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Available online 22 May 2023

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A comprehensive review of partial replacement of cement in concrete

PG. Neeraja [a], Sujatha Unnikrishnan [b], Alwyn Varghese [c]

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Abstract

Cement is one of the largest used construction materials, the production of which releases large quantity of carbon di oxide. Reduction of cement in concrete will help to reduce carbon foot print and also environmental impact. With the advent of industrialization, large quantity of industrial waste is being produced all over the world. Disposal of these waste material causes environmental pollution and needs to be addressed. An extensive literature on partial replacement of cement with various industrial waste is studied and presented in this article. The partial replacement of cement by industrial waste such as Fly Ash (FA), Rice Husk Ash (RHA), Ground Granulated Blast Furnace Slag (GGBS), Silica Fume (SF), and Sugar Cane Bagasse Ash (SCBA) is reviewed. Mechanical strength, strength gain with curing time and durability in concrete with cement being partially replaced by industrial waste materials were analyzed. The maximum replacement of cement by silica fume and sugar cane bagasse ash is 10 % and 15% respectively. Maximum replacement of cement by rice husk ash is 25%. Optimum level of replacement by GGBS and FA is up to 30%. From the test results of RCPT, Carbonation and Sorptivity, durability of concrete improves to a certain extent by partially replacing cement with FA, RHA, SF, GGBS. A slower rate of rise in carbonation depth with age is reported in concrete with partial replacement of cement by SCBA. Sorptivity steadily decreases with the increasing RHA, FA, and GGBS content, maximum at 25 percent, 40 percent, and 40 percent, respectively. This article provides an overview of the mechanical characteristics, durability research, and empirical relationships of concrete with various industrial waste products, including Fly Ash (FA), Rice Husk Ash (RHA), Ground Granulated Blast Furnace Slag (GGBS), Silica Fume (SF), and Sugar Cane Bagasse Ash (SCBA). a sentence more.On the basis of past research, a statistical relation was built by accounting for concrete grade, material type, and dosage.

Introduction

Since decades, there has been an increase in the need for building supplies, particularly for concrete. Concrete's mechanical properties and low cost, especially when compared to other available materials, gained it its utility as a composite material. Concrete has a significant environmental impact since it consumes a substantial quantity of natural resources and emits approximately one ton of CO2 for every ton of OPC produced [1]. By 2030, annual cement production is anticipated to exceed four billion tons [2]. In addition, the concrete industry uses fresh water and natural aggregate. Increased manufacture of concrete for future use will cause a serious depletion of natural resources and environmental degradation. Therefore, in order to meet future concrete demand while preserving natural resources, the need for green concrete is essential. Any concrete that includes less absorbed energy and carbon than conventional OPC concrete is referred to as green concrete [2]. Furthermore, different waste materials are used as either a binder or an aggregate in green concrete. As a result, the green concrete concept, which emerged at the turn of the century, strives to replace all or part of the components of ordinary concrete with waste or recycled resources. Indeed, the concept of green concrete has been expanded to include not only waste materials, but also nano-engineered components that can improve the mechanical properties of concrete and, as a result, its long-term sustainability. Achieving environmental equilibrium through the synthesis of current economic and social resources and the manipulation of long-term growth and endurance is known as sustainability. Concrete can demonstrate sustainability by the use of long-lasting materials with a low carbon footprint, including OPC and aggregates. Green concrete is created from components that were once used in industries or farms [3]. The significant breakthroughs that are being employed to produce green concrete were examined in this article. The use of a number of alternative materials and their effects on the properties of the resulting green concrete are explored. This article is

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Jyothi Engineering College

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Machine Learning for Healthcare Systems

Foundations and Applications

Editors:

C. Karthik Chandran, Jyothi Engineering college, Thrissur, India

M. Rajalakshmi, Sethu Institute of Technology, Madurai, India

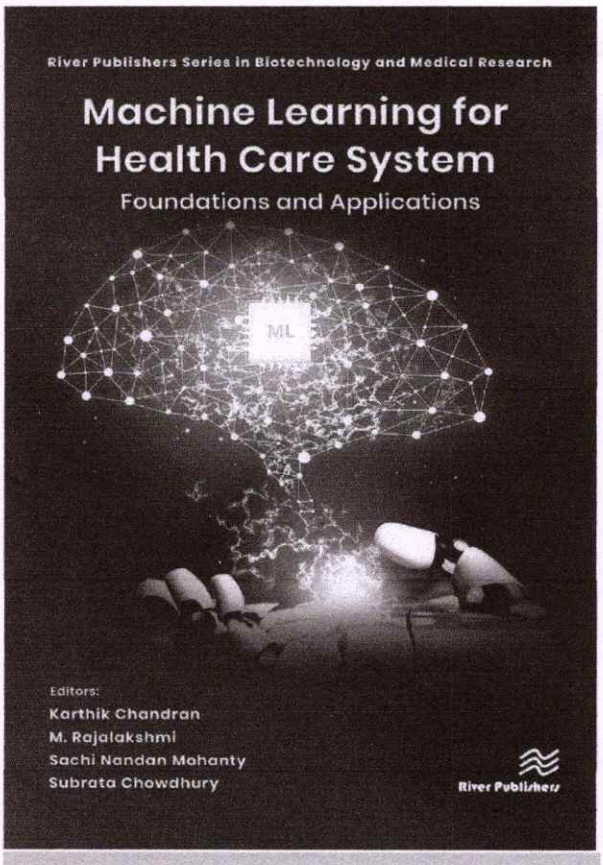
Sachi Nandan Mohanty, VIT-AP University, Amaravati, AP, India

Subrata Chowdhury, Sreenivasa Institute of Technology and Management Studies, Chittoor Andra Pradesh, India

This book provides various insights into machine learning techniques in healthcare system data and its analysis. Recent technological advancements in the healthcare system represent cutting-edge innovations and global research successes in performance modelling, analysis, and applications. The extensive use of machine learning in numerous industries, including healthcare, has been made possible by advancements in data technologies, including storage capacity, processing capability, and data transit speeds. The need for a personalized medicine or "precision medicine" approach to healthcare has been highlighted by current trends in medicine due to the complexity of providing effective healthcare to each individual.

Personalized medicine aims to identify, forecast, and analyze diagnostic decisions using vast volumes of healthcare data so that doctors may then apply them to each unique patient. These data may include, but are not limited to, information on a person's genes or family history, medical imaging data, drug combinations, patient health outcomes at the community level, and natural language processing of pre-existing medical documentation.

The introduction of digital technology in the healthcare industry is marked by ongoing difficulties with implementation and use. Slow progress has been made in unifying different healthcare systems, and much of the world still lacks a fully integrated healthcare system. The intrinsic complexity and development of human biology, as well as the differences across patients, have repeatedly demonstrated the significance of the human element in the diagnosis and treatment of illnesses. But as digital technology develops, healthcare providers will undoubtedly need to use it more and more to give patients the best treatment possible.



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Deep Learning in Medical Image Processing and Analysis

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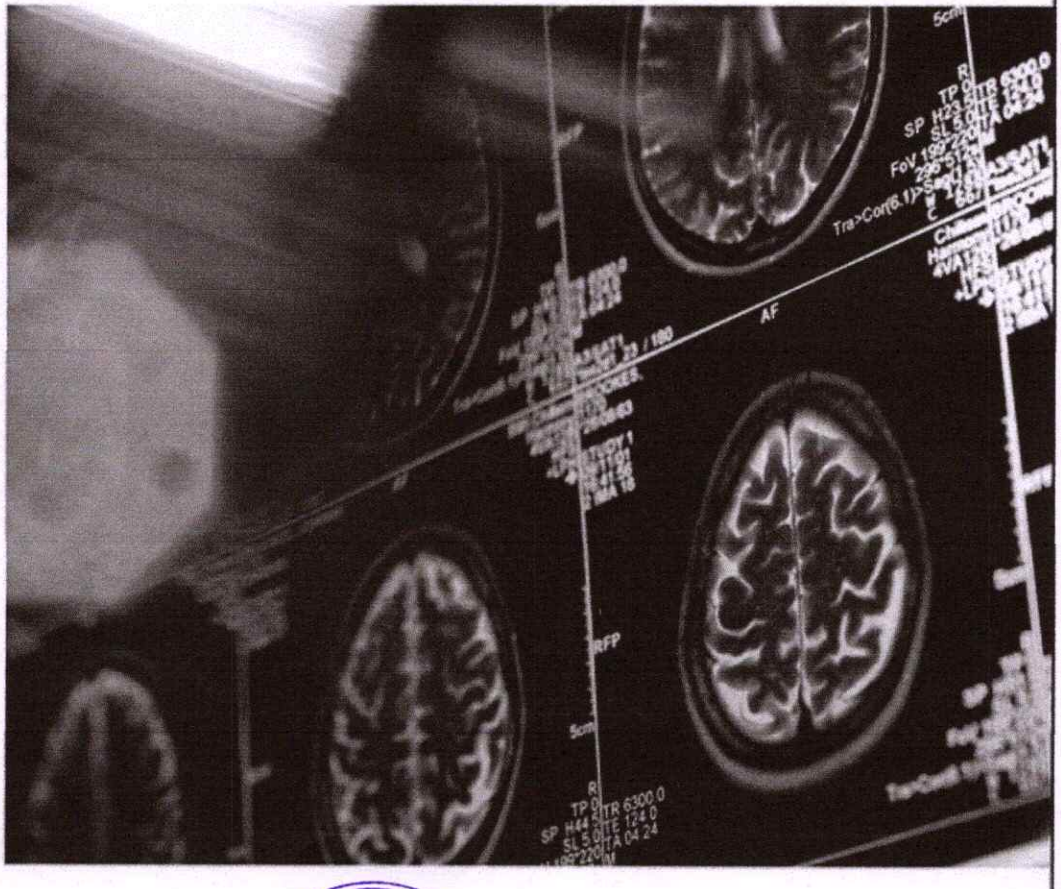

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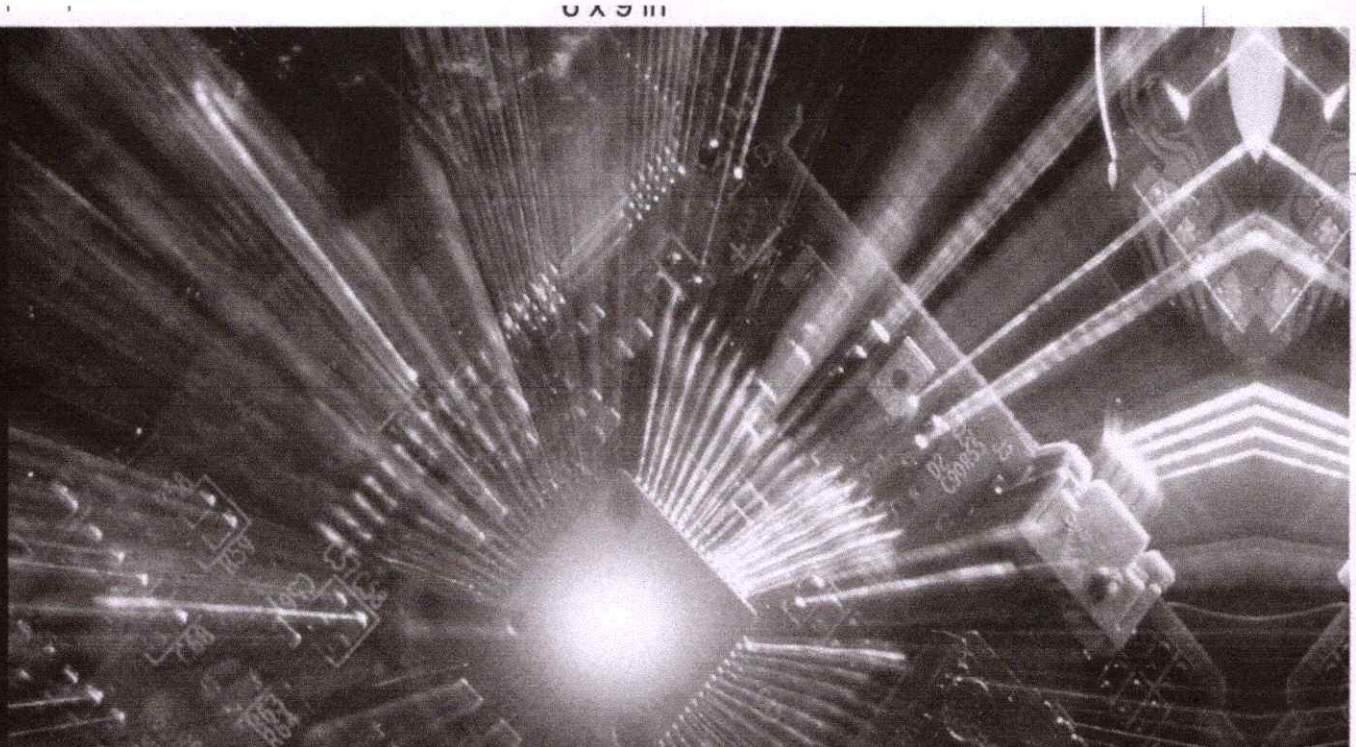

MODELING and OPTIMIZATION of OPTICAL COMMUNICATION NETWORKS

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Machine Learning-Enabled Flexible Optical Transport Networks

Sridhar Iyer[1]*, Rahul Jashvantbhai Pandya[2], N. Jeyakkannan[3] and C. Karthik[4]

[1]*Department of Artificial Intelligence, KLE Technological University, Belagavi, Karnataka, India*

[2]*Department of Electrical Engineering, Indian Institute of Technology, Dharwad, WALMI Campus, Karnataka, India*

[3]*Department of Bio Medical Engineering, Rathinam Technical Campus, Coimbatore, Tamil Nadu, India*

[4]*Department of Mechatronics, Jyothi Engineering College, Cheruthuruthy, Thrissur, Kerala, India*

Abstract

This chapter overviews the various existing solutions for optimizing the Space Division Multiplexed-Elastic Optical Networks (SDM-EONs). Firstly, in view of enabling the realization of SDM-EONs enabled by the development of appropriate fiber solution to ensure long haul signal transmission, the chapter will review various physical layer models which have been proposed to maintain the desired quality of transmission in an SDM-EON under consideration of the fiber solution which has been adopted. Secondly, the chapter will survey new resource assignment strategies and the algorithms used to explore added freedom degrees in multiplexing of the signals within the SDM-EON. Such added freedom degrees are presented by the latest advances in the various fiber solution systems, aiming to exploit the advancing networking profits arising from the aggregate spatial and spectral domains. Lastly, the chapter will detail various open research avenues within the SDM-EONs which require timely solutions.

Keywords: EON, SDM, OTN, spectrum, spatial multiplexing

**Corresponding author*: sridhariyer1983@klescet.ac.in

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A Comparative Analysis on Supercapacitor Based HEV

Rathinam Muniraj[1, a)], N. Karuppiah[2], P. V. Nisha[3], Minju B Chandran[3], T. Jarin[3], Stephy Akkara[4]

[1]*Dept. of EEE, P.S.R. Engineering College, Sivakasi, Tamil Nadu, India*
[2]*Dept. of EEE, Vardhaman College of Engineering, Hyderabad, Telangana, India.*
[3]*Dept. of EEE, Jyothi Engineering College, Thrissur, Kerala, India.*
[4]*Dept. of EEE, Karunya University, Coimbatore, Tamil Nadu, India.*

[a)] Corresponding author: munirajphd@gmail.com

Abstract. Storage systems are playing an increasingly important role in a wide range of applications, including electric vehicles. Supercapacitors (SCs) are making strides in this unique situation due to their high-power density, excellent performance, and long support-free lifetime. The SCs were classified, their key features were summarized, and their electrochemical properties were identified using electrical execution. The coordination of a battery and a supercapacitor can provide significant benefits in the power management of an electric vehicle (EV), in terms of both high energy storage capacity and the ability to manage rapid load variations. A comparison of three different hybrid energy storage system topologies is performed. The advantages and disadvantages of a supercapacitor and a battery were discussed and compared. A comparison of different types of isolated and non-isolated bidirectional DC/DC converters was made, as well as the properties of special electric motors such as performance analysis, power density, torque ripple, noise, and efficiency in relation to their applicability in electric vehicles.

Keywords: Supercapacitors (SCs), Electric vehicle (EV), DC/DC converter, and Hybrid Energy Storage System (HESS).

INTRODUCTION

The supercapacitor is a new invention that promises to play an important role in meeting the needs of electric vehicles both today and in the future. This freshly available super capacitor innovation makes it easier for engineers to adapt their energy and power utilization. Supercapacitors are energy storage devices that are commonly used in conjunction with batteries to compensate for the limited power capacity of the batteries. The lawful regulation of energy storage systems is both a challenge and an opportunity for power and energy management systems. Supercapacitors are used in situations when batteries alone cannot provide energy demands at rapid rates, and they solve many of the issues that arise with batteries. Supercapacitors (SCs) have the advantages of high-power density, extended lifespan, little maintenance, high efficiency, fast response while charging or discharging, and the ability to work at a wide variety of temperatures. Supercapacitors have been used in electric vehicles because of their helpful properties (EVs) [1].

Supercapacitors can aid enhance acceleration and energy recovery in electric vehicles. Supercapacitors are sometimes known as Ultracapacitors or electronic double layer capacitance. Traditional batteries, on the other hand, require longer charging times, limiting the advancement of battery-powered vehicles. The ultracapacitor captures and releases energy quickly, but the battery has a high energy density [2]. As a result, the combination of a battery and an ultracapacitor for an electric vehicle as an energy storage system is one of the best arrangements. As a result of using this combination, the peak current of the battery decreases, and during times of high-power demand, the battery and ultracapacitor deliver both regular and peak power. By resolving the influence of dynamic power exchanges on the battery, an optimum arrangement reduces battery stress and preserves battery life [3].

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Impact of heating cooling regime on flexural behaviour of self-compacting concrete beams exposed to elevated temperatures

A. Arun Solomon [a], N. Anand [b], M. Jemimah Carmichael [c], P.B. Jayakrishnan [d], Alwyn Varghese [e], J. Joel Shelton [f]

[a] Department of Civil Engineering, GMR Institute of Technology, Rajam, Andhra Pradesh, India
[b] Department of Civil Engineering, Karunya Institute of Technology and Sciences, Coimbatore, India
[c] Department of Civil Engineering, Vignan's Lara Institute of Technology and Science, Guntur, Andhra Pradesh, India
[d] Department of Civil Engineering, Carmel College of Engineering and Technology, Alapuzha, Kerela, India
[e] Department of Civil Engineering, Jyothi Engineering College, Trissur, India
[f] RGM College of Engineering and Technology, Kurnool, Andhra Pradesh, India

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Abstract

The present study focuses on understanding the impact of the sudden water-cooling method over natural air-cooling method on Self-compacting concrete (SCC) exposed to Elevated temperature. Design mix M25 Grade of SCC was verified by the basic experiments of fresh and hardened properties of concrete. Fresh SCC experiments were conducted based on the guideline of EFNARC. Five SCC beams were cast for experiments and analytical validation. Two different heating methods, along with two cooling methods, were adopted in this study. The experimental results, such as ultimate load and deflection, were validated using finite element analysis with ANSYS. The investigations were extended for SCC beams of different spans with varying cover thicknesses between 25mm and 60mm using the validated ANSYS models. It was evaluated from the experimental and analytical investigation that water-cooled specimens exhibited an average of 25% higher load carrying capacity when compared to natural air-cooled specimens. The second method of heating yields 13.76% higher failure flexure load when compared to the first method of heating. The optimum cover to resist the flexure load was 40, 45, and 50mm for spans of 4.5, 6.0, and 9.0m, respectively.

Introduction

Self-compacting concrete (SCC) is highly preferred for places where the structure has congested reinforcements and where the provision of vibration is complex. It can flow like liquid with homogeneity and is capable of compacting in its weight. Reduced production time, reduced labor cost for placing and vibration, enhanced filing ability, smooth surface finishing, less formation of honeycombing, lesser permeability, higher durability, and noise reduction during the construction activities are the few advantages of SCC over conventional concrete. Because of its many advantages, many researchers carry various investigations over the years. Evaluating the fire behavior of SCC is one dimension of research investigation since the frequent fire accidents in the construction industry.

Sammy et al. [1] investigated the influence of heating and cooling regime on residual strength behaviour of high-performance and nominal concrete. The investigation was carried out with the elevated temperature ranging of 1100°C with gradual (air-cooling) and rapid (thermal shock) cooling methods. It was reported that the strength was reduced when the samples were exposed to a higher temperature. It was

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A systematic review on characterization of hybrid aluminium nanocomposites

Praveen Raj [a b] ✉, P.L. Biju [a], B. Deepanraj [a c], Nice Menachery [a]

[a] Department of Mechanical Engineering, Jyothi Engineering College, Thrissur 679531, India
[b] APJ Abdul Kalam Technological University, Thiruvananthapuram, 695016, India
[c] Department of Mechanical Engineering, Prince Mohammad Bin Fahd University, Al Khobar 31952, Saudi Arabia

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Abstract

Hybrid composite materials are increasingly being used in a variety of engineering applications because of its additional features and benefits over traditional composite materials without compromising structural performance and durability. Nanocomposites consists of nanosized reinforcements embedded in a polymer/metal/ceramic matrix, whose structures are found to be more complicated than that of micron size reinforced composites. In this article, a detailed review on fabrication methods, metallography behaviour, mechanical characterization and machinability studies of hybrid nanocomposite is presented. The importance of hybridization of reinforcements and the reason behind improvement in properties due to nanoparticle addition are explained in detail. It is found that smaller quantities of nanoparticle addition in the matrix produces a considerable improvement in properties due to their higher surface area. Hybridization of reinforcement is adopted to develop tailor-made properties of hybrid nanocomposites for specific applications.

Introduction

Despite their highly promising mechanical and thermal properties, metal-matrix composites have had minimal use for a long time [1]. The most significant impediments to their proliferation have been flaws such as complex manufacturing requirements and the higher price of the end product. As a result, better manufacturing processes for reinforcements are needed to make them more useful in real-world applications [2].

Composites are versatile materials with unrivalled physical and mechanical characteristics that can be tailored to meet specific application requirements. Many composites show high resistance to corrosion, wear, and to high temperatures [3]. These unique properties give design options to engineers that are not possible with traditional monolithic (unreinforced) materials. In scenarios where monolithic forms are undesirable, composites science allows the use of a complete class of solid materials, such as ceramics, polymers, glass etc. [4]. Furthermore, several composite manufacturing technologies are ideally suited to the fabrication of large and complex geometries, with reduced manufacturing costs.[5].

Composites are vital materials used nowadays in a wide range of applications, includes machine components, electronic packaging, IC engines, trains, aircrafts and various mechanical parts such as automotive structures and mechanical parts viz., flywheels, drive shafts, brakes, pressure vessels and tanks. Oil extraction and production of offshore and onshore ships and boats, maritime construction, leisure and sports equipment; and biomedical equipment's are examples of process industry equipment that requires high-temperature corrosion,

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Corrosion studies on low-cost solid lubricant coated stainless steel specimen

Suneeth Sukumaran [a c], L. Francis Xavier [a], B. Deepanraj [b c], S. Shivakumar [a], Sasidhar Jangam [a]

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Abstract

AISI 304 stainless steel is widely used in industries owing to its many desirable qualities like excellent formability, drawability and resistance to corrosion. However, AISI 304 stainless steel corrodes when exposed to halide environment such as chloride and fluoride. This study is primarily focused to assess the anti-corrosion properties of AISI 304 steel when coated with CaF_2 solid lubricant. CaF_2 solid lubricant was synthesized from the discarded egg-shells by ion exchange method by treating the egg-shell powder with hydrogen fluoride solution. Thermal spray coating method was used to coat the synthesized CaF_2 solid lubricant on the AISI 304 stainless steel specimen. Slurry erosion test and electrochemical impedance spectroscopy test were conducted on the coated and uncoated specimen to assess the corrosion resistance. From the experimental results, the corrosion rate of the coated specimen was found to be very effective compared to the uncoated specimen.

Introduction

Generally liquid lubricants are used in machineries to increase the life of the equipment. They reduce the friction and wear of components having relative motion. However, these liquid lubricants lose their lubricating effect when exposed to extreme circumstances like high temperature, pressure and vacuum [1]. The use of liquid lubricants is not being recommended in many countries due to the environmental and health issues. Usage of liquid lubricants also affects the physical and chemical properties of soil and causes threat to the environment. It was estimated that about 117,576,000 L of lubricating oil is released into the environment annually from wood harvesting industry [2], [3]. In this regard, the usage of liquid lubricants has to be limited and solid lubricants can be used as an alternative. Solid lubricants are considered as an suitable alternative for the conventional liquid lubricants, which fails when exposed to extreme operating conditions [4], [5]. BaF_2, CaF_2, and LiF_2, soft metals like Ag, Pt and Au and metal oxides like Cr_2O_3, NiO and MOO_3 are the mostly used solid lubricants [6]. Fig. 1 reveals the details of the most widely used solid lubricants. Solid lubricants are mostly used in various industrial applications like metal processing industries, defence equipment's, aerospace industries, automotive industries, nuclear reactors, metal forming and power generation industries [7], [8], [9], [10], [11], [12], [13], [14], [15], [16]. High-temperature lubrication is an area that has been researched much in this era around the globe. Due to its synergic effect, most solid lubricants work effectively at high temperature. Among the different types of solid lubricants, CaF_2 possess stable thermo-physical and thermo-chemical properties, low shear strength and has

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Review of Different Types of Spatial Positioning Platforms

Enoch Sam M[1,a)], Anitha Mary X[2,b)], Souvik Pal[3,c)], C.Karthik[4,d)], Subrata Chowdhury [5,e)], Saurabh Adhikari [6,f)]

[1]*Research Scholar, Department of Robotics Engineering, Karunya Insitute of Technology and Sciences, Coimbatore, Tamil Nadu, India*
[2]*Associate Professor, Department of Robotics Engineering, Karunya Insitute of Technology and Sciences, Coimbatore, Tamil Nadu, India*

[3]Department of Computer Science and Engineering, Sister Nivedita University (Techno India Group), Kolkata, India;

[4]*Department of Robotics and Automation, Jyothi Engineering College, Thrissur, Kerala, India*
5 Department of Computer science, Sri Venkateshwara College of Engineering Technology, Chittoor, Andhra Pradesh, India
[6]Swami Vivekananda University, Kolkata, India

[a)]enoch.sam11@gmail.com [b)]anithamary@karunya.edu, souvikpaul22@gmail.com
*d)*karthikmtech86@gmail.com e)subrata895@gmail.com *f)*saurabhadhikari@svu.ac.in

[b)] Corresponding author: anithamary@karunya.edu

Abstract

Spatial position platforms are available with various mechanical structures, which are used for different applications such as stabilization, gaming, aircraft simulation. Platforms which are widely used are 6DOF platform also known as Stewart Platform, 3DOF platform, Gimbal. This article deals with comparison of predominantly used spatial positioning platforms, their Working, their structure, and their suitable application. Based on the structure and their functionality each of the platform have their own merits and demerits, on the basis of the complexity of structure, algorithm, cost, possible degrees of movement each platform's suitable applications are inferred.

Keyword: 6DOF platform, Gimbal, Spatial positioning

INTRODUCTION

Spatial positioning/Spatial Orientation refers to ability to position itself in a particular point in XYZ coordinates. There exist many platforms that can position an object/device placed over it in the specific coordinates (XYZ) as specified, some of the pre-dominantly used platforms are 6DOF platform (Stewart platform), 3DOF platform, GIMBAL.

6DOF Platform also popularly known as Stewart platform is a parallel manipulator made of six actuators, where actuators can be of type hydraulic, pneumatic or servo motors. These actuators attached on the baseplate of platform are crossing over to connecting points on upper/top plate. All of the joints between actuator and plate are made of universal joints, there are about twelve such joints in 6DOF platform. Top plate can be moved along the all 6 Degrees of movement which implies that an object placed on top plate will move in linear axes along x, y, z axis (i.e. surge, heave, and sway), and also along the rotational axes (i.e. yaw, Pitch and roll). 6DOF platform is referred my different names sometimes as motion base, in other areas as six axis platform, it is because of its ability to move in all six degrees of freedom. In some of the places it is also called as synergistic platform as the motion of the platform is produced with the combination of various actuators. The structure has six linkages between top and base plate it is

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Parkinson's Disease Detection using Handwritten drawings and comparing it with Voice Dataset

Akshara R Sankar[1,a)], Dr. Aswathy S U[2,b], C. Karthik[3,c]

[1,2] *Assistant Professor, Department of Artificial Intelligence and Data Science, Jyothi Engineering College, Thrissur, Kerala, India.*
[3] *Associate Professor, Department of Robotics and Automation, Jyothi Engineering College, Thrissur, Kerala, India.*

Author Emails

[a)] Akshara R Sankar : akshara24143@gmail.com
[b)]Dr. Aswathy S U : aswathy.su@gmail.com
c) karthikc@jecc.ac.in

Abstract. Parkinson's disease (PD) is one of the major neurological diseases affecting the nervous system of human body. Till now, there is no proper clinical examination that can diagnose a fully affected PD patient. But, the findings and reports states that the PD patients face disastrous changes in their handwriting. Hence, machine learning experts and research people have proposed different macrograph and computer vision (CV) based methods. Currently, it can take months to get an efficient and proper PD diagnosis, and symptoms that are to be noted and monitored effectively. Even on that note the probability of an improper diagnosis is approx 20 Percent. I have used the Parkinson's disease handwritten dataset and voice dataset. The results confirmed that handwriting is relevant in diagnosing and monitoring PD. Another set of voice dataset has been used to compare it with handwritten dataset. This is an attempt to find the disease as soon as possible by increasing the accuracy of previous results on the same by other researchers. Here I have used classifiers like LDA, KNN, SVM, RF and DT that can predict PD disease, from that SVM has shown greater result in both dataset but was giving greater accuracy in handwritten dataset.

INTRODUCTION

The Parkinson's disease (PD) is one of the major neurological diseases affecting the nervous system of human body. PD is such a disease that makes the retirement age most difficult for the affected ones. i.e., people having an age of 60 years or above. The very common symptoms that are observed in the PD affected population include slowness of movement, voice impairments, rigidness, tremor, and improper balance. Until now, the identification of PD needs proper clinical procedures, methods and years of dedication. However, it is very well known that the PD patients face the problem of shaky hands that leads to a disastrous handwriting change in them. Hence, different computer machine learning experts different macrograph and computer vision (CV) based methods to automatically detect PD using handwritten exams. PD is actually chronic, multilesion, progressive and neurological disease that is caused by the deficiency of a neurotransmitter named dopamine. Usually, PD produces alterations in the postures of the human body that is affected that may raise the risk of falling down and lead to the improper mobility disorders. Thus, it reflects the activities that reduce the quality of living considering the PD affected patients and their support systems.

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A review on electric and electronic waste material management in 21st century

M.V. Ramesh [a], Muthukumar Paramasivan [a,*], P. Akshay [b], T. Jarin [b]

[a] Department of EEE, PVP Siddhartha Institute of Technology, Vijayawada 520007, India
[b] Department of EEE, Jyothi Engineering College, Thrissur 679531, India

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ABSTRACT

The main objective of this paper is to understand the concept of e-waste material management which is a big challenge to the environment in the 21st century. Rapid rise of electronics and IT Retail, gift customer culture, and increasing consumer spending of electronic products creates fateful consequences for the environment. E-waste materials are also dangerous when recycling due to its toxicity, many substances including some carcinogens. These issues and toxicity are due to the release of lead, mercury, cadmium, and metallic elements. In this article reported a brief comparison of how developing and developed countries deal with e-waste materials. Developed countries export this waste as follows: (i) Formal recycling (ii) donations to developing countries. Whereas in developing countries informal recycling takes place, majority of the e-waste materials are being dumped to the land & only a small portion of e-waste is went through proper recycling. There are various laws and guidelines in developed countries, but still, it is difficult to control e-waste materials. Current research focuses on usage and marketing effectiveness use of electronic waste materials in nature. Proper implication of laws should take place and awareness to people around the globe and serious actions must be taken care by the manufacturers.
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Selection and peer-review under responsibility of the scientific committee of the International Conference on Material Science and Computational Engineering 2022.

1. Introduction

Waste material disposal is a new global environment problem and has different and serious effect on health of every living organism. Currently, the world is facing various environmental problems caused by manufacturing activities such as plastic pollution and electronic material waste (e-waste). We all know that as the demand for technology increases so does the production of e-waste, so as a result, the chemical composition of these e-wastes which are being dumped to land will affect the fertility of the land, will also affect the ground water which in turn will affect us. As per the United Nations Global E-waste Monitor 2020, growth in 2019 has increased by 21 % in just five years and double in 16 years by 2030. Comparing growth, it is one among the fastest growing waste in each and every place. While the market demand for the manufacture of electrical and digital system maintains to grow, the carrier existence or alternative durations of such merchandise maintain to say no at some point of the route of technological development. Proper recycling of waste is critical because or else it'll surely affect the near future generation of developing countries [1]. E-waste contains a large variety of different components, including a variety of harmful substances, which pose environmental and health risks if not handled properly. In most countries, household-level waste is (i) dumped in the trash, (ii) formal collection by an accredited body, and (iii) collection of waste by individual people or private sectors/businesses.

Garbage collected via the approved profitable and/or municipal pool sites and pickup facilities is frequently disposed of in a facility with advanced technology, machinery, and infrastructure to ensure that valuable materials are disposed of securely and efficiently. It will be recycled. E-waste is being taken by individual disposal companies and dealers outside the formal system is most often treated and recycled under suboptimal conditions using primitive technology and is usually environmentally friendly. There are no safeguards in place to decrease the release of hazardous chemicals (comfortable recycling). Here a complete account of the existing fashion in international e-waste generation, the most recent processes in e-waste recycling, environmental and occupational fitness worries, possibilities and constraints in powerful e-waste

* Corresponding author.
E-mail address: muthukumarvlsi@gmail.com (M. Paramasivan).

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Design and Evaluation of MPPT Based Two Stage Battery Charging Scheme For A Solar PV Lighting System

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R. Muniraj ; M. Ulaganathan ; Jarin. T ; B. Deepanraj ; Sreekanth. C All Authors •••

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The efficiency of a photovoltaic (PV) system will be greatly influenced by two factors: the effectiveness of the photovoltaic panel and the effectiveness of the electronic charging circuit. Since the PV panel efficiency has been controlled at the manufacturer level, the improvement in effectiveness of the electronic charging circuit is the solitary choice on the researcher side to improve the overall PV system efficiency. This paper proposes a novel design, development, and performance evaluation of a MPPT-based two-stage battery charging scheme that enables efficient battery charging. The street light with a capacity of 20 W has been associated with this proposed system and can function powerfully by the employment of an Automatic Luminous Control Mechanism. The experimental outcomes demonstrate that the suggested scheme with MPPT charger scores an average improved outcome of 10–15% better than a system without MPPT charger. These experimental studies also highlight that the battery back time could be improved because of the employment of an automatic light intensity control mechanism.

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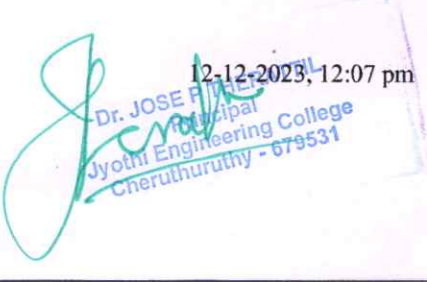

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R. Muniraj
Department of EEE, P.S.R Engineering College, Tamil Nadu, India

M. Ulaganathan
Department of EEE, P.S.R Engineering College, Tamil Nadu, India

Jarin. T
Department of EEE, Jyothi Engineering College, Thrissur, Kerala, India

B. Deepanraj
College of Engineering, Prince Mohammad Bin Fahd University, Al Khobar, Saudi Arabia

Sreekanth. C
Department of EEE, College of Engineering Muttathara, Trivandrum, Kerala, India

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I. Introduction

Energy is considered to be an important and basic infrastructure towards the economic progress of a nation. Solar energy has been a renewable energy source that can lead us away from our commercial energy sources. Light energy is clean, renewable and ecological, unlike fossil fuels like coal, oil and natural gas. Harnessing solar energy by using efficient technologies is expected to play a vital role in serving as a clean energy source for mankind. Photovoltaic cells display non-linear I-V and P-V characteristics that depend upon environmental temperature and light irradiation. For these photovoltaic cells to give off the most power, they should work at MPP no matter how the environment changes [1].

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Authors

R. Muniraj
Department of EEE, P.S.R Engineering College, Tamil Nadu, India

M. Ulaganathan
Department of EEE, P.S.R Engineering College, Tamil Nadu, India

Jarin. T
Department of EEE, Jyothi Engineering College, Thrissur, Kerala, India

B. Deepanraj
College of Engineering, Prince Mohammad Bin Fahd University, Al Khobar, Saudi Arabia

Sreekanth. C
Department of EEE, College of Engineering Muttathara, Trivandrum, Kerala, India

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Quasi Z Source Inverter Fed Induction Motor Drive Using Chaotic Carrier Sinusoidal PWM

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M. Ulaganathan ; R. Muniraj ; T. Jarin ; B. Deepanraj ; C. Sreekanth **All Authors •••**

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R. Muniraj
Department of EEE, P.S.R Engineering College, Tamil Nadu, India

T. Jarin
Department of EEE, Jyothi Engineering College, Thrissur, Kerala, India

B. Deepanraj
College of Engineering, Prince Mohammad Bin Fahd University, Al Khobar, Saudi Arabia

C. Sreekanth
Department of EEE, College of Engineering Muttathara, Trivandrum, Kerala, India

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In almost all applications, voltage source inverter-based adjustable-speed drives (ASDs) have emerged as a crucial substitute. The VSI is used in almost all power electronic household appliances, including air conditioners, power supply, and freezers [1-3]. A battery, a diode rectifier, or a big capacitor might be used as a DC voltage source to power the primary converter circuit in an old-fashioned single-phase voltage-fed inverter. The major component of the main circuit, which also includes four switches, is a free-wheeling diode. Each switch is powered by a power transistor [4].

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Authors

M. Ulaganathan
Department of EEE, P.S.R Engineering College, Tamil Nadu, India

R. Muniraj
Department of EEE, P.S.R Engineering College, Tamil Nadu, India

T. Jarin
Department of EEE, Jyothi Engineering College, Thrissur, Kerala, India

B. Deepanraj
College of Engineering, Prince Mohammad Bin Fahd University, Al Khobar, Saudi Arabia

C. Sreekanth
Department of EEE, College of Engineering Muttathara, Trivandrum, Kerala, India

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Anoop James
Department of Mechanical Engineering, Rajagiri School of Engineering And Technology, Kochi, India

Bilal Abdul Latheef
Department of Mechanical Engineering, Rajagiri School of Engineering And Technology, Kochi, India

Vishnu Sankar
Department of Mechanical Engineering, Rajagiri School of Engineering And Technology, Kochi, India

Jibin Noble
Department of Mechanical Engineering, Rajagiri School of Engineering And Technology, Kochi, India

T Jarin
Department of Electrical and Electronics Engineering, Jyothi Engineering College, Thrissur, India

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I. Introduction
The idea of intelligent robots capable of moving from one location to another over a range of distance which can be remotely accessed was around for a while, they were either ground-based units with wireless communication enabled or tri-counts like drones or UAV, used for either surveillance, inspection, or rectification works [1]. Their relevance is in areas were direct human interaction is not viable.

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Authors

AH Harisankar
Department of Mechanical Engineering, Rajagiri School of Engineering And Technology, Kochi, India

Ashique c Raveendran
Department of Mechanical Engineering, Rajagiri School of Engineering And Technology, Kochi, India

Anoop James
Department of Mechanical Engineering, Rajagiri School of Engineering And Technology, Kochi, India

Bilal Abdul Latheef
Department of Mechanical Engineering, Rajagiri School of Engineering And Technology, Kochi, India

Vishnu Sankar
Department of Mechanical Engineering, Rajagiri School of Engineering And Technology, Kochi, India

Jibin Noble
Department of Mechanical Engineering, Rajagiri School of Engineering And Technology, Kochi, India

T Jarin
Department of Electrical and Electronics Engineering, Jyothi Engineering College, Thrissur, India

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Secure Environment Establishment for Multipath Routing

Saju P. John, Serin V. Simpson, and P. S. Niveditha

Abstract There are a lot of challenges for mobile ad hoc networks (MANET) in the present scenario concerning certificate revocation. Suppose if there is no dynamic access to the central authority, then the certificate revocation of the malicious node is very much crucial. The spoofing of certificates by the intruders will create more threat to the secure communication system. In this paper, we propose to develop a secure multipath Optimized Link State Routing (OLSR) mechanism integrated with certificate revocation and trusted route re-computation mechanisms for MANETs, which helps to overcome these issues. According to the trust value, each node assesses the behavior of its neighbors. The proposed certificate revocation and the route re-computation mechanism minimize the overhead in multipath OLSR. As per the simulation results, the proposed approach could outperform the existing approaches in detecting the malicious nodes.

Keywords Certificate revocation · Trust route re-computation · Network resilience · MANET · OLSR

S. P. John (✉)
Department of Computer Science & Enginering, Jyothi Engineering College, Cheruthuruthy, Thrissur, India
e-mail: sajupjohn@jecc.ac.in

S. V. Simpson
Department of Computer Science & Engineering, SCMS School of Engineering and Technology, Ernakulam, Kerala, India
e-mail: serin@scmsgroup.org

P. S. Niveditha
APJ Abdul Kalam Technological University, Thiruvananthapuram, Kerala, India

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Principal
Jyothi Engineering College
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Engineering College
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Review on Edge Computing-assisted d2d Networks

P. S. Niveditha, Saju P. John, and Serin V. Simpson

Abstract Device-to-device communication is an innovative paradigm which enables user equipment to communicate directly with other user equipment with or without the involvement of network infrastructure. It is an inevitable part of the Internet of Things. Hence, it makes wireless networks more spectrum and energy-efficient with traffic offloading. However, the massive growth of number of devices and the corresponding heavy data traffic generated at the edge of the network created additional burdens on the cloud computing due to the bandwidth and resources scarcity. Hence, edge computing is emerging as a novel strategy that brings data processing and storage near to the end users, leading to what is called edge computing-assisted device-to-device communication. This paper conducts a comprehensive survey on different techniques developed to enhance the performance of device-to-device networks by enabling edge computing capability for the devices in the communication network.

Keywords Device–to-device communication · Edge computing · 5G communication

1 Introduction

Device-to-device communication abbreviated as d2d communication is an advanced data transmission technology, which was developed in the motive of improving the communication network efficiency. In the LTE direct technology, the d2d-enabled

P. S. Niveditha (✉)
APJ Abdul Kalam Technological University, Thiruvananthapuram, Kerala, India
e-mail: nivedithapsukes@gmail.com

S. P. John
Department of Computer Science and Engineering, Jyothi Engineering College, Cheruthuruthy, Thrissur, Kerala, India

S. V. Simpson
Department of Computer Science and Engineering, SCMS School of Engineering and Technology, Ernakulam, Kerala, India

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Review on Image Processing-Based Building Damage Assessment Techniques

I. Sajitha, Rakoth Kandan Sambandam, and Saju P. John

Abstract Quick damage assessment is essential for starting efficient emergency response operations following natural calamities or any other kind of disasters. After a disaster, it is crucial for rescue departments to produce judgments and distribute the resources based on a fast retrieval of precise building damage status. A ground survey is used to implement traditional building assessment, and this is labor-intensive, dangerous, and time-consuming. Studies on building damage extraction over the past few decades have generally concentrated on localizing and evaluating the destructed structures, analyzing the ratio of damaged constructions, and determining the sort of destruction each construction has sustained. Recent research trends are mainly concentrated on the utilization of data collected from multiple sensors for the damage assessments of buildings. Each stage of digital image processing can be carried out in multiple ways and several novel ideas are emerging every single day. This paper reviews the various damage assessment techniques in the different steps of digital image processing.

Keywords Classification · Image enhancement · Image segmentation · Remote sensing · Satellite sensors

1 Introduction

Residential buildings are likely to sustain damage during a significant natural catastrophe, posing a serious risk to both property and lives. Natural disasters are occurrences that have the potential to cause enormous damage. Examples of natural

I. Sajitha (✉) · R. K. Sambandam
Department of Computer Science and Engineering, CHRIST (Deemed to be University), Bangalore, Karnataka, India
e-mail: sajithai@jecc.ac.in

S. P. John
Department of Computer Science and Engineering, Jyothi Engineering College, Cheruthuruthy, Thrissur, Kerala, India

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RESEARCH ARTICLE | MARCH 24 2023

Design of tunable microwave filter using dual mode resonator two pole bandpass filter

Gaswin Kastro G. ; Anie Pradeeba W.; Jarin T.

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AIP Conf. Proc. 2690, 020066 (2023)
https://doi.org/10.1063/5.0120791

Filters are useful components in electronic design. They are required in any communication systems for frequency selection. They allow certain frequencies to pass and reject unwanted frequencies. Microwave signals require special circuits and transmission lines and therefore the design of microwave filters are complex. Modern communication systems require operation in more than one frequency band therefore the microwave filter should be able to operate with more than one center frequency. A tunable microwave bandpass filter is implemented using microstrip lines. The filter is designed using multimode resonator (MMR) and coupled line transmission lines. The filter is simulated in ADS 2009 with substrate material being RO4003C whose dielectric constant is 3.365. Centre frequency of the designed filter is tuned with the aid of varactor diodes. In the passband insertion loss of 1.5 dB and return loss of 25 dB was achieved.

Topics
Linear filters, Electronic filters, Varactor diodes, Telecommunications engineering, Dielectric properties

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RESEARCH ARTICLE | MARCH 24 2023

Design of hexa-band microwave bandpass filter using modified T shaped multimode resonator

Gaswin Kastro G. ✉; Sreeja Mole S.; Jarin T.

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Modern communication systems offer multiservice communication and they function in more than one frequency band. The transceivers of such multiservice communication systems require multiband microwave filters. Multiband filters are bandpass filters with more than one passband. Microstrips have been commonly preferred by engineers to fabricate microwave bandpass filters. The design of multiband filters using microstrips imposes several challenges. Dual band, tri band and quad band filters designed using microstrips can be found in the literature but their operating range span only up to 6 GHz. Also modern applications demand the number of passbands to be as high as seven. Accommodating several passbands within the microwave spectrum without affecting the insertion loss and return loss characteristics is a challenging task. In this paper a 'T' shaped microstrip resonator is designed and then modified to increase the number of passbands. The initial T shaped resonator possessed two passbands centered at 2.4 GHz and 5 GHz. The resonator dimensions and the substrate parameters are modified so that the derived filter possessed five passbands between 1 GHz to 14 GHz. A microstrip spurline is cascaded with the microstrip resonator to enhance the return loss characteristics at 13.3 GHz. A hexa-band microwave filter is thus achieved with satisfactory performance in terms of insertion loss and return loss at all six bands.

Topics

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Volume 77, Part 2, 2023, Pages 478-489

A review on the scope of using calcium fluoride as a multiphase coating and reinforcement material for wear resistant applications

Suneeth Sukumaran [a c], L. Francis Xavier [a], B. Deepanraj [b c]

[a] School of Engineering and Technology, Christ (Deemed to be University), Kengeri Campus, Bengaluru, 560074, Karnataka, India
[b] Department of Mechanical Engineering, College of Engineering, Prince Mohammad Bin Fahd University, Al-Khobar, 31952, Saudi Arabia
[c] Department of Mechanical Engineering, Jyothi Engineering College, Thrissur, 679531, Kerala, India

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Abstract

Solid lubricants play a vital role in the smooth and safe operation of many tribological industrial applications like cutting and forming tools, rolling and sliding contact bearings, gears, cams and protective coating in gas turbine engines for aerospace applications. Generally liquid lubricants are widely used for reducing the friction between the contacting parts which reduce the wear rate and increase the life of the parts. However, these liquid lubricants become useless when they are exposed to high temperature, high pressure and vacuum environmental conditions. Solid lubricants are those materials that can suitably reduce the friction and wear between the contacting or sliding surfaces that are in extreme environments like low and high temperature and pressure. Among the different types of solid lubricants, calcium fluoride is widely used owing to its excellent lubricity at elevated temperature. This paper initially describes the criteria for selecting solid lubricant and provides a comprehensive summary on calcium fluoride solid lubricant which can be used as a coating material in various high temperature metal and ceramic matrix composites for wear resistant applications. Further, investigations related to the selection of optimized coating parameters, synerging multiphase solid lubricants and soft metals with optimal percentage, selection of filler materials, mismatch in coefficient of thermal expansion and its impact on coating life are summarised and discussed. Finally, the scope of synthesizing calcium fluoride solid lubricant from discarded eggshell powders is explored.

Introduction

Owing to the increase in demand for wear resistant, high strength materials with excellent mechanical and thermal properties, the researchers around the globe has steered to design and select new variants and combination to prepare hybrid composite materials [1], [2], [3], [4]. Friction and wear are the main challenges faced by the engineering materials when they are subjected to sliding or rubbing action. Generally liquid lubricants are widely used to reduce the friction and wear. However, these liquid lubricants deteriorate at extreme environmental conditions like high temperature above 350°C and vacuum [5]. Further, owing to the environmental and health issues, most of the countries are not promoting the use of liquid lubricants. Usage of liquid lubricants affect the physical and chemical properties of soil [6]. Thus, there is a need for an alternative lubrication system to replace the conventional liquid lubricants. The effects of liquid lubricants on the physical properties of the soil is shown in Fig. 1 (a). The usage of liquid lubricants is reduced in many countries due to environmental issues and it can be done by switching to minimum quantity lubrication or by using proper solid lubricants.

Solid lubricants are those materials which in spite of being in solid form can be applied between the sliding surfaces to reduce the friction

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An Automated Kidney Tumour Detection Technique from Computer Tomography Images

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The abnormal multiplication of cells in the kidney can lead to the formation of a tumor commonly known as kidney cancer. The early-stage diagnosis of tumors in the kidney can significantly improve the chances of recovery. There are several imaging techniques available to physicians to diagnose the stage of cancer and the response of the patients to the prescription. Various medical imaging techniques are extensively used for the diagnosis and detection of kidney tumors. Currently, the diagnosis and detection are the primary emphases of renal kidney cancer-related research besides recognizing whether the tumor is malignant or not. In this paper, CT images are utilized to spot and pinpoint tumor regions in kidneys using an image processing technique. The current image processing technique combines pre-processing, edge detection, and segmentation stages and anticipated a rapid diagnosis of tumor from CT scans. The available CT scan image can be transformed to a grayscale complement and subsequently subjected to noise reduction during the pre-processing stage. Various well-known algorithms are used in the second stage for detecting the edges. Finally, K means clustering and later on, K means segmentation is employed to distinguish the tumor grown region in the CT images of kidneys.

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Department of Electronics and Communication Engineering, Jyothi Engineering College, Cheruthuruthy, Kerala, India
Department of Electronics and Communication Engineering, Karunya Institute of Technology and Science, Coimbatore, Tamilnadu, India

J Anitha
Department of Electronics and Communication Engineering, Karunya Institute of Technology and Science, Coimbatore, Tamilnadu, India

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I. Introduction

The term kidney cancer or renal cell carcinoma (RCC) is used to represent about 90% of kidney cancers. Though there are several imaging tomography techniques are available to detect cancer in kidneys, the determination of the size, shape, and location of RCC is important to decide the type of treatment. Malignant kidney growth, also known as malignant renal growth, is a condition during which the kidney cells multiply detrimentally forming a tumor. The kidney tumors begin their growth by forming a cover over the tubules in the kidney. Kidney cancers are often detected at their early stages before they spread to other organs. Kidney cancers are grown rapidly if not detected at the early stage and as similar to any other cancer, the mutation of DNAs is the primary reason for cancer in kidneys.

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Authors

Neethu Rose Thomas
Department of Electronics and Communication Engineering, Jyothi Engineering College, Cheruthuruthy, Kerala, India
Department of Electronics and Communication Engineering, Karunya Institute of Technology and Science, Coimbatore, Tamilnadu, India

J Anitha
Department of Electronics and Communication Engineering, Karunya Institute of Technology and Science, Coimbatore, Tamilnadu, India

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Deep learning models and traditional automated techniques for brain tumor segmentation in MRI: a review

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Abstract

Brain is an amazing organ that controls all activities of a human. Any abnormality in the shape of anatomical regions of the brain needs to be detected as early as possible to reduce the mortality rate. It is also beneficial for treatment planning and therapy. The most crucial task is to isolate abnormal areas from normal tissue regions. To identify abnormalities in the earlier stage, various medical imaging modalities were used by medical practitioners as part of the diagnosis. Magnetic Resonance Imaging (MRI) is a non-invasive diagnostic tool used for analyzing the internal structures owing to its capability to provide images with high resolution and better contrast for soft tissues. This survey focuses on studies done in brain MRI. Manual segmentation of abnormal tissues

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Author information

Authors and Affiliations

Department of Computer Science and Engineering, Jyothi Engineering College, Cheruthuruthy, Thrissur, Kerala, India
Parvathy Jyothi

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Dr. JOSE P THERATTIL Principal Jyothi Engineering College Cheruthuruthy - 679531

Department of Computational Intelligence, School of Computing, SRM Institute of Science and Technology, Kattankulathur, Chennai, Tamil Nadu, India
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Corresponding author

Correspondence to Parvathy Jyothi.

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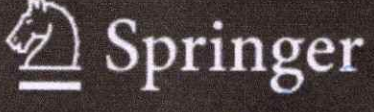

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Recent Trends in Civil Engineering pp 97–108

UHPC Steel Composite Girder: Numerical Studies on Flexural Behaviour in Negative Moment Region

Soorya M. Nair, P. Parthiban & M. J. Anju

Conference paper | First Online: 04 October 2022

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Abstract

Composite girders are extensively employed in the construction of various structures including bridges due to their potential to handle different types of loading conditions. While used in continuous spans of bridges, the lack of ability of concrete to take up tensile forces developed in the negative moment regions has been a matter of concern for a long. Ultra-high-performance concrete (UHPC) is said to have superior properties, including strength,

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Author information

Authors and Affiliations

Department of Civil Engineering, Jyothi Engineering College, Thrissur, India

Soorya M. Nair, P. Parthiban & M. J. Anju

Corresponding author

Correspondence to P. Parthiban .

Editor information

Editors and Affiliations

Department of Civil Engineering, National Institute of Technology Silchar, Silchar, India

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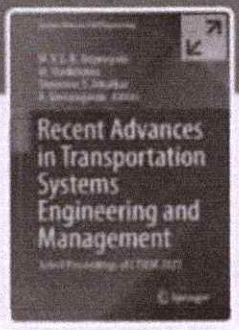

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Traffic Impact Assessment of a Proposed Shopping Mall in a Medium-Sized Town

Neelu Mammen ✉, K. C. Wilson & Vincy Verghese

Conference paper | First Online: 11 November 2022

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Part of the Lecture Notes in Civil Engineering book series (LNCE,volume 261)

Abstract

Urbanization rapidly causes new construction and other developmental activities, and that has its own traffic impact which affects the surrounding road network. One such developmental activity is proposed for a town center in the form of a three [illegible] shopping

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Valsalan Navitha Department of Civil Engineering, National Institute of Technology Calicut, Calicut, India

Vansola Binal Civil Engineering Department, L. D. College of Engineering, Ahmedabad, India

Varghese Renjitha Mary Department of Civil Engineering, NIT Calicut, Kerala, India

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Principal
Jyothi Engineering College
Cheruthuruthy

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Multiclass Classification of Brain Tumor for MR Images Using Shallow Autoencoder Based Neural Network

1st Parvathy Jyothi
School of Computing
Kalasalingam Academy of Research and Education
Krishnankoil, India
parvathyjyothi@gmail.com

2nd S Dhanasekaran
Department of Information Technology
Kalasalingam Academy of Research and Education
Krishnankoil, India
srividhans@gmail.com

3rd Robert A Singh
School of Computing
SRM Institute of Science and Technology
Chennai, India
robertsinghbe@gmail.com

***Abstract*—Brain tumor is an abnormal growth of cells, that may be cancerous or non-cancerous. The earlier prediction, identification, and classification of tumor is essential for rapid diagnosis. In brain MRI, the size and location of tumors can be diverse for different patients. Because of the increased flow of patients in scan centers, patients must now wait for a long time to collect their reports from the radiologists, as it ends up taking the radiologists a long time to classify the images. The proposed methodology in this work can classify tumors from MR brain images into three categories. At first, a shallow autoencoder network is designed for image reconstruction. The encoder segment is made up of three convolutional layers, and in decoder segment, four layers are used for reconstruction. Autoencoder offer excellent noise robustness and feature reduction thereby reducing the possibility of over-fitting. Secondly, to perform classification, an additional convolutional layer is added to the encoder part of neural network along with 2x2 filter. The features extracted from the encoder part were given to a single layer dense neural network and finally testing is performed on SoftMax layer for the classification. The developed algorithm was trained and evaluated on the Cheng dataset, and achieved an accuracy of 95.26%. The developed methods' outcomes outperform well than the conventional techniques.**

Keywords—brain tumor, autoencoder, deep learning.

I. Introduction

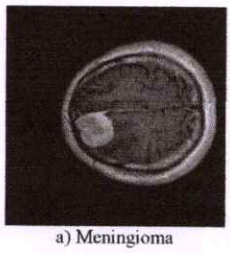
Timely prognosis of brain tumors in multimodal brain images plays a significant role in lessening mortality rates. Brain tumors can be Glioma, Pituitary, Meningioma, Astrocytoma and many more. As per World Health Organization (WHO), Gliomas are life threatening primary tumors. They are malignant and incident rate is 50 percent of all tumors [1]. Meningioma and Pituitary tumors are comparatively low grade as they grow slowly and hence are benign. Hence classification of these three tumors is very essential for patient treatment.

Magnetic resonance imaging (MRI) offers appropriate contrast for different brain tissues relative to X-ray and Computed Tomography (CT). Controlled magnetic field and radio waves makes MRI accepted in diagnosis. When the radio frequency pulse is switched off, various tissues relax at different rates. The broadly used MR sequences are T1 weighted (T1-W), T2 weighted (T2-W), Contrast Enhanced T1-W (CE T1-W) and Fluid Attenuated Inversion Recovery (FLAIR). At the same time, based on MR machine type and acquisition protocol used in different hospitals, the grey values of tissues imaged are different. The proposed methodology is examined on CE T1-W MR brain images. Fig.1 gives the look of brain MRI slices from Cheng dataset which contain CE T1w sequences.

As manual classification is time consuming, automatic classification is employed for accurate diagnosis. Traditional machine learning (ML) algorithms requires hand crafted features for the classification task, which in turn depends on proficient knowledge in the specific area. Feature extraction is crucial in ML as the classification result highly depends on extracted features.

In deep learning (DL), feature extraction is automatic and requires minimum human intervention. Convolutional neural networks (ConvNet) and Autoencoders are the generally used DL techniques for image identification, classification and segmentation. In this paper, a Convolutional Autoencoder (CA)is employed for categorizing various tumors. Initially, the authors developed a shallow autoencoder for image reconstruction. The encoder part possesses three convolutional layers followed by a decoder with four convolutional layers and hence the name shallow autoencoder. After image reconstruction, the encoder part is selected and mutated narrowly for tumor prediction. The detailed architecture of the neural network is discussed in section III. The significant contributions of this work include:

- Recommended a novel architecture using Shallow Autoencoder for image reconstruction.
- Propose an architecture for classifying different tumors by extracting global and local features using a Convolutional Autoencoder.
- The proposed network has been trained from scratch and is compared against pretrained models. The results prove that the model outshines pretrained networks.
- The proposed model shows improved results in classification accuracy in comparison with existing algorithms.



a) Meningioma

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Dr. JOSE THERATTIL
Principal
Jyothi Engineering College
Cheruthuruthy - 679531

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A comprehensive review of partial replacement of cement in concrete

PG. Neeraja [a], Sujatha Unnikrishnan [b], Alwyn Varghese [c]

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Abstract

Cement is one of the largest used construction materials, the production of which releases large quantity of carbon di oxide. Reduction of cement in concrete will help to reduce carbon foot print and also environmental impact. With the advent of industrialization, large quantity of industrial waste is being produced all over the world. Disposal of these waste material causes environmental pollution and needs to be addressed. An extensive literature on partial replacement of cement with various industrial waste is studied and presented in this article. The partial replacement of cement by industrial waste such as Fly Ash (FA), Rice Husk Ash (RHA), Ground Granulated Blast Furnace Slag (GGBS), Silica Fume (SF), and Sugar Cane Bagasse Ash (SCBA) is reviewed. Mechanical strength, strength gain with curing time and durability in concrete with cement being partially replaced by industrial waste materials were analyzed. The maximum replacement of cement by silica fume and sugar cane bagasse ash is 10 % and 15% respectively. Maximum replacement of cement by rice husk ash is 25%. Optimum level of replacement by GGBS and FA is up to 30%. From the test results of RCPT, Carbonation and Sorptivity, durability of concrete improves to a certain extent by partially replacing cement with FA, RHA, SF, GGBS. A slower rate of rise in carbonation depth with age is reported in concrete with partial replacement of cement by SCBA. Sorptivity steadily decreases with the increasing RHA, FA, and GGBS content, maximum at 25 percent, 40 percent, and 40 percent, respectively. This article provides an overview of the mechanical characteristics, durability research, and empirical relationships of concrete with various industrial waste products, including Fly Ash (FA), Rice Husk Ash (RHA), Ground Granulated Blast Furnace Slag (GGBS), Silica Fume (SF), and Sugar Cane Bagasse Ash (SCBA). a sentence more.On the basis of past research, a statistical relation was built by accounting for concrete grade, material type, and dosage.

Introduction

Since decades, there has been an increase in the need for building supplies, particularly for concrete. Concrete's mechanical properties and low cost, especially when compared to other available materials, gained it its utility as a composite material. Concrete has a significant environmental impact since it consumes a substantial quantity of natural resources and emits approximately one ton of CO2 for every ton of OPC produced [1]. By 2030, annual cement production is anticipated to exceed four billion tons [2]. In addition, the concrete industry uses fresh water and natural aggregate. Increased manufacture of concrete for future use will cause a serious depletion of natural resources and environmental degradation. Therefore, in order to meet future concrete demand while preserving natural resources, the need for green concrete is essential. Any concrete that includes less absorbed energy and carbon than conventional OPC concrete is referred to as green concrete [2]. Furthermore, different waste materials are used as either a binder or an aggregate in green concrete. As a result, the green concrete concept, which emerged at the turn of the century, strives to replace all or part of the components of ordinary concrete with waste or recycled resources. Indeed, the concept of green concrete has been expanded to include not only waste materials, but also nano-engineered components that can improve the mechanical properties of concrete and, as a result, its long-term sustainability. Achieving environmental equilibrium through the synthesis of current economic and social resources and the manipulation of long-term growth and endurance is known as sustainability. Concrete can demonstrate sustainability by the use of long-lasting materials with a low carbon footprint, including OPC and aggregates. Green concrete is created from components that were once used in industries or farms [3]. The significant breakthroughs that are being employed to produce green concrete were examined in this article. The use of a number of alternative materials and their effects on the properties of the resulting green concrete are explored. This article is

Jyothi Engineering College CHERUTHURUTHY, THRISSUR-679531

Dr. JOSY THEKKATTIL Principal Jyothi Engineering College Cheruthuruthy - 679531

Investigation on Impact of GaAs and GaN Blazed Grating for High Performance UV-VIS Spectrometer

1st Ajith Ravindran
Electronics and Communication Engineering
Karunya Institute of Technology and Sciences, Coimbatore,
Saintgits College of Engineering, Kottayam
India
ravindran_ajith@yahoo.com

2nd D. Nirmal
Electronics and Communication Engineering
Karunya Institute of Technology and Sciences
Coimbatore, India
dnirmalphd@gmail.com

3rd Binola. K. Jebalin I. V
Biomedical Engineering
Karunya Institute of Technology and Sciences
Coimbatore, India
jebalin.binola6@gmail.com

4th J. Ajayan
Electronics and Communication Engineering
SR University
Telangana, India
email2ajayan@gmail.com

5th Prajoon P
Electronics and Communication Engineering
Jyothi Engineering College
Thrissur, India
prajoon.p@gmail.com

***Abstract*—In this paper we considered a periodic structure with a blazed profile and compared the behaviour of light interaction with III-V semiconductor materials, GaAs and GaN. Th efrequency domain interface of electromagnetic wave is employed to represent wave propagation in a single grating cell. In order to simulate the both faces of the cell, the floquet periodicity constraints are employed on a periodic basis. This article indicates the recent advances in the use of the novel materials namely GaAs and GaN in blazed gratings, with their refractive index properties. Plots were made of the grating's transmittance and reflectance for every material as a function of the incident angle. Also, we evaluated the performance of these gratings at different thickness ranging from 200nm to 800nm and at different blaze angle range. It was found that, gratings with GaAs with blaze angle 17.1° have a good potential to use it in the range of 200nm to 800nm in reflective type grating and GaN with blaze angle 23.96° is a good material for transmission type grating in the range of 200nm to 800nm.**

***Index Terms*—Diffraction, Blazed grating, Optical Grating, Refractive Index, GaAs, GaN.**

I. Introduction

Gratings are tiny optical devices that separate pure white light into its individual wavelengths. They have a tiny optical dimension and are produced on substrates [1]. When polychromic light reflects off the grating, it is gets dispersed and diverted to the sample material. Each grating manufacturing system's goal is to achieve reasonable parameter values. High-performance MEMS-based spectrometers must therefore have high-performance grating and they can be manufactured using MEMS manufacturing techniques. Grating profiles come in different shapes includes Rectangular and Blazed gratings [2].

The angle of incidence, polarisation of incident light, refractive index of the grating material, and the grating period [3] [4] [5] [6] [7] significantly influence the pattern of energy was reflected into various diffraction orders at a particular wavelength [8]. Lord Rayleight predicted that changing the grating profile may change the energy distribution into the diffraction orders as early as 1874 [9] [10]. In both infrared and visible applications, certain materials, such as BK7, sapphire, SiO2, GaN, and GaAs, can be employed. Yet, the efficiency of such an optical device could be increased by selecting materials that are well suited for the applications.

The saw-tooth grooved Blazed gratings, when compared to rectangular and sinc profile gratings, can offer the best efficiency since they can redirect the majority of incident light into a unique order [11]. In other words, it's a form of reflecting or transmission diffraction grating that's been tuned to maximize efficiency in a single diffraction order. As a result, blazing gratings as the diffractive spectroscopic component are extremely attractive in spectroscopy and other applications [12]. This leads to a concentration of maximum optical power in the proper diffraction order and a reduction of residual power in all other orders, especially the zeroth. Each grating can only achieve this condition for a unique wavelength. The blaze angle is the direction in which optimum efficiency is obtained. The problem with this form of grating is that a large anti-blaze angle will considerably limit the efficiency of the intended diffraction order. But by proper tuning of this anti-blaze angle, high efficiency diffraction can be achieved [13].

Jyothi Engineering College
JYOTHI ENGINEERING COLLEGE
LEAD KINDLY LIGHT
CHERUTHURUTHY, THRISSUR-679531

Dr. JOSE P THERATTIL
Principal
Jyothi Engineering College
Cheruthuruthy - 679531

An Explicit Solution for an Inventory Model with Server Interruption and Retrials

E Sandhya[1,2(✉)], C. Sreenivasan[3], Smija Skaria[4], and Sajeev S. Nair[4]

[1] Jyothi Engineering College, Cheruthuruthy, Thrissur, Kerala, India
[2] Government College Chittur, University of Calicut, Malappuram, Kerala, India
esandhya1729@gmail.com
[3] Government Victoria College, Palakkad, Kerala, India
[4] Government Engineering College, Thrissur,APJ Abdul Kalam Technological University, Thiruvananthapuram, Kerala, India
sajeev@gectcr.ac.in

Abstract. Customers enter into a single server queuing model in accordance with a Poisson process where inventory is served. The inter service time follows exponential distribution. Upon arrival, finding the server busy the customers enter into an orbit from where they retry for service at a constant retrial rate. While the server serves a customer the service can be interrupted, the inter occurrence time of interruption being exponentially distributed. Following a service interruption the service restarts according to an exponentially distributed time. Inventory is replenished according to (s, S) policy, replenishment being instantaneous. For the model under discussion we assume that no inventory is lost due to server interruption, the customer being served when interruption occurs waits there until his service is completed and no arrivals or retrials are entertained and an order placed if any is cancelled while the server is on interruption. Explicit expression for the steady state distribution is calculated and several performance measures are evaluated explicitly and numerically. Graphs which show the variation of various performance measures with parameter values are also drawn.

Keywords: (s, S) inventory model · Positive lead time · Retrial · Server interruptions · Explicit solution

Introduction

The pioneers in the study of queueing inventory models are Melikov and Molchano [23] and Sigman and Simchi- Levi [25]. In Sigman and Simchi- Levi customers are allowed to join even when there is no inventory in the system. They also discuss the case of non exponential lead time distribution. Later Berman and et al. [3] considered an inventory system where a processing time is required for serving the inventory. Here they considered deterministic service time and

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Principal
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COVID-19 Cases Prediction Using Different LSTM Models and Comparison of Effectiveness of Different Models

Essmily Simon, Swapna Sasi & Aswathy Wilson

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Abstract

Large infectivity and transmissibility of COVID-19 caused severe damage to the economy, education and health of many countries. Due to the increasing number of COVID-19 cases in the world, some predictive methods are therefore needed to forecast the number of cases of COVID-19 in the future. Long