl-5,6-dihydrobenzo[4,5]-Imidao[1,2-C] Quinazoline (N-N)

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Abstract: Cobalt(II), Nickel(II), and Zinc(II) salts react with a 6-pyridyl-5,6-dihydrobenzo[4,5]-imidao[1,2-C] quinazoline (N-N) to produce complexes of the composition $MX_x(N-N)$, nH_2O (n = 0, M = Co, X = ClO_4; n =1, X = Cl; n = 0, M = Ni, X = I, n = I, X = Cl or ClO_4; n = 0, M = Zn, X = Cl). The complexes are insoluble in common organic solvents but are soluble in dimethylformamide in which they behave as non-electrolytes. The prepared quinazoline metal complexes are subjected to evaluate potential capacity against human oral cancer cell line. Here we are using the most effective qualitative method that is MTT assay to check the cell survival capacity for the dosage of drug.[6,8]

MTT assay is a colorimetric assay used for the determination of cell proliferation and cytotoxicity based on reduction of the yellow colored water-soluble tetrazolium dye MTT to formazan crystals. Mitochondrial lactate dehydrogenase produced by live cells reduces MTT to insoluble formazan crystals, which upon dissolution into an appropriate solvent exhibit purple color, the intensity of which is proportional to the number of viable cells and can be measured spectrophotometrically at 570nm.

Keywords: Cobalt, nickel, zinc, quinazoline complexes, N-heterocycle, Anticancer, MTT Assay

Introduction:

Quinazoline and its derivatives are widely known for their analgesic, antibacterial, antifungal, anti-convulsant, anti-inflammatory, anti-HIV, and anti-cancer activities, exhibited physiological and pharmacological interaction in targeting the receptors.[1-4] Herein, we describe the synthesis and characterization of the quinazoline ligand, 6-pyridyl-5,6dihydrobenzo[4,5]-imidao[1,2-C] quinazoline (I; N-N) and its reaction with cobalt, nickel and zinc halides and perchlorates. The synthesized ligand (I) was characterized by physical, spectral and single crystal x-ray structural analyses was reported. Now a day's cancer is a major and becoming common life-threatening disease, due to various factors in present life style. Even though the research is still under process to fight against complete eradication of cancer, some therapies are used as a tool to cure in initial levels of development.
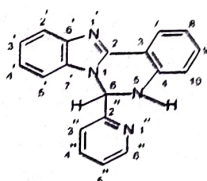

(I)

Anticancer agents may be natural or synthetic, biological or chemical agents which tends to suppress the growth of cancerous cells at different cellular gradient. Amongst

Ohmic and Viscous Dissipation Effect on Free and Forced Convective Flow of Casson Fluid in a Channel

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Abstract. Analytical study of the free and forced convective flow of Casson fluid in the existence of viscous dissipation, ohmic effect and uniform magnetic field in a porous channel to the physical model. The nonlinear coupled partial differential equations are converted to linear partial differential equations using similarity transformation and the classical perturbation method. The physical parameters such as Prandtl number (Pr), viscous dissipation (VD), Schmidt number (Sc), Reynolds number (R), thermal buoyancy parameter (λ), Ohmic number (Oh), Casson fluid parameter (β), Darcy number (Da), Hartmann number (M2), the concentration of buoyancy parameter (N), chemical reaction rate (γ) effect on velocity, temperature and concentration have been studied with pictorial representation. For the particular case, the present paper analysis is compared with the previous work and is found good agreement.

Keywords: Casson fluid, perturbation technique, magnetic field, porous medium, ohmic effect, viscous dissipation.

1. Introduction

Among non-Newtonian fluids, Casson fluid has gained the attention of researchers because of its wide applications in the field of engineering such as food processing, metallurgy, drilling and bioengineering operations have been mentioned by Ramesh *et al.* [1]. The free and forced convective flows in a vertical channel to study the effect of Joule heating and viscous dissipation have been studied both analytically and numerically by using the power series method by Barletta *et al.* [2]. The steady laminar MHD mixed convection of viscous dissipating fluid about a permeable vertical fluid to study the ohmic effect and viscous dissipation in the presence of the magnetic field, to solve the equations Keller box method is implemented, temperature and velocity profiles are studied for the physical model by Orhan Aydın *et al.* [3]. The effect of ohmic heating and viscous dissipation effect on an incompressible, viscous, steady flow of an electrically conducting fluid in the presence of a magnetic field at a stagnation point has been studied by Pushkar Raj Sharma *et al.* [4]. The governing equations are solved numerically by using the fourth-order Runge-Kutta method with the shooting technique. Temperature and velocity profiles are discussed graphically.

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Similarity Solution of Non-Newtonian Three-dimensional Boundary-layer Through Porous Medium

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Abstract: An analysis is made to study a three-dimensional boundary-layer flow of non-newtonian fluid over a porous media. The governing partial differential equations of momentum are transformed into self-similar non-linear ordinary differential equations by using new form of suitable similarity transformations. The obtain equations are then should by using shooting method. The flow phenomena is characterized by the power-law index 'n', permeability of porous media 'ω' porosity parameter 'ϕ' effective viscosity 'λ', three-dimensionality parameters 'α'. The numerical results of the velocity profiles are obtained and displayed graphically.

Keywords: Porous medium, Power-law fluid, Effective viscosity, Porosity, Similar solution.

1. Introduction

In recent years, the evolution of the study in non-newtonian fluids have effectively attracted many researchers in the field of science and engineering by its challenging applications. An interesting model for non-newtonian fluids is from Lee and Ames [1] and Hansen and Na [5]. The non-newtonian model generalizes the visco-inelastic behaviour of some fluids as Power-law, Powel-Eyring, Prandtl, Eyring, Ellis and Reiner-Philippoff fluids. The special interest is towards the two models i.e, the Power law fluids and the Powel Eyring fluids. The power law fluids are the non-newtonian model used commonly and the Powel-Eyring fluids are brought up by the kinetic theory of liquids. In past decades, the work on the three dimensional boundary layer flow of the non-newtonian fluids is much less comparitivity with the two dimensional boundary layer flow of the non-newtonian fluids because its mathematical complexity of the problem, hence therefore such problems were generally avoided. There are large number of research articles (REF) based on the study of the Newtonian and non-newtonian boundary layer flows.

The work of Schowalter [11], Na and Hansen [5] and Timol and Kalathia [13], refers to two-dimensional flows of non-newtonian Power-law fluids. The laminar three-dimensional incompressible boundary layer equations of non-newtonian power-law fluids and obtained similarity solution of such equations was first analysed by Schowalter [11]. According to him, the similarity solution exists only if free stream velocities $V(x)$ and $W(x)$ in X-direction are constant. Further Na and Hansen [5] extended Schowalter [11] analysis and arrived a similarity solution for the system of laminar three-dimensional boundary-layer equations of power-law fluids. According to their work for similarity requirement, the free stream velocities

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Three-Dimensional Blasius Flow of a Non-Newtonian Fluid

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Abstract

Three-dimensional boundary-layer equations have been modelled for non-Newtonian power-law fluid over a moving flat plate. The governing partial differential equations are transformed into coupled non-linear ordinary differential equations using suitable similarity transformations and then solved numerically using shooting method. The effect of various parameters like shear-to-strain-rate parameter (α) , fluid index (n) $and the velocity ratio parameter (λ) are discussed persuasively in the relevant graphs.

Keywords: Three-dimensional Blasius flow; Boundary layer non-Newtonian fluid; Similarity solution; Three-dimensionality parameter; Numerical solution.

1. INTRODUCTION

There are numerous experimental and computational studies available on non-Newtonian fluid flows in both two-dimension and three-dimension in the literature. The boundary layer flow of non-Newtonian fluids has become an important topic of investigation, ever since its various industrial and engineering applications such as in polymer processing, food processing, biochemical industries etc. The classical theory of fluid dynamics depends upon the hypothesis of a linear relationship between the stress tensor and strain tensor, rate of strain tensor and even rate of the stress tensor.

Newton's viscosity law's states that, the shear stress between adjacent fluid layers is proportional to the velocity gradients between the two layers. The fluids which do not follow this linear relationship are called non-Newtonian fluids and a few examples of non-Newtonian fluids are a slurry paste, printer ink, condensed milk, molten rubber, shampoos, tomato sauce, etc.

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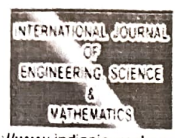
Drag on an impermeable cylinder embedded in a sparsely packed porous medium in presence of magnetic field

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Abstract

The present devoted to find an expression for drag power qualified by the solid cylinder placed in a sparsely packed porous region with additional magnetic field in the transverse direction to the flow. The flow is governed by the Brinkman model (To take care of the boundary effects that exists on the boundaries, the Brinkman modified the Darcy equation by considering a Laplacian term in velocity to Darcy law) and solved analytically using a uniform shear far from the cylinder. It is found that, amplifying in the permeability of a porous region is to decline the drag on the solid cylinder. Further, a reversed behavior is noticed in the hydrodynamic force when the magnetic field is raised and the same is represented graphically.

Top

Keywords

Brinkman model, Porous region, Hydrodynamic force, Uniform shear.

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Fluid Flow in Composite Cylindrical Regions

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Abstract. A steady, 2-D, viscous fluid flow past a fixed solid cylinder of radius 'a' has been considered where the density is constant for considered fluid. The flow of fluid happens in 3 regions namely fluid, porous and fluid region. The constitutive equations for the flow in porous and fluid regions are Brinkman and Stokes equations respectively. The variation of flow patterns by means of streamlines has been analysed by applying different boundary conditions at the interface of fluid – porous and porous – fluid regions and also on the surface of the solid cylinder assuming that the even velocity far off from the fluid region. The nature of streamlines is observed for the distinct values of porous parameter 'σ' and the corresponding flow behaviour is analysed graphically. From the obtained results it is noticed that increase in porous parameter, suppress the fluid flow in porous region consequently the fluid moves away from the solid cylinder.

1. Introduction

The idea of fluid flow through/past a porous media finds its importance in applied sciences and engineering fields such as filtration, acoustics, geochemistry, soil mechanics, rock mechanics, petroleum engineering, biomedical engineering, structural engineering, and in the field of geosciences like hydrogeology, petroleum geology, geophysics, and also in the inter disciplinary fields of biology and biophysics, material science. In addition, the principle of porous flow has applications for inkjet printing and nuclear waste disposal techniques, among others.

In the literature, many studies are available on the flow of fluid through the cylindrical permeable medium with the support of Darcy's and Brinkman equation under the dissimilar boundary conditions. Raja Sekhar and Amaranath et al. [2] described the flow field using Darcy's equation. Pop and Cheng et al. [1], Bhupen Barman et al. [3] and, Pop and Ingham et al. [4] studied the Stokes flow problem to describe the motion of the fluid over a porous region with the help of Brinkman model. In the presence of a magnetic field, the flow of heat transfers in a certain fluid past a constantly moving porous plate has been studied by Chandran et.al [5]. By shooting method they gained the numerical solutions for velocity and temperature functions. Raghava Rao and Sekhar et al. [6] analysed the flow of electrically conducting, steady, and viscous fluid around a circular cylinder with influence of magnetic field applied in the axial direction. The obtained non-linear Navier-Stokes equation was solved using Finite difference method. The numerical solution for the fluid flow through and around a permeable cylinder was inspected by Bhattacharya et al. [7]. They noticed that, as a result of increase in Darcy number, drag ratio approached from unity to zero. The flow theory of viscous and incompressible fluids with different kinematic viscosities was studied by Neeraj Dhiman et al. [8]. Kelvin - Helmholtz's linear study on the instability of the cylindrical interface had been carried out under the influence of a saturated porous bed structure, by exposing the fluids to uniform magnetic fields applied in the axial direction with the help of viscous potential flow theory. It was found that though the effect of porous media on the stability of the system is unstable, the axial electric

Numerical Study of Micropolar Fluid Flow Past an Impervious Sphere

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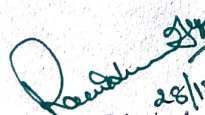Karnataka, India

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Abstract. The numerical study of axi-symmetric, steady flow of an incompressible micropolar fluid past an impervious sphere is presented by assuming uniform flow far away from the sphere. The continuity, linear and angular momentum equations are considered for incompressible micropolar fluid in accordance with Eringen. The governing equations of the physical problem are transformed to ordinary differential equation with variable co-efficient by using similarity transformation method. The obtained differential equation is then solved numerically by assuming the shooting technique. The effect of coupling and coupling stress parameter on the properties of the fluid flow is studied and demonstrated by graphs. It is noticed that the viscous sublayer reduces and velocity magnifies with increase in coupling number. Also, the dimensionless shearing stress vanishes at front and rear stagnation points for the variation of the coupling number and stress parameter

Citation

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[1]Jayalakshmamma DV, Dinesh PA, Chandrashekhar DV. Numerical Study of Micropolar Fluid Flow Past an Impervious Sphere. DDF 2018;388:344-9. https://doi.org/10.4028/www.scientific.net/ddf.388.344

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Jayalakshmamma, D.V., P.A. Dinesh, and D.V. Chandrashekhar. "Numerical Study of Micropolar Fluid Flow Past an Impervious Sphere." Defect and Diffusion Forum 388 (October 2018): 344-49. https://doi.org/10.4028/www.scientific.net/ddf.388.344

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MLA
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Research Article

Influence of gamma irradiation on photoluminescence and nonlinear optical properties of Eu^{3+} activated heavy metal borate glasses

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Abstract

Gamma irradiation effect on absorption, photoluminescence (PL), and nonlinear optical (NLO) features of Eu^{3+} doped heavy metal borate glasses was studied and elucidated in detail. With blue light excitation, the emission intensity of Eu^{3+} doped glass was monitored with respect to irradiated dose. The PL intensity of the glasses was reduced with a raise in gamma dose rate because of the formation of colour centres. The quality of the emission colour of the pre- and post-irradiated glasses was analysed using 1931 CIE system. The Nonlinear Optical (NLO) features were examined by the Z-scan technique in the near-infrared spectral region and using femtosecond pulse excitation. The NLO attributes were enhanced with increase gamma irradiation dose. These enhancements are ascribed to the development of defects and non-bridging oxygens when irradiated with gamma radiation. The enhancement of NLO coefficients with gamma irradiation dose suggest the high dose irradiated glasses are useful for photonic device applications, particularly for optical limiters.

Introduction

Recently, substantial efforts have been made by the optics/photonics research community on fabrication and investigation of heavy metal oxide (HMO) based glass systems for the development of devices in optics, photonics, and nuclear engineering applications [[1], [2], [3], [4], [5], [6]]. In particular, rare earth (RE) doped glasses, specifically Eu^{3+} ion activated glasses are beneficial for visible solid state lasers and high power solid state lighting devices as the optical gain host [[7], [8], [9]]. The $4f$–$4f$ electronic transitions of Eu^{3+} in the glass host offers sharp emission bands in the UV–visible zone when excited with UV and/or blue light [10]. However, intensity of the Eu^{3+} emission bands are highly dependent upon the composition of the glass matrices [11,12]. For the efficient luminescence from RE, the RE must be situated in a low phonon energy environment. The HMOs such as Bi$_2$O$_3$ offer low phonon energy but these oxides are inadequate to form glass structure by their own due to their high electronegativity chemical nature [13,14]. though, the HMOs can be mould into glasses by adding suitable glass former into the glass structure. Among all the glass families investigated thus far, the borate groups are interesting due to their low melting temperature and it offers wide variety functional groups (tri, tetra and pentaborate) in the vitrified network [15]. HMOs in the borate glass matrices enhances their chemical resistance against moisture attack, increases thermal stability and importantly decreases the phonon energy of the borate glasses (1400cm^{-1}) [16]. Thus, highly polarized bismuth and lead in the glass network are considered potential materials for visible luminescence applications [17].

The research on influence of gamma irradiation on HMO based glasses has been carried out to understand the mechanism of radiation–matter interaction [18]. These interactions can be classified as photoelectric effect, Compton scattering, and ionization based on irradiated radiation type and its energy. High energy gamma radiation deposits its energy in vitrified network through ionization [19]. The resulted electron–hole pairs are going to trap at pre-existing defects for long time and it leads to the creation of the colour centres in the glass network [20]. Since past, irradiated silicate, borate and phosphate glasses are analysed for dose evaluation of gamma irradiation [[20], [21], [22]]. In the recent past, uses of radiation from radio isotopes in medical as well as food industry is considerably increased for human health safety [23]. Thus,

WDMRR: Watch Dog Monitored Ring Routing Protocol to Improve QoS in Wireless Sensor Networks

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Abstract: Wireless Sensor Networks (WSNs) consists of randomly deployed sensing nodes that cooperatively monitor the surrounding environment. The routed information is monitored using Watch Dog Monitored Ring Routing (WDMRR) protocol. The WDMRR protocol includes formation of ring structure and monitoring by making use of watchdog nodes. Simulation results showed that WDMRR protocol improves the throughput, minimizes the delay compared to the centred sink structure by adapting efficient routing path and mobile sink. The WDMRR protocol shows 13% improvement over Ring Routing with respect to Network Lifetime.

Index Terms: Delay, Energy Efficient, QoS, Security, Throughput, Wireless Sensor Networks.

I. INTRODUCTION

Sensor nodes are spatially distributed which can sense, process and forward the diverse kind of information to other nodes for further transmission. The operation of WSNs includes battery operated sensor nodes which is expected to lower its energy level during its transmission. Today's, WSNs applications demand delay sensitive uninterrupted communication. QoS (Quality of Service) in network is the measure of various capabilities of a system to deliver a guaranteed level of service without interruption to different applications [1]. Transmission of time-critical data can be transmitted using QoS-based energy-efficient routing protocols. In a given network the network efficiency can be increased by prioritizing routing paths using QoS-based routing protocols. Network lifetime can be increased by using a mobile sink that helps in consuming same energy by the remaining nodes. This mobile sink achieves load balancing with respect to energy[2][3][4]. During transmission of information in WSNs should provide guaranteed QoS requirement and energy efficient service selection. Different mechanisms have to be developed that are capable of satisfying QoS requirements such that high energy is maintained at the same time [5].

Sensor Nodes in Wireless Sensor Networks are supervised by Watchdog node which can evaluate various parameters and avoids different attacks. These Watchdogs are responsible to detect when it finds malicious nodes in the network [6]. There are many sensor networks that are developed to detect and collect information related to activities of enemy, explosions and other activities [7].

A. Motivation

Energy conservation becomes important monitoring entity which requires efficient routing paths for transmission. Thus, efficient routing protocols like ring routing helps to stabilise the energy burden on the network. Using static sink node can drain networks energy especially nodes which lie close to sink node, so mobile sink nodes can be used in the network to save maximum energy.

B. Contribution

The real-time applications demand QoS based data transmission within the network. Using mobile sink, network parameters like network lifetime, throughput and delay can be improved to large extent. Watchdog nodes defined in our work avoids transmission to malicious nodes and provides secured data transmission.

C. Organisation

The paper is organized as follows: In Section II, the literature review on routing protocols is provided. In Section III Background of the work carried out is given. In Section IV Problem statement, Objectives and Assumptions are discussed. System setup, Mathematical model and illustration are shown in Section V. The Simulation results and performance evaluation of Watchdog Monitored Ring Routing and various QoS parameters are presented in Section VI. The paper is concluded in Section VII.

II. LITERATURE REVIEW

The raise in the requirement of WSNs in various applications requires reliable security mechanism and energy efficiency. Also, it should not compromise with the QoS parameters of the network with the increase in the size of the network.

Maximizing Network Lifetime using Fuzzy Based Secure Data Aggregation Protocol (FSDAP) in a Wireless Sensor Networks

Reshma S, Shaila K, Venugopal K R

Abstract: Abstract: Secure Data Aggregation in Wireless Senor Networks (WSNs) is a challenging issue. The various protocols has been suggested in the recent past such as EDIT[13], ADA[8], TSDA[9], SEDAN[10]. These protocols effectively meet the constraints of WSNs. In this paper, we have proposed a Fuzzy Based Secure Data Aggregation protocol (FSDAP) which is an efficient localized protocol. The FSDAP protocol is designed with three phases. The first phase selects Aggregator Node using ANS algorithm. An ANS algorithm involves two steps to elect an Aggregator Node in the clustered network. In first step, the cluster head is selected based on the Euclidean distance and in second step, the cluster head is selected based on the fuzzy product and fuzzy value (α). Then, in second phase, a selected AN eliminates data redundancy sensed by all sensor nodes within the cluster. Finally, in third phase, the FSDAP protocol effectively detects malicious node and provides secure data transmission path. Thus, the proposed protocol, FSDAP utilizes the node's resource parameter uniformly, which in turn improves Network Lifetime, maximizes Throughput Rate, maximizes Packet Delivery Ratio and minimizes End-to-End Delay. The FSDAP is simulated using the NS2 simulator and compared with centroid algorithms Fuzzy C-Means and K-Means algorithm and a secure aggregation protocol implemented using SAR (Secure Aware Ad hoc Routing). The time complexity of FSDAP protocol is $O(m2n)$.

Keywords: Data Aggregation, Data Transmission, Fuzzy, Malicious Node, Localized, Network Lifetime, Wireless Sensor Networks.

I. INTRODUCTION

Wireless Sensor Networks (WSNs) consists of a large number of tiny sensor nodes and one or more base stations. The tiny sensor nodes are capable of sensing, processing and sending an event to the base station.

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Health care[4], Machine Surveillance and Preventing The sensor nodes are battery powered and limited resource constrained devices.[1][2]. So, it is necessary for the WSNs applications to utilize the resource effectively. WSNs have diverse applications viz., Disaster relief operations, Biodiversity mapping, Intelligent building[3].

Maintenance [5][6]. For example, the environmental conditions are measured using spatially distributed independent sensor nodes and can be accessed by the user as shown in Fig. 1. The real-world applications collect data from multiple sensor nodes. The sensor nodes sense redundant data and transmit to the base station. The redundant data transmission consume more energy[7] and depletion of more energy in the network results with network partition. Therefore, the practical solution is to aggregate the sensed data before data transmission. Hence, it is necessary to elect an efficient Aggregator Node (AN).

Fig. 1: Wireless Sensor Networks (WSNs) Infrastructure

There are various data aggregation protocols viz., Tree - Based, Cluster - Based and Hybrid Data aggregation[8][9] that are used to elect an efficient AN. In cluster-based data aggregation protocols[10][11][12], the aggregator node is elected based on distance and residual energy and EBRP[13] protocol elects the Aggregator Node (AN) based on energy density, residual energy and distance. Mahalanobis distance, membership value and Fuzzy C-Means algorithm to extract ellipses from the cluster are used in [14]. Thus, it covers the whole network and avoid holes in network and thus guarantees data delivery to the base station. The objective of the aggregation protocols is to minimize the redundant data transmission and maximizes Network Lifetime. The afore mentioned aggregation protocols minimize redundant data transmissions in network [15][16] and prolongs Network Lifetime. But various aggregation protocols efficiently do not meet the resource constraints.

In addition to data aggregation, it is also necessary to provide security for successful data delivery to the base station with effective utilization of available resource parameters. There are various security attacks [17] viz., snooping attack, worm hole attack, black hole attack, packet replication attack, Denial-of-Service (DoS) attack, Distributed DoS (DDoS) attack, etc.

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CONGESTION CONTROL FOR A ULTRA-WIDEBAND DYNAMIC SENSOR NETWORK USING AUTONOMIC BASED LEARNING

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ABSTRACT

The physical conditions of the area of interest is being collected at the central location using a set of dedicated sensors that forms a network is referred to as Wireless Sensor Network. A dynamic environment is required for a secure multi-hop communication between nodes of the heterogeneous Wireless Sensor Network. One such solution is to employ autonomic based learning in a MAC Layer of the UWB TxRx. Over a time period the autonomic based network learns from the previous experience and adapts to the environment significantly. Exploring the Autonomicity would help us in evading the congestion of about 30% in a typical UWB-WSNs. Simulation results showed an improvement of 5% using Local Automate Collision Avoidance Scheme (LACAS-UWB) compared to LACAS.

Key words: Autonomic Network Architecture, Dynamic En- vironment, LACAS, Stocastic Model, Ultra Wide-band, Wireless Sensor Networks.

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Hybrid Domain Steganography for Multiple Images using DWT-LSB Method

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Abstract: The technique of hiding information with coexistence of other information is called Steganography. Users usually stores their documents in the form of images so this can be achieved using steganography. Image steganography can be performed in spatial-domain, Transformation-domain and hybrid domain. A new hybrid domain based steganography for hiding multiple image in a single image is proposed in this paper. The properties of Discrete wavelet transforms is used for developing the algorithm that provides security and also reduces the storage capacity in huge databases. While storing various documents of a user in a huge database confidential and integrity has to be Maintained. Possibility of mismatching of document in huge databases is very common and data storage for maintaining those documents are challenging task. In this Approach, multiple secret images are embedded in a single cover image to get stego image using hybrid domain. Discrete Wavelet Transform (DWT) and Least Significant Bit (LSB) techniques are used in embedding multiple images that reduces the storage capacity along with, enough security. The proposed algorithm provides acceptable Peak Signal to Noise Ratio (PSNR) ratio and data capacity of hidden information is more compared to existing methods.

Keywords : Cover Image, DWT, LSB, PSNR, Secret Image Steganography, Stego Image

I. INTRODUCTION

Steganography [1-3] is a technique of embedding data such that it doesn't draw the attention of the hackers. Steganography means covered writing and is originated from two Greek words with 'Steganos' means covered and 'graphia' means writing. In cryptography data is hidden by scrambling it so that it is unreadable but gives a clue to the hacker.

In recent era, information exchange takes place electronically where new issues, requirements and opportunities are emerged. It is intended that only the authorized person has rights over the data during communication so that unauthorized persons cannot seize the information. Hence, steganography is used to hide the data in other data for secure communication. Consider a person who wishes to deliver some information to recipient such that no one else knows about the information, this can be achieved using steganography technique.

Different types of steganography methods used for embedding information are:

Text Steganography: It allows the user to embed text behind other files by altering the format of text or a file to generate an arbitrary character within the text file. In this technique a text file is preferred as a cover media wherein the secret data is embedded. In this technique, the data is more susceptible to the hackers. Since, the hacker recognize the pattern and decodes the secret data easily. The process of text steganography is difficult since it lacks a large-scale redundancy of information when compared to audio, image and video-based steganography.

Image Steganography: The image steganography technique has gained much attention in the field of steganography. Image steganography techniques are of three types:

1. **Spatial-Domain Steganography:** In this some bits of both cover image and secret image are directly manipulated for embedding secret data.

2. **Transformation-Domain Steganography:** The first and foremost thing is to convert the spatial-domain images to transformation-domain and then embeds the secret data.

3. **Hybrid-Domain Steganography**: Both spatial domain and transformation-domain techniques are employed for hiding secret image in cover image. Initially cover image is converted to Transformation-domain and then the concept of spatial-domain is applied to hide the secret image.

Video Steganography: Embedding information in a video is similar to image steganography where different frames of video are considered to embed information in it.

Audio Steganography: The Audio steganography is most interesting technique as it involves Human Auditory System. Best way to achieve the audio steganography is to use Ultrasound range to transmit secret information.

The aim of this work is to hide the information in image by providing security and to reduce the storage capacity in huge databases. Consider, a bank where customer's data like, account details, photo, Aadhar, PAN and few more details has to be collected and maintained in database. Similarly, in defense, medical field, colleges, some public and private sectors where multiple data of a person or user are stored in databases as image. First, the database is secured using cryptography. If at all hackers can attack and get information about individuals steganography provides the security at next level.

Reconfigurable hardware architecture of public key crypto processor for VANET and wireless sensor nodes

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Abstract: This work proposes encryption of text and image data, embedding as elliptic curve point. Finite field arithmetic is utilised efficiently in this reconfigurable crypto system. Pre-computations for text data and image input conversion is done using MATLAB. This architecture is tailored for cryptographic applications and VANET using Xilinx Spartan-xc3s100e-4-fg320 FPGA with Verilog coding. Total encryption and decryption time results around 10.09021 microseconds for 100×100 images, 22.091 microseconds for 256×256 images and 0.029 microseconds for a message. The message size is varied with different stream size and dynamic mapping of input data and a cipher image with high randomness indicates good security i.e., less vulnerable to attacks. An entropy statistical analysis is performed on plain and encrypted images to assess the strength of the proposed method. An encryption throughput rate is 450 Mbps and area throughput 3.63, which is a good improvement over previous implementations.

Keywords: elliptic curve cryptography; entropy; ElGamal; FPGA; mapping; public key cryptography; VANET.

Biographical notes: G. Leelavathi is an Assistant Professor in the Department of Electronics and Communication Engineering at Govt. SKSJTI, Bangalore, India. She received her BE and ME degrees in Electronics and Communication Engineering from Bangalore University and Visvesvaraya Technological University, respectively. Her research areas are wireless sensor networks and reconfigurable embedded systems. She has published around 10 papers in national and international conferences.

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Fast Discrete Curvelet Decomposition with Gradient Fusion Based Technique for Pansharpening of Multispectral Image

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Abstract: The Process of improving the local details of multispectral image using the information captured from different image sensors is called pansharpening. In this paper, the information captured from three different satellite sensors such as synthetic aperture radar (SAR), multispectral (MS) and panchromatic (PAN) of the same scene is combined effectively using the proposed a novel approach. This approach consists of three stages of fusion scheme, where block based wrap fast discrete curvelet decomposition technique is used in the first stage, which results an intermediate PAN image that contain the almost complete spatial details of SAR image and nonadaptive sparse details of the SAR and PAN images. Next the gradient fusion based technique is used to combine the SAR and an intermediate PAN image which retains more information in the PAN-SAR (PS) fused image. Further pansharpening of the MS image is accomplished by using the hybrid technique which is based on injecting the primary and secondary high frequency components into the original MS image. In this algorithm, the high frequency details are extracted by taking difference between the PS and synthesized intensity image, then the extracted high frequency details are modulated by local adaptive and post processing fusion parameter. The experimental outputs reveal that the proposed algorithm results better performance than other techniques by providing more spatial information in multispectral image while preserving the spectral details and has the potential characterize urban areas in a fused image in a better way.

Index terms- Curvelet Transform, Gradient Fusion, Hybrid Pansharpening, Multi-sensor Image Fusion, Multispectral, Panchromatic, Spatial Resolution, Synthetic Aperture Radar.

I. INTRODUCTION

With the rapid advancement in the earth observing satellites, different remotely sensed imagery such SAR, MS and PAN images having different resolution have been obtained. Each these images are formed by using different image formation mechanism, hence each of these images has its own kind of characteristics and consist of different sort of information. SAR is an active sensor which operates at C band having its own illumination and observes the earth's surface 24/7 with all weather conditions. In SAR, image formation depends on backscattering mechanism. SAR image has high spatial information in a densely populated area where large numbers of high rise buildings with complex roof and different structures are located sealtogether, because a high backscattering response results from high dielectric properties of various objects.

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One of the earth observing sensor which captures the earth's surface in multiband and results the multispectral images, typically these sensors are passive sensors require sun's illumination for their operation and cover infrared, visible bands of the EM spectrum by providing less than 15 bands. PAN image is generated by combining the visible bands such as RGB and infrared band of multispectral image that results in single band image. Since PAN image is produced by using the complete light energy in the visible and infrared bands, a huge amount of lunar power collected per pixel that provide more spatial details in the panchromatic image than multispectral image [18]. However, the multispectral image has high spectral information, hence these images have complementary information, hence all these images are usually combined to improve the image visual interpretation and missing information recovery. Several fusion techniques have been proposed to combine complementary details of SAR, multispectral and panchromatic images and resultant fused image finds the significant demands in the remote sensing applications like land monitoring, maritime monitoring emergency management etc. In the past few decades, various multispectral pan sharpening schemes have been proposed to merge the high spatial components of panchromatic image into MS image to increase ground details. The satellite image fusion scheme based on an adaptive pan sharpening with deep self learning network is developed using the algorithm called point spread function (PSF) estimation [1]. This algorithm is used to get the multispectral image blue kernel, further an edge detection based co registration technique is designed for better geometric alignment among the panchromatic (PAN) and multispectral images. Later multispectral image is down sampled using approximated PSF to train the pansharpening network. Finally high resolution MS image is obtained by prediction of the trained deep self learning network using multispectral and panchromatic images. Adaptive intensity -hue-saturation with multi scale guided filter based fusion scheme is proposed to sharpen multispectral image by inserting detail components of the PAN [2]. First upsampled multispectral image is used to obtain the intensity component adaptively, then multi scale guided filter is used to acquire the more detail components of panchromatic image. Fused image is generated by the model based algorithm in which detail components of panchromatic image are inserted into all the bands of an upsampled multispectral image using the injection gains strategy to control the quality of detail components injection.

Reckoning Network Lifetime Ratio for Wireless Sensor Network

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Abstract: Advanced Technologies such as Internet of Things, Machine Networking give rise to the deployment of autonomous Wireless Sensor Nodes. They are used for various domains namely battlefield monitoring, enemy detection and monitoring the environment change. These Wireless Sensor Nodes have the properties of low cost and high battery life. NL (Network Lifetime) is an important phase of Wireless Sensor Network (WSNs), in which the nodes can maintain sensing for a more amount of time. NL can be improved by use of multiple techniques namely Opportunistic Transmission, Scheduling of Timed Data Packets, Clustering of Nodes, Energy Harvesting and Connectivity. This paper provides the energy consumption computation, life time ratio definition and the overview of NL improvement techniques. The paper also presents brief review of the Destination based and Source based routing algorithm.

Keywords— Energy Harvesting, Lifetime Ratio, Wireless Sensor Network, Network Lifetime, Beam forming

I. INTRODUCTION

Wireless Sensor Networks (WSNs) can be classified into cluster based network and single area random networks. Cluster based network will divide the entire area into a set of sub-areas. Each of the area will have a set of nodes. One among the node is chosen as the cluster head for communication between nodes of different clusters [1], In order to have a better aerial communication a new application layer is provided which will have ContikiMAC layer along with IEEE 802.15.4 2.4 GHz physical layer. With this modification better efficiency energy, high reliability is obtained [2]. The information needed for placement of multiple target sources is provided by acquisition of Received-signal-strength (RSS) values with the help of inexpensive sensors. Three algorithms are used to estimate the value of transmission power, location and orientation of target sources [3]. WSNs have higher advantage as compared to wired networks with respect to flexibility and easy access. Sequential Scanning is responsible for scanning of channels one by one, sensor nodes will be divided into subset and for each subset sequential scan is performed and the last approach will make use of randomized approach in which channel is assigned a random value [4]. Wireless Medical Sensor Networks (WMSNs) will be used for remote patient monitoring. The characteristics of environment are delay sensitivity and critical data.

When the data is transmitted to the actual intended node at regular intervals at a higher rate causes issues like packet drops, retransmissions, and collisions [5]. Exponential cat swarm optimization (ECSO) [6] combines two algorithms. The first algorithm is exponential weighted moving average and second algorithm is cat swarm optimization (CSO). In this algorithm cluster head is opted based on fuzzy-based ant colony optimization (PFuzzyACO) which computes fuzzy, ACO and penguin search optimization. The optimized routing algorithm finds an efficient route between the initiate and terminate node based on multiple parameters namely trust computation, energy value, delay value and density based computation of traffic. The taxonomy of applications in which WSN spans is summarized in Fig1.
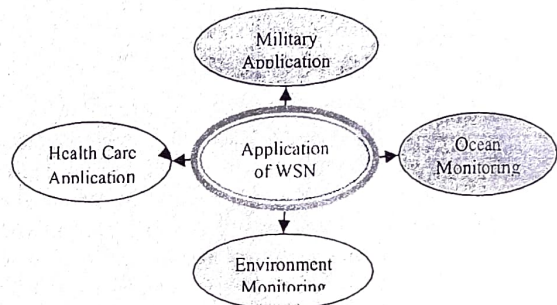
Fig1: Application of WSNs

Fig 1 shows the applications in which WSN is used in a large amount namely Military, Health Care, Ocean Monitoring and Environment monitoring.

II. CLASSIFICATION OF WSN

The broad classification of network is described in Fig2. There are two kinds of classification. The first kind is single area network and then second kind is cluster based network.
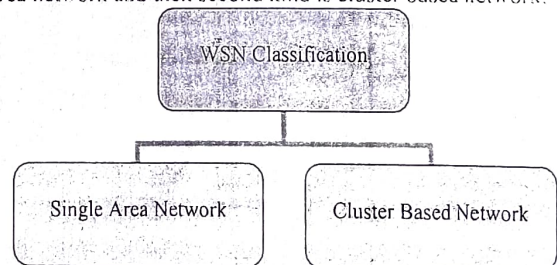
Fig2: Classification of Wireless Sensor Network

Single Area Network has all the nodes spread within an area at randomly locations and each of the node will communicate with other node in the network using its own specific algorithm and there is no controlling authority. The Single Area Network is provided in the Fig3.

Numerical Study of the Three-dimensional Stagnation Point Flow of Non-Newtonian power-law fluid

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Abstract

In the present task, we consider the motion of a steady, laminar three-dimensional stagnant boundary-layer (3D BL) flow of non-Newtonian Ostwald-de-Waele model. The governing partial-differential system with appropriate boundary conditions are transformed in to couple nonlinear ordinary-differential systems using surface similarity transformations. These equations contain two physical parameters: three-dimensionality parameter and power index. The resulting system are solved by numerical methods (i.e. shooting technique). The various effects of physical parameter on the velocity field and wall shear stress are analyzed through graphs and tables.

Keywords: *Power law fluid; Three-dimensional Boundary-layer; Shooting technique; Velocity ratio parameter; Shear-to-strain rate; Similarity solution.*

1. Introduction

The study of non-Newtonian fluid has gained interesting challenges to mathematicians, physicist, engineers and computer scientists, because of their numerous applications. Also some industrial materials are non-Newtonian such as in food, slurries, plastic, high polymer, petrochemical, rubber, paint and biological industries. Generally, non-Newtonian fluids are complex mixtures. Some examples of a power-law fluid commercial are manufacturing of plastic sheets, performance of lubricants and movement of biological fluids. In particular, the study of boundary layer flows of non-Newtonian fluids has attracted the keen interest of scientist due to several industrial and technological applications such as material processing, oil recovery, ceramics, soil, lungs and kidney etc.. are also typical examples of non-Newtonian behavior.

In view of their difference with Newtonian fluids, several models of non-Newtonian fluids have been proposed for 2D and 3D BL. In this present work we studied on Ostwald-de-waele model with all boundary-layer assumptions. We analyze the behavior of the non-Newtonian fluid flow on three-dimensional stagnation point by similar solution.

There are third-order nonlinear ordinary differential equations defined over an infinite range that occur in various branches of scientific and engineering field and also have been a topic of extensive analysis in a variety of fluid mechanics problems. Very few of these ODEs have got closed-form solutions for specific parameters because coupled, nonlinearity and infinite interval always make the problems more complicated and hence these ODEs require special mathematical tools. Obtaining a solution of these ODEs for all involved parameters is the key point of this work.

The early work of non-Newtonian fluid on the two-dimensional flow was done by Acrivos et al. (1960), he discussed the flow past on horizontal flat plate with heat transfer in detail. The art of research of power-law fluids is described in several books like, Schowalter 1978, Bird et al. 1987, Chhabra 1993 and also in few articles like Irvine Jr. and Karni 1987, Andersson and Irgens 1990. Wu and Thompson (1996) analyzed power-law shear-thinning flows on a stagnation plate. Liao (2003) obtained an analytic solution of MHD on a non-Newtonian fluids over stretching sheets. Hayat et al. (2011) investigated on the stretching surface of mixed convection non-Newtonian fluid with presence of magnetic field in the stagnation-point flow.

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Analytical Approach for Mixed Convective Flow in Presence of Casson Fluid in a Porous Channel

B. V. Shilpa, D. V. Chandrashekhar, P. A. Dinesh, and A. T. Eswara

Abstract An analytical approach have been carried to study the mixed convective flow in presence of Casson fluid in a porous channel with an external constraint of magnetic field applied uniformly to the physical model. Perturbation technique has been implemented to find the characteristics of non-linear coupled partial differential equations of concentration, temperature and velocity. The pictorial representation of the effect of physical parameters such as Reynolds number R, Hartman number M^2, Casson parameter β, buoyancy parameter λ, chemical reaction rate γ, concentration buoyancy parameter N, Prandtl number Pr, Schmidt number Sc on concentration, temperature and velocity has been studied. As the variation of non-dimensional parameters make an important role in studying the changes on concentration, temperature and velocity. The analysis of the solution is also compared with the earlier work, and for a particular case, it has been found to be good agreement.

Keywords Perturbation technique · Casson fluid · Magnetic field · Porous channel

1 Introduction

The study of Casson fluid flow in a channel has many applications in engineering. Casson fluid is one of the non-Newtonian fluids in which shear stresses are non-linearly proportional to the velocity gradient. Casson fluid is one of the most

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Learning on Tools Used in IoT Development Life Cycle

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Abstract: Internet of thing is an entity of the physical or virtual object, which is able to identified as well as integrated into communication system. Managing the Internet of Things is called as Web of Things. The IoT gadgets are rooted with sensors, gateways, Internet connectivity and cloud. Also using these gadgets we can converse with other devices through Internet for secured communication. Growth of IoT can be seen extremely fast in our present life. It is acknowledged that by 2020 thousands of billions of objects will be deployed globally. We trust to facilitate IoT as software-driven, therefore utility requirements resolve the modernization as well as improvement towards IoT. Primary domains identified are energy transportation, distribution, smart town, smart communication, smart domestic, atmosphere, supply chain, as well as fitness care. This study presents open source tools used in IoT development life cycle. The expression open source was mainly associated to infrastructure software, where we can improve the code re-usability rather than the implementation using web of objects.

Keywords : AMQP, CoAP, IoT, JSON, Node-RED, VSCP

I. INTRODUCTION

IoT is growing rapidly in everyday at a rate that is extremely quick. This brings the revise of IoT as well as its associated prospect incredibly essential. This study presents a developer to utilize the open tools for all IoT services. The word open source is associated with multiple packages in the software, that presents the original source object code. In general open source tools can be accessed from the developers till the end users to examine, utilization as well as change or growth. The development towards the Web of Things is mainly supported based on the improvement that are continuous in the area of microelectronics, IT Infrastructure. The modren days IoT application layer as shown in Fig. 1 is named as connectivity terminologies. The word connectivity mainly concentrates on Web of Things with different building blocks such as Gateway WoT, Note WoT, LAN and WAN WoT and many more. It has assistance to create more requests that are riveting as well as ranging from machine-driven entities to information analyzers.

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Web of Things consists of interconnected gadgets similar to smart home appliances, equipment, wheels. The user experience depends on the virtual structure as well as its specifications [1] [2] [3].

II. UTENSILS FOR DEVELOPING INTERNET OF THINGS

Implementing an IoT typically calls for the mutual super vision of an actuator and an endpoint. The mechanism that monitors the connected device is mainly probing for a particular assessment that energizes the end point into movement. This can be a linked home surroundings gadget that permits the end user to reveal the high temperature of the residence and alter the thermostat settings slightly, or else it can be a security gadget that tracks moves inside a structure and alert designated customers for changes.

IoT LAN	Local, Short range comm., may or may not connect to internet, building or organization wide
IoT WAN	Connection of various network segments, organizationally and geographically wide, connects to the Internet
IoT Node	Connect to other nods inside a LAN via the IoT LAN, may be sometimes connect to the internet through a WAN directly
IoT Gateway	A router connecting the IoT LAN to a WAN to the internet, can implement several LAN and WAN, Forwards packets between LAN and WAN on the IP Layer
IoT Proxy	Performs active application layer functions between IoT nodes and other entities

Fig. 1. Modern Days IoT Application Layer [1].
Developing applications for linked gadgets requires the following:

- Endpoint authentication,
- Session advent or creating a session,
- Destructing a session and logout from a session,
- Individual device statistics plan info,
- Individual person billing info as wished,
- Individual device details,
- User latest API activity,
- Tool claiming and activation,
- Incoming and outgoing SMS control,
- Device ordering.

IoT solutions discriminates mainstream tools provided by the company and it provides the principal edge to the IoT gadgets. There are companies that still function largely far away from the tech segment. They will also notice profit based on some market terms and conditions.

Fast and Efficient Parallel Alignment Model for Aligning both Long and Short Sentences

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Abstract

Recently, demand for fast and efficient translation system been widely seen. However, translation model are dependent parallel corpora. However, it is challenging to obtain large parallel corpora for resource starved language such as Kannada-Telugu pair. The existing Giza++ based word alignment and Moses phrase based alignment model are efficient for aligning only short sentences. However, for longer sentence the accuracy of model degrades. For performing alignment for longer sentences, neural based alignment has been presented in recent times. However, these models are trained using fixed vector length. Thus, induces memory and training overhead. For overcoming research challenges, this work presents a parallel alignment model using recurrent neural network (RNN). Further, to utilize memory efficiently and minimize training time parallel execution of RNN under GPU is considered. For improving alignment accuracy presented a cost function by combing statistical and neural based alignment method. Experiment are conducted to evaluate the proposed alignment model in terms of accuracy, Word alignment error (WAE), memory utilization, and computation time.

Keywords—Neural alignment model, Phrase alignment, statistical alignment, Word alignment model.

I. INTRODUCTION

Neural Networks (NN) have recently attained wide scope and have been used in applications such as natural language processing (NLP) [1], speech recognition [2], and image processing [3] and attained good result. Since the presentation of these systems and significant outcomes in various applications, numerous scholars in various fields are making utilization of the neural systems as an answer for their issues. MT which is a subcategory of NLP was firstly built utilizing neural systems by [4]. Neural machine alignment and translation model is a new paradigm for alignment and machine translation that has grown superiorly, especially in terms of human evaluation, compared to statistical and rule based alignment and translation model [5], [6] initially developed as a pure sequence to sequence model [7], [8] and enhanced using attention based variant [9]. Neural machine alignment and translation model has now been widely applied for alignment and MT, as well as various other NLP related field such as parsing, summarization, and dialogue.

Number of approaches using neural network has been presented in recent times with good success [11], [12], [13], [14]. However, accuracy is not efficient as compared with phrase based alignment model. Further, neural based alignment and translation model have been used in [15], [16], [17], [18]. In [18] used feed forward neural network for building alignment model. However, [19]] showed RNN attain better performance than feed forward neural network (FFNN). In [20], [21] presented encoder-decoder model using both RNN and convolution neural network (CNN), [22] presented Long Short Term Memory (LSTM) networks for merging statistical alignment model with neural network. In [23], [24], [25] presented an alignment model to address memory issues for performing aligning longer sentences. Further, [26], [27] presented bi-directional alignment and translation model. However, these model incurs computation overhead for performing decoding operation (i.e., due to poor convergence rate when compared with statistical alignment model).

The methodology presented so far for neural based alignment and translation model are generally belongs to encoder-decoder family and encodes all necessary information of source sentence into fixed-length vector from which the decoder performs alignment and translation. This may affects the alignment of neural system for longer sentences, especially those sentence that longer than the sentences in the training dataset. To address, this paper present a novel alignment model that automatically soft search parts of source sentence that are important to predicting target phrase/word, without necessity to form these part as a hard segment explicitly. The most important feature of our approach is it does not encode a whole sentence into fixed-length vector. Instead, it encode sentence into set of vectors and select subset of these vector in adaptive manner in decoding process. This

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Continuous kannada speech segmentation and speech recognition based on threshold using MFCC and VQ

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Article Info	ABSTRACT
	Continuous speech segmentation and its recognition is playing important role in natural language processing. Continuous context based Kannada speech segmentation depends on context, grammer and semantics rules present in the kannada language. The significant feature extraction of kannada speech signal for recognition system is quite exciting for researchers. In this paper proposed method is divided into two parts. First part of the method is continuous kannada speech signal segmentation with respect to the context based is carried out by computing average short term energy and its spectral centroid coefficients of the speech signal present in the specified window. The segmented outputs are completely meaningful segmentation for different scenarios with less segmentation error. The second part of the method is speech recognition by extracting less number Mel frequency cepstral coefficients with less number of codebooks using vector quantization. In this recognition is completely based on threshold value. This threshold setting is a challenging task however the simple method is used to achieve better recognition rate. The experimental results shows more efficient and effective segmentation with high recognition rate for any continuous context based kannada speech signal with different accents for male and female than the existing methods and also used minimal feature dimensions for training data.

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1. INTRODUCTION

Speech segmentation with recognition is challenging task now a days. Proposed speech segmentation in this paper is the processes of isolating the speech signal with context based information of the particular scenario. The segmentation of the speech based on context is to identify end points of the context information based on words, syllables or phonemes in natural langages. The speech segmentation is a subpart of speech recognition system. In natuaral language processing context, semantics, and grammer are very important to recognize the speech. The applications of automatic speech recognition system are used in broadcast news transcription, information extraction and retrieval, identity the speakers voice and allow the authenticated user to utilize the services and many more.

Higher lag is method is used to extract the features of speech signal with linear prediction [1]. The method gives two prediction errors, one is the ordinary convention linear prediction and other one is the delayed version with k number of samples of linear prediction. Further Combined Higher Lag Linear Prediction (CHLLP) model simultaneously by zero lag and higher lag prediction. In CHLLP model the cost function CHLLP model is equal to the cost function of conventional linear prediction if signal is completely periodic with fundamental period length equal to P number of samples and if m number of samples selected

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Design of RSA Processor and Field Arithmetic of ECC with Vedic Multipliers for Nodes in Wireless Sensor Networks

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Abstract:*In Wireless Sensor Nodes due to the resource constraintsthe fast multipliers are preferred for data processing. In this paper, the RSA processor using Vedic multiplication technique is proposed which is capable of achieving considerable speed and with minimum area utilization. The multiplication of two prime numbers is implemented using Nikhilam and Urdva-tiryagbhyam multipliers,The results show that there is good improvement in delay and device utilization usingUrdvaTriyagbhagam method. Urdva-tiryagbhyamis utilized in Point addition and Point doubling, which are finite field arithmetic of ECC in both prime and binary field. Multipliers are implemented on RSA and ECC over NIST/SECG GF(p) and GF (2^M) curves and estimates the algorithms with respect to performance in speed and memory usage.*
Keywords: *Elliptic Curve Cryptography, FPGA,NikhilamMultiplier, RSA algorithm, Urdva-tiryagbhyam Multiplier, Wireless Sensor Networks.*

I. Introduction

The increase in application of Wireless Sensor Networks (WSNs) in environments like home, military and commercialrequiresspeeding up of the data processing in the network [1].Cryptography is a practice for building the message secure with encryption and decryption processes.ECC and RSA are the public-key algorithms that have been investigated by the researchcommunal for several years. The RSA was developed by Rivest, Shamir and Adleman in 1976.Koblitz and Miller available work on ECC in 1985. Modular exponentiationis the major operation underlying in RSA and its security isin question due to its difficulty of factoring large integers. ECC operates on groups of points over elliptic curves and originates its security from the hardness of the elliptic curve discrete logarithm problem (ECDLP). The Public Key Cryptography (PKC)involves cryptographic processes which are computationally intensive and sensor nodes are strictly resource constrained. In encryption systems multipliers play important role. High speed systems with low power consumption and time delay mainly depends on multiplier execution time. Compared to conventional multiplication, Vedic technique of multiplication involves very less number of operations resulting in fasterand high performance multiplier[2-4]. Compared to RSA, ECCbetter suited for WSNs, since ECC offers smaller key sizes, performs faster computation, as well as memory, energy and bandwidth are saved.

The construction of Vedic multipliers is based on Vedic Sutras. The Vedic mathematics has been distributed into sixteen different Sutras and their methods are comparable to the working of human mind which is capable of condensing the complex calculations into simpler ones, consuming less power and attains lower chip area[4].In this work, the multiplication is computed using NikhilamandUrdva-Tiryagbhayam multiplication methodologies for RSAalgorithm that improves the performance in terms of area and speed.Nikhilamincludes minimum number of steps, space, time saving and cerebral calculation.*Urdhva – Tiryagbhayam*formula is appropriate to all cases of multiplication and division of a large number by another large number.This is based on "Vertically and Crosswise" technique andcreates almost all the numeric computations faster and easier. The benefit of multiplier developed on this sutra is that with the rise in the number of bits, area and delay increase at a smaller rate.So this Sutra is used for design of field arithmetic'sof ECC, Point addition and Point doubling.

*Motivation:*Security is generally expensive and thespeed is more obviousin WSNs dueto limited resources of the sensor nodes. In orderto increase the speed while appropriately utilizingthe available resources, it is important to use multipliers which have better performance with respect to security algorithms. Vedic multipliers allow the encryption and decryption of messages to speed up RSA algorithm and finite field arithmetic of ECC.

Effective Speckle Noise Removal of SAR Image Based on Combination of Modified PCA and HMF with Enhancement

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Abstract—Despeckle of Sythetic Aperture Radar (SAR) image is a challenging task for the reseachers due to the presence of multiplicative speckle noise caused by scattered radar waves. This multiplicative speckle noise creates echoes that are directly degrades image quality, aslo makes the object identification difficult. From past few decades the number of speckles noise reduction techniques have been developed to restore the perception quality of SAR images, so that the resulting images are well suitable for further undertaking. However, the existing techniques are not able to perserve edge details of the image while reducing speckle noise. The system model proposed in this paper consists of three stages to reduce the speckle noise in the SAR image. The first stage of the proposed model consists of two stage block based modified Principal Componet Analysis (PCA) which removes maximum amount of speckle noise in SAR image. This block based modified PCA is obtain by selecting different values of standard deviation by applying certain technique that can reduce the maximum amount of speckle noise present in the SAR image. The second stage of proposed model consists of Hybrid Median Filter (HMF) that is used to further removal of the multiplicative noise remaining in the modified PCA output image, particulaly to remove the speckle noise at the edges. Final stage is used to enhance the features of the despeckle image using sharpening filter. In order to maintain good image perception quality, in this paper the selection of the standard deviation is an important factor in the proposed system model to effictively reduce the speckle noise with the existing methods. Thus the system method used in this paper produced better experimetal results than existing methods with regarding to both removal of speckle noise with enhancement of image features.

Index Terms—Sythetic Aperture Radar image, Speckle noise, Despeckle image, Principal Component Analysis, Hybrid median filter.

I. INTRODUCTION

THE Synthetic Aperture Radar is an active satellite sensor which is generally placed on a satellite or an aircraft that emits the microwave signals to remote area of interest and collect the reflected waves to form SAR image. Because of its own illumination SAR can sense remote area during both day and night in any weather conditions. SAR and optical radar images are need to be fuse in order obtain the good perception quality of remote sensing scene and to bring proper alignment of the images the co-registration process is required before the image fusion. However, SAR images are inherently degraded by a speckle noise formed by multiple interference of reflected microwaves which are scattered around the each pixel in the image. Due to presence of speckle noise in the image, the object identification is a challenging task for researchers by removing this noise and preserving good perceptional quality in the acquired SAR image. Also, this type of noise creates echoes which are directly degrades image quality, changes the precision of image registration process and reduces the significance of the merged image. Hence speckle noise reduction is prerequisites for image registration process used to align the multi sensor images geometrically. Number of speckles noise reduction techniques have been developed in the past two decades to improve the quality of SAR and optical images, so that the resulting images are suitable for further process.

Hyunho Choi et al.[1], anisotropic diffusion filter is used as a pre-processing filter for noisy image. Since speckle is a multiplicative noise, author transformed the output of pre processing image into logarithmic form to make as an additive noise. Because of additive noise Discrete Wavelet Transform (DWT) with soft thresholding and a guided filter are used to remove speckle noise by preserving edge details. The experimental results gives better performance in terms of objective and subjective than the conventional filtering method.

Younggi Byun et al. [2] , to improve the quality of SAR image, Lee Filter is used to remove speckle noise present in the homogeneous area rather than heterogeneous.

Norashikin Yahya et al. [3], homomorphic process is employed in order to transform multiplicative speckle noise image into additive noisy image, then signal and noise spaces are generated by decomposing the noisy image vector space. The clean image is obtain by removing the noise spaces and estimated from the remaining signal space using linear estimator that minimizes the image distortion. The experimental results gives better performance in terms of preservation of edges, texture, and point targets and required computational time is less.

Yao Zhao et al. [4], different sets of wavelets are used to estimate the noise level present in the SAR image. This noise level is removed based on adaptive total variation regularization by solve the total variation regularization problem. Experimental results of visual assessment of image quality and objective evaluation using Despeckle Evaluation Index (DEI) shows that Adaptive Total Variation (ATV)-regularization model preserving sharpness and edges while removing noises.

Fan YANG et al. [5] model the algorithm as a first step, is to

Design of Experiments Through Numerical Approach to Solve Multistage Rotor Failure

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Abstract - With the demand for the thrust-to-weight ratio of current generation aero-engines continuously increasing the need for pushing advanced engine-materials to operate even in the non-linear regime satisfactorily, becomes mandatory. Critical engine-components need to meet the conflicting requirements of stiffness, strength, fatigue, creep and impact and operate in high speed, pressure and temperature environments, with minimum component weight and reliability associated with aero-engines.

Scientific approach such as Design of experiments is now a commonly used tool across industries to optimize component design. Advance Design optimization tool includes design objectives, variables, behavioural constraints for parametric optimization of design. Design of experiments pay way for flexibility in machine design adopting computational techniques in recent years. Sensitivity analysis, robustness through parametric evaluation aiming at design objectives, variables, behavioural constraints for parametric optimization of design. Optimum design surface method has made possible with available solver to arrive at best possible probable optimized design.

The main aim of this paper is to model for a multistage drum type rotor coupling of a gas turbine engine typical two stage of a LP turbine. Linear design-optimization tool is used successfully to reduce the weight of a turbine rotor disc, without violating the geometrical constraints imposed and meeting all the design goals. Cases where 10 per cent weight reductions have been achieved in discs, through axi-symmetric analyses, with considerable saving in analysis time, are presented in this paper. Multi-stage turbine disc and coupling arm optimization cases are presented and discussed in full length.

Keywords: Campbell Diagram, Design of Experiments, FEA, Optimization, Rotor Coupling, Structural Integrity, Vibration

I. INTRODUCTION

The functional necessities and features of flexing coupling is to transmit rated torque without undergoing buckling, permanent deformation i.e. to possess with high torsional rigidity. However, under conditions of misalignment, flexing coupling element must have necessary flexibility to accommodate these situations without inducing excessive force and moment on shoulder shaft, bearing and bolts. Misalignment is compensated using laminated disc sets. Both of the requirements should be achieved by maintaining stress levels which are safely in the range of fatigue limit of flexing material. Metal-flexing coupling is identified to show irregular large-amplitude vibrations in axial direction when excited at natural frequency of coupling.

Considering various loads acting upon the disc and variation of the loads with respect to time are the factors that add to the complexity of turbine disc design. Weight of disc plays a vital role in improving efficiency of the gas turbine [1]. Hence, allows component to operate under plastic zone assuring the safety of the component with design limits. In present work an attempt is made to understand design criteria's used for the design of gas turbine disc running at speed of 12000 RPM [6] and operating at a temperature of 500°C. The finite element analyses were carried out to check the mechanical and structural integrity of the disc in a systematic order using the commercially validated FE package software.

II. ANALYSIS OBJECTIVES

Rotating engine components require high stiffness and low weight. The present requirement at which the designers are focused is at arriving high weight to thrust ratio. Often these rotors attain over-speed and vary with thermal gradients leading to peak strain accumulation at critical

Verification of Over-Speed and Burst Margin Limits Inaero Engine Rotor Coupling Along with Estimation of Low Cycle Fatigue Life

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Abstract

Turbine of an aero engine is considered as a key knowledge for development in overall engine performance. High performance turbines with augmented operational temperature require sophisticated design concepts. Weight reduction, increased strength and stiffness are the major requirements for highly stressed turbine disc in forthcoming aircraft engines. A major challenge during the design process of a modern low weight turbine disc is to find rotor disc geometries that meet both, static and fatigue requirement for both mechanical and thermal loads. The important functions of flexible coupling in turbomachines are, transmit mechanical power from one shaft to another with constant velocity, reimburse for mis-alignment without affecting structural integrity, without generating excessive thrust on either shaft for axial movement with minimum power loss. Aero engine rotor burst evaluation is one of the most important problems to be taken care off, whenever it comes to designing a turbo machinery disc. The consequences of a failure can be intense, since the disc fragments into multiple pieces and they are hurled away in all the possible direction at high speeds. In present work evaluation of safety limits and low-cycle fatigue (LCF) life estimation of an aero engine flange coupled disc through classical methods. By blending the terminologies with simulation engineering to arrive at a probable interpretation of number of duty cycles is carried out. The methodology compares the fatigue parameters involved in evaluation of disc life at off-design condition through sensitivity analysis. The design tool closely connects the flight certification regulating agencies for safety in air transportation vehicles. The off-design speed regulations through API and MIL handbook for material specification are considered to carry out finite element analysis.

Keywords: Flexible couplings, rotor burst, low-cycle fatigue, API & MIL handbook, finite element analysis

INTRODUCTION

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Considering various loads acting upon the disc and variation of the loads with respect to time are the factors that add to the complexity of turbine disc design. Weight of disc plays a vital role in improving efficiency of the gas turbine[1]. Hence, allows component to operate under plastic zone assuring the safety of the component with design limits. In present work an attempt is made to understand design criteria's used for the design of gas turbine disc running at speed of 12000 RPM and operating at a temperature of 500°C. The finite element analyses were carried out to check the mechanical and structural integrity of the disc in a systematic order using the commercially validated FE package software. This includes,

- A sensitivity study for material model and its behaviour at in-service condition.
- 3-D analysis for estimation of over-speed margin evaluation with safety factor
- Estimation of over-speed margin in rotating aero rotor disc as per international authorities for integrity, blending the classical approach with FEA
- Application of 3-D elasto-plastic strain to conventional equations to arrive at fatigue life of disc; Coffin-Manson method

DESIGN CONSTRAINTS

The major loads acting on turbine blades are, centrifugal and thermo-mechanical loads. Thermal load is dominated by centrifugal loads for every cycle; Hence, importance is given for mechanical loads. In a bladed disk assembly, the disk happens to be the stronger section compared to disk. Replacing blade under failure is cost effective than replacing disks. During operating at design speed and over-speed circumstances, the average stresses obtained at cross sectional areas has to be well within allowable design limits as per design rule for both blade and disk. To sidestep all these complexities an integrated bladed rotor coupled assembly is considered for analysis. The constraints for present analysis is sequenced as follows

1. Design Parameters

2. Behavior constraints

Drag on a Micropolar Flow Past a Cylinder Specifying Uniform Velocity away from the Boundaries

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Abstract: *A study of the effect of drag force on an micropolar flow past a cylinder specifying uniform velocity away from the boundaries. We find a similarity solution, assuming the fluid outside the cylinder and satisfies the Eringen's micro polar equations and applying no slip condition at the cylinder of the surface. An appearance for drag force is obtained. It is found that the increase in the coupling parameter with fixed coupling stress parameter is to increase drag. Further a reversed behavior is noticed that the drag is decreases and the same is represented graphically.*

Keywords: micropolar flow, coupling stress parameter, Drag, Eringen's micropolar equations

1. Introduction

The earliest formulation of a general theory of microcontinua is accredited to Eringen [1] has considered as fluids with deformable microelements. Eringen's [2] 'micropolar fluid theory' is based on the assumptions that the deformation of the fluid microelements is very small. This theory is still capable of taking into account the effect of microrotational surface and body couples. The evaluation of uniform flow past a cylindrical shell in Newtonian stokes flow has been extensively investigated in the literature, because of its application in lubrication theory, transpiration cooling and other important applications. The stokes uniform flow past a porous sphere has also been investigated by several authors with the assumsion of axisymmtric flow (Padmavati et al [3], Berman [4], Rudraiah et al [5]).

Although researchers started working on this area when Happel[6, 7] and Kuwabara [8] take geometry of cell exterior and particle to be the identical (cylindrical/spherical) and provide disappearance of shear stress and disappearance of revolution at cell surface correspondingly. Micropolar fluids are of attention in the general context of non-Newtonian fluid mechanics. Some purpose ranges from flow of blood and blood-like fluids [9], suspensions of rigid particles in Newtonian fluids [10, 11], liquid crystals, granular fluids [12] and hydrodynamic turbulence [13].

However in environmental pollution problems, particularly in water pollution problem, it is central to consider the effects of suspended particles on the flow past a cylinder. The effect of these suspended particles may be taken into account either using Eringen'smicropolar fluid model or using Saffman dusty fluid model. The Saffman dusty fluid model does not much importance of the effect of micro rotation of balanced particles unless we consider principal of angular momentum in addition to linear momentum. The micropolar fluid model has built in mechanism of taking care of micro rotation.

The recently Deo, Yadav and Tiwari [14] studied flow past a swarm of particles of cylindrical geometry with Happel's formulation and also studied the cause of different parameters such as particle volume fraction on flow pattern. Complete study of cell model functional to the micropolar flow along and at right angles to cylindrical particles is given in the work of Sherief et al. [15]. The core of the cell was considered to be solid, slip conditions for linear and angular velocities were set on its surface. The growth of the cell model to the viscous spheroid in micropolar spheroidal shell is agreed in the work [16].

Presently the analytical study of micropolar fluid flow past an impermeable cylinder specifying identical velocity far from the boundaries. The expression for drag force is determined. The evaluation of drag coefficient on non - dimensional coupling parameter N1 and coupling stress parameter N3 is discussed and presented graphically

2. Mathematical Formulation

Consider a steady incompressible micropolar fluid flow past an impervious cylinder of radius 'a' embedded in a sparsely packed porous medium. The schematic representation is show in figure 1. Under assumptions and approximations made together with governing by the equations of continuity, conservation of momentum and Conservation of angular momentum

$$\nabla \cdot \vec{q} = 0 \qquad (1)$$

$$-\nabla p + \varsigma \left(\nabla \times \vec{\omega} \right) + |\varsigma + \eta| \nabla^2 \vec{q} = 0. \qquad (2)$$

$$\varsigma \left(\nabla \times \vec{q} \right) - 2\varsigma \vec{\omega} + |\lambda' + \eta'| \nabla |\nabla \cdot \vec{\omega}| + \eta' \nabla^2 \vec{\omega} = 0 \quad (3)$$

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SORET AND DUFOUR EFFECTS ON MIXED CONVECTION HEAT AND MASS TRANSFER WITH VARIABLE FLUID PROPERTIES

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ABSTRACT

A Numerical approach has been carried out for the study of Soret and Dufour effects on mixed convection heat and mass transfer past a vertical heated plate embedded in a Newtonian fluid saturated sparsely packed porous medium with variable fluid properties such as variable porosity, permeability and thermal conductivity. The boundary layer flow in the porous medium is governed by Lapwood-Brinkmann extended Darcy model. Similarity transformations are employed and the resulting ordinary differential equations are solved using shooting technique with Runge–Kutta-Fehlberg scheme to obtain velocity, temperature and concentration distributions. The features of fluid flow, heat and mass transfer characteristics are analyzed by plotting the graphs and the physical aspects are discussed in detail to interpret the effect of various significant parameters of the problem. The results obtained show that the impact of buoyancy ratio parameter (N), Soret number (S_r), Dufour number (D_f), Prandtl number (Pr), Schmidt number (Sc) and other parameters plays an important role in the fluid flow through porous medium. Further, the obtained results under the limiting conditions were found to be in good agreement with the existing results.

Keywords: Newtonian fluid; vertical heated plate; porous media; Mixed convection; shooting technique.
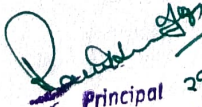
1. INTRODUCTION

Soret and Dufour effects are interesting macroscopically the physical phenomenon in fluid mechanics, when heat and mass transfer occur simultaneously in a moving fluid, the relation between the fluxes and the driving potentials are of more intricate nature. It has been found that an energy flux can be generated not only by temperature gradients but by composition gradients as well. The heat transfer caused by concentration gradient is called the diffusion-thermo or Dufour effect. On the other hand, mass transfer caused by temperature gradients is called Soret or thermal diffusion effect. Thus soret effect is referred to species differentiation developing in an initial homogeneous mixture submitted to a thermal gradient and the Dufour effect referred to the heat flux produced by a concentration gradient. The effect of the Dufour parameter on the local surface temperature becomes more significant and the effect of Soret parameter leads to an increase in the local surface concentration.

In most of the studies related to heat and mass transfer process, soret and Dufour effects are neglected on the basis that they are of a smaller order of magnitude than the effects described by Fourier's and Fick's laws. But these effects are considered as second order phenomena and may become significant in areas such as hydrology, petrology, geosciences, etc. The soret effect, for instance, has been utilized for isotope separation and in mixture between gases with very light molecular weight and of medium molecular weight. The Dufour effect was recently found to be of order of considerable magnitude so that it cannot be neglected (see Eckert and Drake [9]). Several authors have studied the problem of mixed convection about different surface geometrics. The analysis of convective transport in a porous medium with the inclusion of non–Darcian effects has also been a matter of study in recent years. The inertia effect is expected to be important at a higher flow rate and it can be accounted for through the addition of a velocity squared term in the momentum equation, which is known as the Forchheimer's extension of the Darcy's law. A detailed review of convective heat transfer in Darcy and non-Darcy porous medium can be found in the book by Nield and Bejan [15].

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Strength Characteristics of High Performance Concrete using Bagasse Ash and Slag Sand

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ABSTRACT

Today the high demand in industry is fast construction owning to the properties of strength and high durability. Over the years' concrete has seen progressive development with respect to high performance. High performance concrete (HPC) due to its own property is been largely used for construction of global infrastructure such as bridges, dams, roads etc. The main aspect of the work is to check the durability and strength of HPC. In this study, an investigation is performed to develop high performance concrete using waste materials like Bagasse ash and slag sand - from different industries - with different percentage. Cement is partially replaced by Bagasse ash and M sand by slag sand with varied concentration. Concentration of Bagasse ash replaced in cement are 0%, 8%, 12%, 16%, and 20%, as for Manufactured sand the replaced percentage of slag sand is 0%, 15%, 30%, 45% and 60%. The physical test of constitutes used in HPC has been carried out. The strength characteristics such as compression, tension and flexure are conducted for the curing period of 28 days. The result shows that, including Bagasse ash and slag in concrete increases the compressive strength up to a percentage concentration of 8% Bagasse ash and 15% slag sand, any further increase in the concentration of Bagasse ash and slag sand would decrease the overall strength of concrete.

Key words: Bagasse ash; slag sand; high performance concrete compression; flexure; tension.

1. INTRODUCTION

According to American Concrete Institute, Concrete needs special combination of uniformity and performance requirements that cannot be achieved using regular constituents and traditional mixing, placing, and curing practices. High performance concrete (HPC) is intended to design and perform higher than nominal concrete in terms of its durability and strength [1, 2]. The proportions of High-Performance Concrete (HPC) mixtures are designed and engineered towards providing high strength and durability, although composing of primarily the same materials as conventional concrete mixtures, necessary for the structural and environmental requirements of the project. The approximate compressive strength of High-strength concrete is more than or equal to 55 MPa. This value of 55 MPa is chosen, as it would require special care for production and testing of the concrete and this defined high strength value would require special structural design [3, 4, 5]. Contents of High-performance concrete would include one or more of cementitious materials namely Silica fume, ground granulated blast furnace slag or fly ash & sometimes a superplasticizer. The term 'high performance' is somewhat pretentious because the basic feature of this concrete is that it's constituents and quantities are carefully chosen so as to have specifically appropriate properties that are intended use of structure viz high strength and low penetrability[6,7,8].

Hence, High-performance concrete (HPC) does not behaves differently when compared to nominal concrete as the composition of nominal and HPC are same [9,10, 11]. The workability qualities, strength and durability are enhanced to a very high extent due to the use some admixtures and minerals viz Silica fume and Superplasticizer.

2. CHARACTERIZATION OF MATERIALS

The property of the materials is obtained from the experimental tests carried out according to IS codes for cement, bagasse ash, slag sand, manufactured sand (M-sand), 20mm and 12 mm aggregates.

A. Cement

Birla super 53 grade of OPC is used as referred in the code IS: 12269-1987 the terms of tests as per IS-4031 part 11-1988. The tests are carried out and the properties of the cement are obtained.

3. BAGASSE ASH

Bagasse ash is used as replacement material for the cement. The bagasse ash is procured from the sugar factory in K.M Doddi.

Analytical and Experimental Study of Flexural Behaviour of Slag Sand Reinforced Concrete Beams with Various Duct Openings

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Abstract: The provision of transverse openings in floor beams to facilitate the passage of utility pipes and service ducts results not only in a more systematic layout of pipes and ducts,it also translates into substantial economic savings, In the construction of a multi-storey building. Along with opening, the partial replacement of steel slag sand with crushed stone is done which further reduces the cost of the beams. In order to obtain the optimum level of replacement, steel slag sand is varied from 0-100% and tested under compressive strength for maximum strength. With help of ANSYS software, various shapes of openings, keeping equivalent area of cross section such as circular, rounded rectangular and rounded square, provided at critical zone are modelled and analysed in order to obtain the optimum shape of the openings in beams. To reduce stress concentration at corners of the openings, Special reinforcements are provided as per ACI specification. With that optimum shape experimental work is carried out. Where 8 beam were casted of size 2000*450*230mm and tested under loading frame with two pint loading and simply supported condition, The results obtained such as deflection, initial cracks, and ultimate failure load were compared with the beams without openings, with openings using steel slag sand and without using steel slag sand. Also comparison of analytical results with that of experimental results was carried out.

Key words: Compressive Strength, ANSYS, Openings.

I. INTRODUCTION

A. General

In the present scenario, we know that the second widely utilized material is cement next to water, hence it has a very adverse impact on the present environment. Engineers and scientists are trying all the possible alternatives for replacement of building material, which are eco-friendly and emphasizing on the use of reprocessed and reutilized metallurgical waste.

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such that accumulation of industrial waste like iron and steel slag can be minimized and put into practice to produce concrete by making use of it efficiently to its full extent. Slag sand is solid waste disposed in huge amount by iron and steel industry across the world.

It possess similar property as that of river sand, hence can be used as replacement for fine aggregate or coarse aggregate depending on the application of the concrete. Steel slag sand can also be used with cement as active admixture to order to enhance the concrete properties. These supplementary cementitious materials greatly reduce the impact on natural resources along with decrease of CO_2 emissions. Due to fast economic growth there is an urgent need to pay attention towards alternatives and research work needs to be carried out towards it. In the current study, the usefulness of slag sand is studied in reinforced concrete beams with different duct opening. Experimental and analytical work is carried out to understand the behaviour of the RC beams. For the conveyance of pipes and ducts for various purposes such as air conditioner, sewage pipe and water supply system etc. are passed through the transverse opening in the floor beams. When such type of design is adopted, it reduces the height of the structures and it tends to a most economical design. Whenever an opening is provided in beams, it possess problems pertaining to stress concentration at the corners of the opening, deformation and excessive deflection under service load, hence a special consideration on design of the beam around the opening. According to ACI code is carried out, in order to counteract the negative effects of the premature failure of the beams due to Vierendeel Truss Action. When diagonal reinforcements are provided it improves the load carrying capacity of the beam. The aim of this study is to investigate the behaviour of steel slag sand reinforced concrete beams with various shapes of duct openings.

B. Steel Slag Sand

The slag sand is a secondary product obtained from steel and iron manufacturing industry by Basic Oxygen Furnace (BOF) & Electrical Arc Furnace (EAF). Nearly 110-180kg of steel slag is produced from every 1 ton of steel produced. The components of steel slag include MgO, SiO_2, CaO, Al_2O_3 & Fe.