



3.3.3 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during the year 2023

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2023

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Developing an Efficient Harvester and Weeder for Improved Plantation Productivity

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Keywords: Agricultural machinery, Palmyra sprout, harvester, weeder, law of the lever.

Abstract

In India, many agricultural techniques and agricultural machinery are manufactured to suit the farmer's demands. Farmers are the future of farming who constantly need various farm equipment and equipment to make the process easier and require less time. The Palmyra sprouts, also known as the Palmyra cabbage, are young tubers harvested from growing the Palmyra palm. Palmyra sprouts are a vital food source, especially in South Asian countries, and are consumed cooked as a vegetable. The sprouts are a good source of protein, vitamins, and minerals, making them an essential part of the diet in the region. The present study has been to provide both comfort and safety. The culmination of our effort has resulted in the development of a new "Palmyra sprout harvester and weeder". The harvester utilizes the law of lever mechanism, which is based on the principle that a small force applied at a long distance from the pivot point of a lever can exert a greater force at a shorter distance from the pivot point. The star wheel type of weeder is used in this work to remove weeds in the field, by using a power source from the battery (12V, 2.5A), motor (300rpm and 12V) and provides the necessary power (30W). The basic calculation, 2D and 3D models, and designing are included in the work. The work is conducted some experiments to compare the performance of the mechanical harvester and manual method in terms of labour, time, and cost. The weeder's theoretical and actual field capacities are as follows: 1.39 Ha/h and 0.97 Ha/h. The result of the equipment was presented in the tables, and a comparison was made between the manual and the proposed model. The result of the equipment and test gave a better efficiency than the manual method in terms of harvesting and weeding efficiency, cost-labour and time. The salient feature of our machine can be listed as the mechanism used is very simple, and easy to operate, unskilled workers can also operate this machine. By using these implements, the farmer can harvest the palmyra sprout with less stress and within a short duration of time.

I. INTRODUCTION

Harvesting of the crop is one of the important agricultural operations which demand a considerable amount of labour. The availability and cost of labour during harvesting season

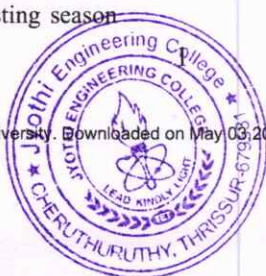
are serious problems. The shortage of labour during harvesting season and the vagaries of the weather cause great losses to the farmer [1]. It is, therefore, essential to adopt the mechanical method so that the timeline for harvesting operation can be ensured. The use of mechanical harvesting devices has increased in recent years. Harvesting machines or equipment are based on mechanical systems [2]. These harvesting machines are classified based on crops. In this regard, a reaper is used for cereal grains, threshers for seed and corn pickers for maize harvesting, which is very costly making it not suitable to most small farmers [3]. Although, some manually operated implements were developed. Recently various types of machines for harvesting root crops have been developed and are available on the market [4].

However, the cost of such machines is very high, and the machine also has complex mechanisms and parts, and is big. Root and tubercrops are the third most important food crops after cereals and grains legumes. They constitute an important and cheap source of food and energy, especially for the weaker section of the population. Tuber crops find an important place in the dietary habits of small and marginal farmers, especially in the food security of the ever-increasing population. They have studied Soil-tool interactions and the field performance of implements. It covers the initial soil condition, tool shape, tool speed, and movement of drawn and PTO-driven implements, as well as low and high-speed soil movement, soil strength, and tool forces. The advantages and disadvantages of the different pulled and PTO-driven primary tillage implements, including mould board, chisel, disc ploughs, and spading machines, as well as machinery for reduced and conservation tillage, are examined. Future agricultural needs are predicted, along with long-term trends, and themes like farming by the soil and managing soil ecosystems are highlighted. Performance evaluation of three pre-lift soil loosening devices for cassava root harvesting- For the efficient harvesting of cassava, it is essential to loosen the soil in the root zone before lifting

<https://doi.org/10.1049/icp.2024.0910>

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Multi-Class Machine Learning Based Approach for Sleep Disorder Identification Using EEG Signals

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Keywords: sleep disorder classification, Support Vector Machine, EEG Signal, Rapid Eye Movement, Non-Rapid Eye Movement.

Abstract

Accurately identifying sleep stages is crucial for the analysis and management of sleep disorders. Electroencephalogram (EEG) signals have shown promise in sleep stage identification. This research presents a novel method for classifying different sleep stages using EEG data based on a multi-class support vector machine (SVM) approach. The proposed method involves preprocessing the EEG signals to remove noise and artifacts, followed by feature extraction using wavelet transform and statistical methods. A multi-class SVM classifier is then trained to identify four sleep stages: waking, non-rapid eye movement (NREM) stage 1, non-rapid eye movement (NREM) stage 2, and rapid eye movement (REM) stage. The method is evaluated on a dataset comprising EEG signals collected from 20 healthy individuals during a full-night sleep study. The results demonstrate that the proposed technique outperforms existing EEG-based approaches, achieving an average classification accuracy of 86.2 for sleep stage identification. The suggested method has potential applications in clinical settings for sleep disorder evaluation and management. Additionally, it can be extended to other applications requiring the identification of various classes from EEG data.

1. INTRODUCTION

Sleep is an imperative physiological phenomenon that is indispensable for the preservation of optimal mental and physical well-being. Multiple sleep disorders, including but not limited to insomnia, sleep apnea, and narcolepsy, have the potential to substantially impair the overall quality of life and increase the susceptibility to long-term health complications [1]. The occurrence of disturbances in achieving a state of restful sleep, which are commonly referred to as sleep disorders, requires meticulous examination and intervention. The primary crucial phase in tackling sleep-related issues entails the identification of discrete sleep stages. Polysomnography (PSG) is widely recognized as the definitive benchmark in this context, providing an all-encompassing sleep examination that amalgamates various physiological markers. Nevertheless, the implementation of PSG necessitates a substantial

allocation of resources, a considerable investment of time, and the involvement of personnel possessing specialized expertise and access to sophisticated equipment [2]. The utilization of electroencephalogram (EEG) signals has demonstrated significant efficacy in the identification and differentiation of various sleep states. According to EEG data, the autonomic nervous system, a crucial regulator of sleep-wake cycles, controls the electrical activity in the brain. In recent times, the application of machine learning methodologies has been observed in the domain of electroencephalogram (EEG) data analysis, specifically for the purpose of distinguishing and classifying different sleep stages. Support Vector Machines (SVMs), which are extensively utilized in the field of machine learning, have been effectively utilized for the purpose of classifying sleep stages into both binary and multiclass categories. This manuscript presents a methodology employing a multi-class support vector machine for the purpose of extracting sleep stages from electroencephalogram (EEG) data [3,4]. The real-time implementation of this methodology facilitates the perpetual monitoring of patients' sleep patterns by medical professionals. Healthcare professionals can easily implement this methodology in various environments due to the cost-effectiveness and wide availability of EEG technology.

The system facilitates the generation of readily comprehensible outcomes for healthcare practitioners, leveraging the data to make well-informed determinations regarding patient care and treatment [5]. The technique has the potential to improve treatment outcomes by tailoring treatment plans to specific sleeping patterns. The Support Vector Machine (SVM) machine learning system is designed and optimized to classify electroencephalogram (EEG) data into discrete sleep phases by utilizing predetermined parameters derived from the signal. The proposed system includes a series of steps that are done in order. The first step is collecting data, then there is pre-processing, feature extraction and selection, labeling, SVM training, model optimization, assessment, and finally deployment.

The utilization of this approach exhibits the capability to optimize the manual analysis process, resulting in a reduction of both time and expenses. Furthermore, it greatly improves the precision of sleep stage identification while also offering valuable insights into sleep disorders. Through the utilization of electroencephalogram (EEG) data and support vector machines (SVM), the accurate identification of sleep stages can enable medical professionals to make informed and precise determinations regarding patient care. The proposed methodology involves the initial pre-processing of EEG signals, followed by the extraction of relevant features using statistical

Effective Feature Extraction Framework to Improve Network Intrusion Detection System

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Abstract— A network intrusion detection system (NIDS) is a crucial component of a robust cybersecurity strategy. Its primary purpose is to continuously monitor network traffic and detect suspicious or malicious activity that could be indicative of a cyberattack or unauthorized network access. The effectiveness of NIDS depends heavily on the techniques we use to boost the classification accuracy of intrusion and minimize the computational difficulty while performing training and testing. The high volume of network traffic combined with its large number of features will increase the classification time. With the recent emergence of deep learning techniques, scientists have shown interest in learning dataset features, followed by the classification of intrusions. This study offers a novel method for extracting high-dimensional features from input data by employing a stacked sparse autoencoder. Simple machine learning models are then built using the remaining low-dimensionality features. Simulations were conducted, and the efficacy of binary and multiclass classifications was verified. The proposed method exceeds most of the other existing approaches in terms of performance.

Keywords— intrusion detection system, deep learning, sparse autoencoder, NSL-KDD

I. INTRODUCTION

Recent developments in computer networks and mobile communication have increased their use in critical sectors like banking, healthcare, electronic commerce, the military, and automotive applications. Meanwhile, increase in attacks on the systems by the attackers increased with the diversity and frequency of the data. With the rise of Internet of Things, the world has seen incredible transformations and has benefited from cutting-edge, cost-effective solutions across a broad spectrum of industries. It is expected that the IoT market will reach 75 billion devices by 2025. In the highly connected world, there is a huge growth in data transmission across channels and protocols, which raises serious security concerns and highlights the need for advanced intrusion detection systems. Cyberattacks come in various forms, and the threat environment has become increasingly unpredictable. The emergence of professionalized cybercriminal groups has resulted in the emergence of new attack types. Based on the 2023 cyberthreat defense report released by the CyberEdge group, 85% of the organizations surveyed suffered from at least one successful cyberattack last year [1].

To ensure network security for protecting client data, it is necessary to provide privacy, service availability, and data security. Using network security tools known as NIDS, computer networks and host computers can be monitored using advanced techniques and some restrictive measures. The two categories of intrusion detection techniques are anomaly detection-based NIDS (ADNIDS) and signature-

based NIDS (SNIDS). SNIDS approaches operate by correlating the input data with predefined patterns or attack signatures. Although these techniques are effective in identifying existing attacks, they are unable to identify new attacks. Any deviation from the usual network behavior is detected by ADNIDS, which flags such deviations as threats. This method can also be used to detect attacks from unknown sources.

In the case of big data, the conventional techniques used for the collection, storage, and processing of data might not work; hence, a deep learning approach is the best option. Deep learning (DL) is an area of machine learning (ML) in which many neuron layers represent the learning stage. It is capable of processing large amounts of data and has demonstrated its effectiveness in various domains. Deep learning techniques can automatically learn intricate patterns and representations from large volumes of network data. Therefore, researchers have increased their efforts to examine the use of DL in IDS.

Unsupervised and supervised techniques of machine learning are incorporated with optimization algorithms in anomaly detection-based NIDS to improve classification accuracy and detection of intrusions. Examples of ML models used in the detection and classification of intrusions include Support Vector Machines (SVMs), Naive Bayesian, Random Forest, and Decision trees. Many researchers who studied NIDS used unsupervised learning methods prior to using shallow machine learning because they found that using unsupervised methods before shallow machine learning improved the detection rate.

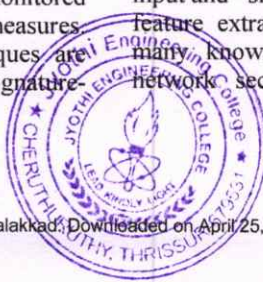
To create an efficient anomaly detection-based NIDS, the following steps must be undertaken. The first step is to choose the appropriate features from the network traffic dataset based on feature extraction and dimensionality mitigation, which will result in improved classification outcomes [2]. The second step is to use the most effective techniques to improve the classification results and speed. Owing to its superior performance in processing complex and large-scale data, deep learning presents a possible solution to the intrusion detection problem. To achieve this, we employ a deep learning-based Stacked Sparse Autoencoder (SSAE) model to minimize the feature dimensions of the input.

The SSAE model is then applied sparsity constraints to improve its ability to generalize and classify data accurately. When compared to the current techniques, SSAE may effectively reduce the original feature dimensions of the input and simplify the classifier's detection process. Its feature extraction capability is clearly superior to that of many known methods. Deep learning can revolutionize network security and intrusion detection, but there are

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Modern Multilevel Inverter for Application of Drive with Grid Connected Renewable Energy Sources

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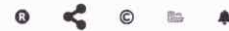


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- II. Proposed System
- III. Proposed Hysteresis Current Controller
- IV. Simulation Results
- V. Conclusion

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The grid with integration of PV-FC system efficiency and performance can be improved up to a large extent because of the invention of modern DC-DC & multilevel power elec... [View more](#)

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The grid with integration of PV-FC system efficiency and performance can be improved up to a large extent because of the invention of modern DC-DC & multilevel power electronic converters. For a few years ago, the Conditioning Unit (CU) was utilized to coherence advanced power electronic devices which has got an important position in the study of power electronics. The present paper fetches the explained analysis of 5-level multilevel inverter with motor drive along with boost converters. The pv side dc/dc converter utilizing Maximum Power Point Tracking (MPPT) algorithm, i.e., P & O (Perturb & Observe) type of MPPT algorithm. In suggested paper the arrangement is consists of pv, fuel cell with dc/dc converters, DC bus and grid/load(drive). In this paper the grid/drive side inverter replaced with neutral point clamped multilevel inverter. The proposed multilevel inverter topology improve the efficiency and reduces harmonics. The obtained simulation results would be carried out under environment of MATLAB simulation.

Published in: 2023 2nd International Conference on Automation, Computing and Renewable Systems (ICACRS)

Date of Conference: 11-13 December 2023

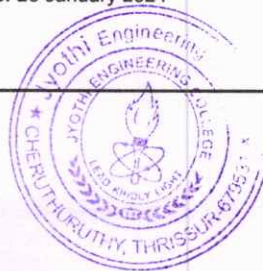
DOI: 10.1109/ICACRS58579.2023.10405229

Date Added to IEEE Xplore: 26 January 2024

Publisher: IEEE

► **ISBN Information:**

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ANN controller for mitigation of power quality issues using single phase unified power flow controller

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Abstract—This research proposes a nonlinear control method for single-phase Unified Power Flow Controller (UPFC) to improve Power Quality (PQ) issues in single-phase power grid. The main objective of this work is to maintain the appropriate level of load voltage minimal distortion and the control aims include the following: (i) compensation for current harmonics and reactive power; (ii) compensation for voltage disturbances (harmonics and swell, sags and flickers of voltage); and (iii) regulate the voltage on the DC bus. For the purpose to reduce harmonics in power systems and generate reference current for AC supply, the Decoupled Double Synchronous Reference Frame (DDSRF) theory has been presented. The influence of harmonics is then lessened by injecting this harmonic into power systems. Artificial Neural Network (ANN) with Hysteresis Current Controller (HCC) is used to create hysteresis Current regulation, which lowers Total Harmonic Distortion (THD) and increases output voltage. Through several simulation outcomes, the suggested system's effectiveness is examined. Hardware results are also confirmed with simulation outcomes using Matlab/Simulink.

Keywords—Power Quality, Unity Power factor correction, Decoupled Double Synchronous Reference Frame, Artificial Neural Network, Hysteresis Current Controller

I. INTRODUCTION

Because of the widespread use of electrical devices like variable-speed drives, computing power supplies, combustion appliances, networks of communications, switches, electrical controllers, etc., maintaining PQ in an electric power system is getting more and more difficult [1]. The amount of the sinusoidal voltage and current are affected by these elements in various load situations, which lowers the operational effectiveness of the whole electrical system and the connected components [2, 3]. Additionally, the demand for a high-efficiency power system has caused a

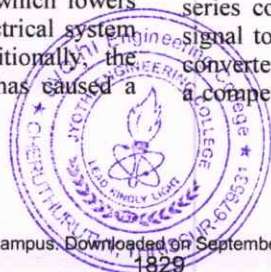
slow change in the characteristics of electric utility network components from being primarily linear to strongly nonlinear, providing resulted in various kinds of PQ problems (such as voltage sag and swell, flickers etc.). Normally, the PQ issues resolved by the implementation of Flexible AC Transmission (FACT) devices.

The most widely used comprehensive multifunctional FACTS device is the UPFC [4]. It has the ability to precisely or concurrently adjust every factor influencing the flow of power through a gearbox line. Alternately, it may autonomously regulate the transmission line's active and reactive power flow [5]. In the electrical transmission line, both reactive and active power flow concurrently. It can also function as a harmonic isolator under certain circumstances. A typical UPFC is made up of two Voltage Source Converters (VSCs), one of that functions as a shunt and series converter, that are linked together by a dc link [6]. The UPFC's shunt converter regulates the dc voltage as well as the UPFC bus voltage or its reactive power.

By infusing a desirable series voltage that is controlled through it's the phase and magnitude angle, the series converter regulates both the active and reactive power flow on the transmission line [7]. The series converter and the power system interchange reactive and active power as a result of the connection with the inserted series voltage and transmission line current. The shunt converter supplies the series converter with the active power it needs in addition to considering into account the absence of UPFC converters. For purpose of to control the voltage across dc link in both stable and transient states, active power consumption of the series converter is determined and provided as a balanced signal to the shunt converter in [8]. Additionally, the shunt converter receives the reactive electricity flow differences as a compensation signal to keep the UPFC bus voltage steady

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Optimization Enhancement of Output Voltage for PV System with 9 Level Inverter

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Abstract— Nowadays the need for electricity is increasing. To full fill the need for electricity by using two ways either non-conventional energy sources or renewable energy sources. Based on the cost and availability renewable energy source is the most possible energy source. The most available as well as cheap renewable energy source is solar. So, recently more research going on solar energy sources to utilize their maximum energy for different applications. The latest research trends in the field of solar are "Solar energy Conversion system". The LUO converter is employed to increase the performance of the PV system by increasing the voltage that is output. The LUO converter is used to increase the oscillating PV voltage. For an AC load application convert DC-DC Converter voltage to 9 level Inverter Circuit. Analyze the Single phase, three-phase, and induction-based conditions in the proposed model.

Keywords— LUO converter, PV, Dc-Dc Converter, Inverter, Multilevel

I. INTRODUCTION (HEADING 1)

Nowadays, the importance of Renewable sources of energy in the production of electric power is growing in order to fill the gap between electricity supply and demand for energy. It will be an alternative resource for fossil fuel and is also called a non-conventional source of energy. Solar energy is a naturally available and inexhaustible resource which is green energy because it will not emit greenhouse gases [1]. Solar photovoltaic contains various fabrication methods which convert sunlight to electrical energy is said to be a photovoltaic effect. It will generate DC electrical power so the huge MW solar power plants are connected to the smart grid for the inverting operation [2].

The grid-connected solar PV converts DC from PV module to AC and distributes it to the consumer. Once the PV system is connected to the Grid after satisfying the consumer's demand it can send the extra electrical energy to the grid. In the smart grid connection, there will be fluctuation in voltage, frequency, and harmonics due to the constant changes in solar irradiation and also other sources [3]. The grid-connected PV contains Solar modules, MPPT with converter and inverter, filter, and distribution line [4]. In this system power quality is an important phenomenon to show the efficiency and operating condition of a grid-connected PV system.

Solar PV is predicted to be the least expensive renewable energy source in the near future due to significant cost reductions in PV components. In 2018, European PV installations exceeded 156 GW, setting an all-time record for PV installations. Major efforts continue to improve efficiency and advance PV manufacturing process. Power grids are being penetrated by PV systems at an accelerated rate. Integration of large-scale PV systems with electric grids can produce a slew of dynamic and operational issues that must be resolved optimally in order to ensure power system stability and dependability.

Inverters with multiple levels have potential because they provide almost sinusoidal output-voltage waveforms that are enhanced harmonic characteristics of output current, decreased stressing of electrical components caused by decreased voltage output, decreased losses during switching than typical both of-level inverters, smaller filter size, and lower EMI, among other features that make those less costly, lighter, as well as more compact.

The work's objectives are (i) to reduce leakage current and (ii) to improve the efficiency of the voltage boosting

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A Review Study On The Impact Of Electromagnetic Fields In The Development Of The Brain

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Abstract— The potential downside of rapid technological advancement has increased exposure to radiofrequency from wireless transmitting equipment and technologies. Because the radiation is nonionizing, it can disrupt your DNA, and also impact the water molecules or sugar molecules in your body. Normal mobile phone signals and even your Wi-Fi signal are in the microwave range, which means they utilize the same frequency as your microwave to cook food. Since the mobile phone emits a very high amount of radiation it will cause your skin or body to heat up somewhat. So you may actually experience your phone being hot in your hand when you use it too much now. Most human beings claim to be sensitive to the electromagnetic radiation emitted by modern digital devices and mobile phones, they describe symptoms such as headaches, nausea, skin responses, burning eyes, and weariness, nevertheless, these are only impacts claimed on a daily basis. A few studies have shown considerably more disturbing outcomes, such as probable links between the side of the brain used while people are using their phones and the emergence of brain tumors. So an intense review is necessary to look into this problem to get aware and take prevention accordingly.

Keywords— *Electromagnetic field, Nervous system, Brain development, Neurulation, Effects of electric-magnetic field, Controlling of EMF.*

I. INTRODUCTION

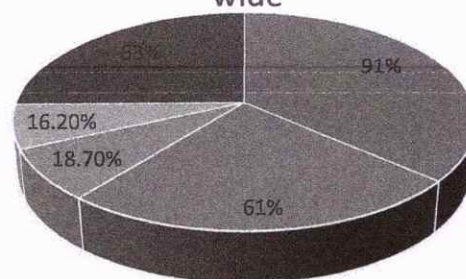
The widespread usage of cellular phones throughout the world demonstrates the influence of cellular phone EMF on human beings and other organisms. Using a cell phone closer to our ears and heads may cause Electromagnetic radiation exposure. Different parts of the electromagnetic spectrum correspond to different types of radiation, and many of them are completely harmless; however, radiation with very short wavelengths is harmless. These persons also experience issues with their central and peripheral nervous systems, which coordinate important processes. Whereas it affects the life cycle of nerve cells, regular sleep patterns, and headache frequency.

EMF exposure during pregnancy and lactation may cause neuronal cell damage and hinder the differentiation of stem cells into neurons. Human and animal model studies yielded notable results about issues impacting brain development. Neuronal cell death and the suppression of cell transformation into neurons in humans are the results of

EMF radiation exposure. The key objective is to investigate the consequence of the Electro Magnetic Field (EMF) on the Central Nervous System (CNS). As the CNS gets affected due to the EMF produced by cell phones, it happens due to the overuse of smart devices. Fig 1 shows the overall usage of the devices.

According to Fig. 1, the device that people use the most is the smartphone, and this device is the most health-threatening thing in the world when viewed from the perspective of an ordinary user. A thorough study is required for the various effects. Here sufficient information is provided regarding the preventive measures that must be undertaken to protect ourselves from harmful radiation. Maintaining the Integrity of the Specifications Since EMF from cellular phones causes drastic effects on human health, it is necessary to evaluate those effects and take preventive measures. The brain is the major controlling and coordinating part of the human body it is therefore essential to analyze the various effects of EMF on brain development. The brain can be affected in both pre-natal and post-natal life and we are liable to implement proper measures to maintain our health.

Digital device users world wide



■ Smartphones ■ Headphones ■ Smart watch
■ Tablet ■ laptop

Fig 1. Smart devices used widely by people

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Power Quality Enhancement in IOT Based Hybrid Renewable Energy Systems using D-STATCOM

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Abstract— Now-a-days, society largely depends on sources of clean energy. Nevertheless, incorporating it into the power system is complicated and has technical difficulties. Voltage sag and swell are the main issues with power quality (PQ) that arise from the unpredictability of clean energy sources. In this paper, a D-STATCOM is employed to compensate PQ issues arising due to solar and wind farms. The main contribution of this work is that a photovoltaic (PV) and wind fed D-STATCOM is used to mitigate the issues of PQ, SUC voltage sag, swell, harmonics and flickers. In order to enhance functionality of wind system the squirrel cage induction generator (SCIG) is employed. To stabilize the output voltage of PV system, a Re-Lift Luo converter is introduced. Adaptive neuro-fuzzy interface system (ANFIS) based maximum power point tracking (MPPT) is intended to maximize the power from PV array and is used efficiently to maintain the system reliability. The PWM rectifier increases the current flow through PWM operation and regulates the dc link voltage at the converter side. Here, the recurrent neural network (RNN) is utilized to generate the reference current for hysteresis current controller (HCC), which minimizes the current distortions. The experimental prototype of this work has been realized employing a Node MCU Wi-Fi module and MATLAB simulation platform.

Keywords—PV-Wind system, D-STATCOM, PQ, RNN, ANFIS, HCC

I. INTRODUCTION

In the modern era, the reliability of power is an important issue. Power quality (PQ) issues typically have complicated and challenging fundamental causes. Absence of poor PQ may negatively impact human wellness, reduce efficiency or harm machinery or devices. Thus, it is crucial to keep the PQ at a high level [1]. Consumers and suppliers are possibly becoming more conscious of PQ due to the rising demand for high-quality, dependable electricity and the rise in the amount of distorted loads. Harmonic distortion, voltage sags, swell and poor power factor are the three most prevailing PQ issues in modern power systems [2].

A distribution STATCOM (D-STATCOM) is suggested in this paper to investigate the reduction of voltage sag. D-STATCOM is one of the most appropriate techniques to improve power quality. Primary goals of the D-STATCOM are load balancing, PF correction, reactive power compensation and harmonic suppression in power system [3]. Commonly, the control methods in D-STATCOM can be divided into

instantaneous reactive power (IRP) and synchronous reference frame (SRF). The instantaneous electric power of the loads in SRF is computed using the IRP theory in the ab stationary reference frame. Even while the IRP theory is simple, it may not accurately capture the power characteristics in a three-phase imbalanced system. On the other hand, the SRF approach which is also known as the dq technique performs better. The SRF method is frequently used in the D-STATCOM because it is more precise than stationary reference frame-based methodology [4]. But, as the load changes, the power flow through the capacitor of dc link in D-STATCOM, cause the grid currents to have poor dynamic properties, drop in the DC-link voltage and suffer a lesser efficiency. DC-link voltage regulation plays an important role in maintaining constant voltage levels under load changes in the D-STATCOM.

Dc-dc converters such as Boost [5], Buck-Boost [6], CUK [7], SEPIC [8] and LUO [9] in the proposed work have found to provide poor dynamic performance. Hence, a Re-Lift Luo converter has been selected and found to perform effectively in terms of efficiency and voltage boost. Efficiency of solar modules is greatly increased with maximum power point tracking (MPPT) controllers. For the purpose of determining the most suitable load to the photovoltaic (PV) array, a number of MPPT methods have been developed. The MPPT methods can be classified into 2 types: traditional methods such as perturb and observe (P&O), incremental conductance (In-Con), and artificial intelligence (AI) methods such as artificial neural networks (ANN), fuzzy logic (FL) [10] etc. However, there are a number of drawbacks associated with these traditional approaches, including slower tracking speed, significant MPP variations, and drifting problems when the weather is constantly changing. Thus, to overcome the aforesaid issues, and considering its dynamic performance, this work suggests an adaptive neuro-fuzzy interface system (ANFIS) based MPPT.

This paper aims at a PV and wind fed D-STATCOM to improve the PQ. The dc link voltage is stabilized by the Re-Lift Luo converter connected to the PV array. The ANFIS- MPPT tracks the maximum power from PV array. With the help of recurrent neural network (RNN), the reference current generated is fed into HCC for removing the current distortions. The obtained results are displayed using Node MCU, which shows that the suggested method is efficient in contrast to

State-of-the-Art Techniques For Design Of Anti-Cancer Drug Delivery System Based On Optimal Control Methods: A Review

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Abstract—Cancer is a leading cause of mortality and morbidity worldwide. Approximately 700,000 cancer deaths occur annually in the United States and every year, more than a million new cancer cases are predicted. Chemotherapy and hyperthermia are effective treatment options for patients with high-risk cancers. At disseminated cancer sites, chemotherapeutic drugs can be infused into the bloodstream to stop cancer cell growth and/or spread. The dose of drugs infused into a patient's vein during chemotherapy is often controlled using computerized drug delivery systems. Clinicians typically struggle to identify the correct dosage of intravenous chemotherapy because of unforeseen side effects such as immune response and increased toxicity, and optimization algorithms and automated control approaches have been developed to aid in the safe administration of cancer chemotherapy drugs. To govern the distribution of closed-loop intravenous anticancer medicines, several controllers have been created, and numerous mathematical models have been developed to mimic the behavior of cancer by considering various phases in various treatment options such as chemotherapy and radiation. This study provides a current state-of-the-art review of the function of anti-cancer drug delivery systems, as well as the control approaches and different strategies used in building an anti-cancer drug delivery system, such as mathematical models, optimized control, and hybrid algorithms.

Keywords— Cancer, Drug Delivery System (DDS), chemotherapy

I. INTRODUCTION

Cancer is among the most devastating diseases and the root cause of more than 25% of deaths worldwide [1]. In 2023, 1,958,310 new cancer cases and 609,820 cancer deaths are projected to occur in the United States and as per a recent analysis by the International Agency for Research on Cancer (IARC), if current trends continue internationally, this figure is expected to rise by 50% by 2030 [2]. Lung, breast, colorectal, and stomach cancers are the most diagnosed malignancies globally, accounting for more than 40% of all cases.

According to the WHO, men have a 25% higher age-standardized cancer incidence rate than women. Cancer kills 0.4 million people in India each year, making it the third leading cause of death. The incidence rate has been growing in most regions of the world; however, data from wealthy and developing nations vary greatly. The incidence rate is higher

in more developed countries, but mortality is relatively higher in less developed regions owing to the lack of early detection and treatment facilities. On average, a cancer patient dies every two seconds. There is a one-in-six chance of contracting cancer and dying from it. Cancer is a condition in which malignant crab-like cellular malfunctions multiply at a bewildering speed in the tissues, resulting in a condition where surgery, radiotherapy, and chemotherapy are not able to cure, control, or even contain the disease. In addition, one or more of these treatments usually cause death in four out of five patients within five years.

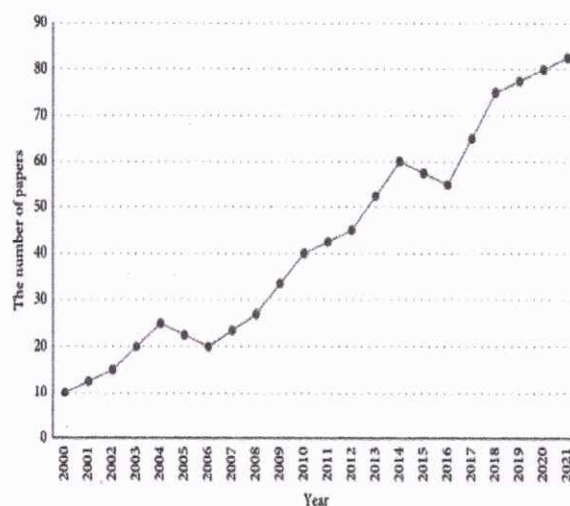


Fig.1. No. of papers published from 2000-2021 in the area of cancer drug delivery

In addition to chemotherapy and surgery, radiation therapy, hormone therapy, and immunotherapy may be used to treat cancer. Chemotherapy is the standard treatment for most disseminated cancer. Cancer chemotherapy attempts to destroy cancer cells while inflicting little or no harm on healthy tissues [5]. Several anticancer agents, including cisplatin, paclitaxel, etoposide, vinblastine, vincristine, camptothecin, and indomethacin, are used clinically worldwide. However, these drugs are associated with various adverse effects. The occurrence of dose-limiting side effects and the development of resistance associated with the use of conventional anticancer drugs frequently reduces the clinical benefit, highlighting the urgent need for the development of

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Article

Numerical Study of Queuing-Inventory Systems with Catastrophes Under Base Stock Policy

Authors:  [Agassi Melikov](#),  [Laman Poladova](#),  [Edayapurath Sandhya](#) | [Authors Info & Claims](#)

Distributed Computer and Communication Networks: Control, Computation, Communications: 26th International Conference, DCCN 2023, Moscow, Russia, September 25–29, 2023, Revised Selected Papers

Pages 251 - 264 https://doi.org/10.1007/978-3-031-50482-2_20

Published: 24 March 2024 [Publication History](#)

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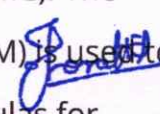
Feedback



Abstract

We consider a single-server queuing-inventory system (QIS) with catastrophes under the base stock policy. Consumer customers (c-customers) that arrived to buy inventory, can be a form of queue in an infinite buffer. All items in the warehouse are destroyed if a catastrophe is occurring, but in such cases, the c-customers in the system (on the server or in the buffer) are still waiting to be restocked. Upon the arrival of the negative customer (n-customer), one c-customer is pushed out, if any. A hybrid sale rule is used: if upon arrival of the c-customer, the inventory level is zero, then according to the Bernoulli scheme, this customer is either lost (lost sale rule) or is joining the queue (backorder rule). The mathematical model of the investigated QIS is constructed as a two-dimensional Markov chain (2D MC). The ergodicity condition is established, and the matrix-analytic method (MAM) is used to calculate the steady-state probabilities of the constructed 2D MC. Formulas for

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

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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.

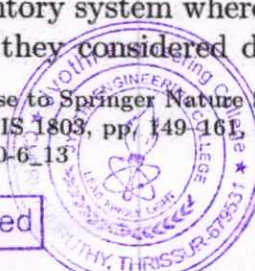
Keywords: (s, S) inventory model · Positive lead time · Retrial · Server interruptions · Explicit solution

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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A. Dudin et al. (Eds.): ITMM 2022, CCIS 1803, pp. 149–161, 2023.
https://doi.org/10.1007/978-3-031-32990-6_13

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Self-supervised approach for organs at risk segmentation of abdominal CT images

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Abstract. Accurate segmentation of organs at risk is essential for radiation therapy planning. However, manual segmentation is time-consuming and prone to inter and intra-observer variability. This study proposes a self-supervision based attention UNet model for OAR segmentation of abdominal CT images. The model utilizes a self-supervision mechanism to train itself without the need for manual annotations. The attention mechanism is used to highlight important features and suppress irrelevant ones, thus improving the model's accuracy. The model is evaluated on a dataset of 100 abdominal CT scans and compared its performance with state-of-the-art methods. Our results show that the proposed model got comparable performance in terms of the dice similarity coefficient. Moreover, the inference time is much faster than traditional manual segmentation methods, making it a promising tool for clinical use.

1 Introduction

Medical image segmentation is a crucial task in medical imaging, as it plays a significant role in the precise diagnosis and treatment planning of various medical conditions. Organ At Risk (OAR) segmentation is a critical aspect of medical image segmentation, which involves distinguishing and contouring organs in medical images of the human body anatomy. OARs are healthy tissues near the tumour volume that may be affected by radiation treatment. Accurate segmentation of abdominal organs is essential for radiotherapy treatment planning of abdominal cancer patients, as it enables precise targeting of radiation to the tumour while minimizing exposure to healthy surrounding tissues. The abdominal cavity contains various organs, such as the liver, spleen, pancreas, stomach, and intestines, which differ in shape, size, and position. Computed Tomography (CT) images are commonly used for radiotherapy and for organ segmentation.

Manual segmentation methods, traditionally used for organ segmentation, are time-consuming and prone to inter-observer variability. The process requires experts to accurately identify organs and tissues, making it highly dependent on their subjective interpretation. Automatic segmentation methods can provide a solution to the limitations of manual approaches by producing accurate and consistent segmentation results. This approach relies on advanced image processing techniques and anatomical knowledge. Deep learning-

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Exploring the Use of Nano-Enhanced Phase Change Material for Vaccine Cold Storage: An Experimental Study

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ABSTRACT

Vaccine transport requires a temperature range between 2 to 8°C. Constant and steady cooling in the above temperature range is required during the transportation of vaccines. The vaccine storage requires an efficient thermal management system for the depository of vaccines. The phase change materials can store and release more energy during latent heating regions than other materials that undergo sensible heating and cooling. The energy storage characteristics of phase change materials (PCMs) are employed to transport vaccines efficiently, without the constraints of traditional cold chain transport systems. The operating temperature of the cold storage box and financial limits determine which PCM is used. Polyethylene glycol (PEG 400) was selected as PCM for cold storage in the present study. However, PCMs generally have low thermal conductivity, which is not ideal for energy storage. To combat this, nanoparticles are added, which improve the heat conductivity of the PCM basis without significantly changing the material's unique features. The additive SiO₂ is used with copper nanoparticles to enhance thermal conductivity. The Differential Scanning Calorimetry test is done to find the melting point and latent heat. This paper reports the results of experimental investigations carried out to find the thermal performance of a cold storage box of PEG400 with nanoparticles. The nano-enhanced PCM (NePCM) cold storage box can maintain thermal management in cold storage between a safe range for multiple hours of transportation without providing any external power supply. The heat sink system was experimentally tested for its thermal performance and effectiveness.

Keywords: Phase change materials, Thermal management, Heat transfer, Cold storage.

1. INTRODUCTION

Energy storage is an effective solution to solve the problems in an energy crisis. The energy storage systems can store energy generated during peak off hours. Latent heat thermal storage using PCM is the key technology due to isothermal energy storage, release, and energy storage density [1]. Latent heat

thermal storage with PCM is widely used in the heat sink in electronic cooling [2], thermal storage systems [3], thermal management of building [4] and so on. 1.3 billion tonnes of food is perished annually around the globe due to the problems in the cold storage transportation [5]. A cold storage box is a conserving box which is required to keep the perishable food items and vaccines. The constant cooling temperature at cold storage boxes during the transportation is maintained by latent heat thermal storage system technology using PCM [6]. PCMs are excellent candidates for effective heat transfer and thermal energy storage systems because of their exceptional capacity to store and release significant amounts of thermal energy during phase transition. The thermal conductivity of PCM should be high for better heat transfer performance. The thermal conductivity of pure PCM is low, which necessitates the use of efficient thermal conductivity enhancement method for the effective utilisation of PCM. The dispersion of PCM into nanomaterial improves its thermal conductivity [7]. Many researchers investigated the effect of nano-enhanced PCM on cold storage applications. The temperature should be maintained between 2 to 8°C for the vaccine cold storage [8]. The PCM and filler nanomaterial selection is based on the melting temperature and latent heat [9].

Passive thermal storage systems based on PCM have many advantages over active cold storage systems. Madruga and Mendoza studied the effect of metallic nanoparticles on the thermal conductivity of PCM by thermocapillary. Metallic nanoparticles improve passive thermal energy storage systems' thermal conductivity, which in turn improves their ability to transmit heat [10]. Daneshazarian et al. [11] added graphene nanoplatelets to paraffin PCM for increasing the thermal conductivity, but it leads to a reduction in latent heat. The increase in the concentration of nanoparticles causes agglomeration and leads to the deceleration of the melting process by the reduction in latent heat [12]. Therefore, the experimental investigations of cold storage boxes should be conducted at the optimum concentration of nanoparticles. According to Wang et al. [13], adding 1.2 weight percent of copper nanoparticles to PCM resulted in a 24.4% improvement in thermal conductivity. At the same time, they observed that the latent heat of composite PCM decreased by 1.5%.

Many researchers explored various synthesis methods of nanoparticles that are used as filler material for NePCM. Sipos


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


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Tensile and shear strength evaluation in joining dissimilar plates of mild steel with aluminum alloy through explosive cladding approach

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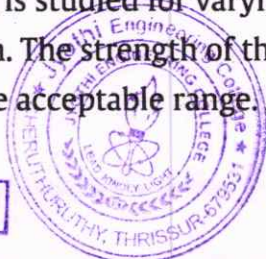
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Materials Today: Proceedings, Volume 80, Part 3, 2023, Pages 1702

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Abstract

Explosive cladding is known for its ability to join a wide variety of metals that other welding methods cannot do. In this present work, the weldability of aluminium alloy and mild steel plates and their bonding strength through an explosive cladding process investigation is performed. Experiments are conducted in the open air using Gelatin (SG-90) variety explosive having a detonation velocity of 3400m/sec. Experimental trials for single replications were adopted. Ram tensile test has been carried out to determine the bonding strength. The effects of angle of inclination, loading ratio and stand-off distance on the weld strength were analyzed. The possibility of obtaining a sound weld depends on the limiting conditions of the above parameters. The microstructure of the explosive clad joints is studied for varying process parameters which shows a wavy profile that produces higher strength. The strength of the weld in both tensile and shear strength obtained is good and is within the acceptable range. An increase in strength of welded joints is obtained for higher parameter range.

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Subgrade soil stabilization using coir and polypropylene strips

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AIP Conf. Proc. 2690, 020003 (2023)

<https://doi.org/10.1063/5.0121188>

The in-situ materials on something that the pavement structure is built is referred to as the subgrade. The sub - grade should be capable of withstanding the loads imposed by the pavement construction. A good subgrade is one that can withstand a large amount of stress without deforming excessively. When subjected to heavy wetness or cold temperatures, most soils experience some volume change. Clay soils may shrink and expand depending on their moisture level, and soils with too much particles might freeze heave in colder climates. One of the techniques to enhance the strength of weak soil is to stabilise the soil by addition of certain materials. This can be done through both mechanical and chemical methods. This study attempted the use of sustainable materials such as coir fibre and polypropylene strips for subgrade soil stabilization and concluded that load bearing capacity of the soil by has risen the addition of both coir and polypropylene fibre compared to the virgin soil.

Topics

Natural materials, Polymers

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A review on effect of M sand in the properties of concrete 🛒

M. J. Anju; M. P. Sureshkumar; R. K. Manikandan; S. Gunasekar ✉; N. Ramesh; D. S. Vijayan

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AIP Conf. Proc. 2690, 020007 (2023)

<https://doi.org/10.1063/5.0119837>

The construction sector consumes a large amount of concrete. Sand accounts for approximately 35% of the volume of concrete. Manufactured sand is a by-product and it is a usable substitute for river sand. The manufactured sand obtained from hard rocks by crushing plant. It is also known as M-Sand, Crushed stone sand, Quarry dust, Rock sand, Crushed dust, and other names. The quite exhaustive research has been carried out on using manufactured sand in concrete. This research review effort focuses on the enhancement of strength of concrete by focusing on strength parameters to improve the strength characteristics of concrete and thereby improving its living standard in terms of Compressive Strength.

Topics

Review

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Enhancing Neural Style Transfer with Gradient Loss for High-Quality Artistic Image Synthesis

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Abstract—Art is an incredible skill of humans and it is a great achievement of artificial intelligence that there exists an algorithm for artistic images, which was firstly developed by Leon A. Gatys. Gatys proposed an artificial system of fill up an image with desired styles. Although a lot of corrections have been made in this algorithm and some are effective, but cannot say that it has reached its full form and the research is still going on. This paper introduces optimal modifications to make the result of combined artistic style images with high perceptual quality. Here introduces a new loss term called the gradient loss, which identifies the edge features and makes it more precise for the high visual experience. As well as for getting the optimum loss value of style image, bring the smooth l_1 loss instead of computing the mean squared error. The effectiveness of our model illustrates experiments.

Keywords—artificial intelligence, gradient loss, means squared error, smooth l_1 loss

1. INTRODUCTION

The paper titled "Image Style Transfer Using Convolutional Neural Networks" by L. A. Gatys, A. S. Ecker, and M. Bethge was presented at the IEEE Conference on Computer Vision and Pattern Recognition (CVPR) in 2016 [1]. This paper introduced a groundbreaking approach to artistic style transfer through the utilization of deep convolutional neural networks (CNNs). Artistic style transfer encompasses the creation of an image that melds the content from one source image with the artistic style from another. Traditional methods for style transfer relied on handcrafted features and computationally expensive optimization techniques. However, this paper presented a novel technique that utilized the representational power of CNNs, specifically pretrained VGG networks, to achieve remarkable results.

The authors introduced two key concepts in their approach: style representation and style transfer. To represent the style of an image, they employed feature correlations in different layers of the CNN. The authors demonstrated that the Gram matrix, which captures the correlations between feature maps provides an effective representation of style.

While computing the Gram matrix at multiple layers of the CNN, they captured both local and global style information.

For the style transfer process, the authors proposed an optimization-based method [2]. Given a content image and a style image, the goal was to generate a new image that preserved the content of the former while adopting the artistic style of the latter. The optimization process involved minimizing a cost function that consisted of two components: a content loss and a style loss. The content loss ensured that the generated image preserved the content of the original image, while the style loss matched the style representations between the generated image and the style image. The paper demonstrated the effectiveness of their approach by producing visually appealing style transfer results. It showed how their method could handle a wide range of artistic styles, including famous paintings by renowned artists. Moreover, the authors also conducted an ablation study to analyze the contributions of different network layers and loss functions in the style transfer process.

The significance of this paper lies in its introduction of a deep learning-based framework for artistic style transfer. It paved the way for subsequent research and popularized the use of CNNs for style transfer tasks. The simplicity and effectiveness of the proposed approach made it accessible to a wide range of applications, including interactive style transfer in real-time systems and mobile devices.

There is a large range of algorithms for texture transfer, they have some fundamental limitations. Leon A. Gatys introduced the groundbreaking "A Neural Algorithm of Artistic Style," which leverages CNNs to create high-level image representations. This algorithm can extract both content and style from images and employs a texture transfer technique to merge the semantic content of a target image with the stylistic characteristics of a source image. CNNs, are composed of layers of small computational units that hierarchically process visual information in a feed-forward manner. Each layer of these units can be thought of as a collection of image filters, with



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Production of eco-friendly paver block by incorporating saw dust ash as cementitious materials 🛒

P. G. Neeraja ✉; G. Suresh; K. Vishnuvardhan; S. Gunasekar; E. Gifty; Soorya M. Nair; Pandurang Y. Patil

✚ Author & Article Information

AIP Conf. Proc. 2690, 020005 (2023)

<https://doi.org/10.1063/5.0120594>

Cement Concrete Paving Blocks (CCPB) are one of the most extensively used construction materials in the world. Since these are easier to construct, sturdy, long-lasting, low-cost, weatherproof, and flammable. They're ideal for constructing roads, pavements, and parking lots, in fact. Concrete pavement blocks have the benefit of being easily rebuilt using a variety of building techniques, allowing them to be reused or reconfigured in various ways as needed. Instead of being used once and discarded, they may be used in different shapes or for different purposes. This experimental study is conducted to determine the result of incorporating Saw Dust Ash (SDA) in the production at interlocking pavers blocks as a substitute for cement. The various strength properties of paver blocks were conducted for the evaluation of significant strength of concrete paver blocks. The use of SDA as a cement substitute in paver block manufacture is investigated in this study. The use of saw dust as a partial replacement for sawdust is explored in this research to address environmental concerns on fine aggregate in paver block with 0%, 10%, 20% and 30% respectively. Based on the experimental results, it has been concluded that, 10% replacement of cement with saw dust ash give enough strength properties to the paver block.

Topics

Cement

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Nodule Detection and Prediction of Lung Carcinoma in CT Images: A Relative Study of Enhancement and Segmentation Methods



K. A. Nyni and J. Anitha

Abstract Image enhancement and segmentation plays an indispensable role in the accurate analysis of affected nodules in lung Computed Tomography (CT) images. Computer-aided detection or diagnosis has become very crucial in the healthcare system for fast detection of lung cancer. The radiologist has a difficult time in correctly identifying the cancerous lung nodules. Because of the vast number of patients, radiologists frequently overlook malignant nodules in imaging. Many recent studies in the field of automated lung nodule diagnosis have revealed significant improvements in radiologist performance. When detecting pulmonary nodules, imaging quality must be taken into account. This has prompted us to investigate the pre-processing stage of lung CT images, which includes a contrast enhancement and segmentation stage. In this paper, different lung nodule enhancement and segmentation methods are compared. The different enhancement methods compared are Histogram Equalization (HE), Contrast Limited Adaptive Histogram Equalization (CLAHE), Image Complement (IC), Gamma Correction (GC) and Balanced Contrast Enhancement Technique (BCET). The five different segmentation methods compared are Adaptive Image Thresholding (AIT), Flood Fill Technique (FFT), Fast Marching Method (FMM), Grayscale Intensity Difference (GSID) and Watershed Segmentation (WS).

Keywords Image enhancement • Segmentation • CT images • Lung nodule

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M. Saraswat et al. (eds.), *Proceedings of International Conference on Data Science and Applications*, Lecture Notes in Networks and Systems 551,
https://doi.org/10.1007/978-981-19-6631-6_29

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A Web Application for Enhancing Stray Dog Welfare: Identification and Virus Detection

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P Sobha Xavier ; Jyotsna Joshy ; Maria Rose Thayil ; M Nandalal ; Riya Xavier **All Authors**

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Abstract:

Stray dog populations have been a persistent issue in many parts of the world, posing a risk to public health and animal welfare. In this paper, we propose a novel approach to addressing this problem through the application of machine learning techniques. Our approach involves three key components: Rabies detection, Dog identification and adoption. Firstly, we leverage machine learning models to detect rabies in stray dogs. By using RNN (recurrent neural network) classifier with LSTM algorithm we identify rabies in dogs from their videos. This allows for early detection and treatment, ultimately improving the health and well being of stray dogs. Secondly, we use machine learning algorithms to develop an efficient dog identification system. Our system is capable of identifying individual dogs based on face features trained on teachable machine. This allows for better tracking of stray dogs and facilitates the implementation of targeted interventions. Finally, We provide dog adoption methods from the provided database. This increases the likelihood of successful adoptions, reducing the number of stray dogs on the streets. Overall, our proposed approach offers a comprehensive solution to the issue of stray dog welfare, leveraging the power of machine learning to improve dog identification, virus detection, and adoption. We believe that our system has the potential to make a significant impact in reducing stray dog populations and promoting animal welfare.

Published in: 2023 9th International Conference on Smart Computing and Communications (ICSCC)

Date of Conference: 17-19 August 2023

Date Added to IEEE Xplore: 06
December 2023

ISBN Information:

Electronic ISBN: 979-8-3503-1409-0

Print on Demand (PoD)

ISBN: 979-8-3503-1410-6

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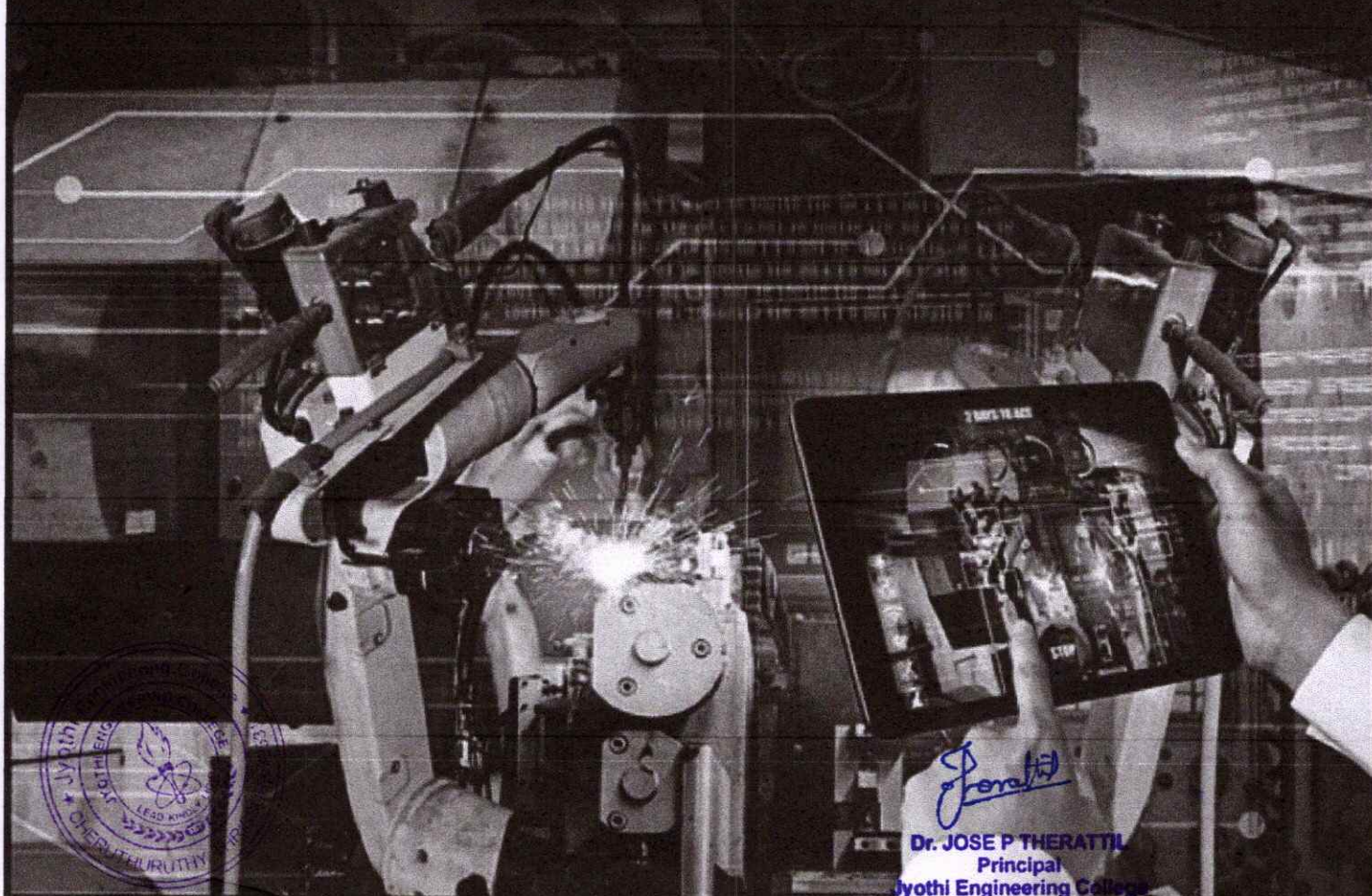


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SELF POWERED CYBER PHYSICAL SYSTEMS

Editors

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and Felcy Jyothi Serrao



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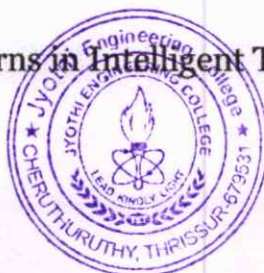
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ANN-Based Cracking Model for Flexible Pavement in the Urban Roads

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³ Department of Robotics and Automation, Jyothi Engineering College, Thrissur, Kerala, India

⁴ Department of Biomedical Engineering, Sethu Institute of Technology, Madurai, Tamil Nadu, India

Abstract

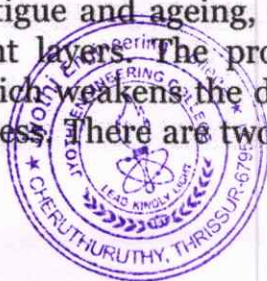
A novel technique is presented in this paper aimed at predicting the distress on pavement using a data-driven methodology. The main focus of this study is to manage the difficulties and ensure safe and comfortable roadway use. Diagnosing deterioration types and using proper maintenance techniques is critical, especially in the early phases. A model is developed for predicting the distresses using the ANN technique where the factors influencing the progression of cracking were drainage, modified structural number and equivalent standard axle load are considered. The model developed with ANN can be utilized for the optimum maintenance of urban roads, especially in metropolitan cities. The method is verified with extensive testing by performing it, and its analysis helps us to ensure its efficiency and adaptability.

Keywords: Flexible pavement, crack prediction, artificial neural network, ANNs, sensitive analysis, artificial intelligence

11.1 Introduction

To efficiently construct flexible pavement, the researchers focused on a new methodology in the middle of the 20th century. Then they focused their research on the maintenance and rehabilitation of the constructed pavement at the end of the 20th and the start of the 21st century [1]. The pavement will get deteriorate very rapidly beyond the point of effective maintenance. In order to attain optimum pavement maintenance, highway engineers are using software developed for pavement management systems, such as HDM-4 are highly effective [5]. Cracking is an important parameter used to quantify bituminous pavement deterioration; the parameters, such as fatigue and ageing, are the principal factors for forming cracks in flexible pavement layers. The propagation of cracking is accelerated through embrittlement, which weakens the different layers of pavement resulting from ageing and water ingress. There are two types of cracking: Thermal cracking

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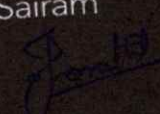
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MODELING and OPTIMIZATION

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MODELING and OPTIMIZATION of OPTICAL COMMUNICATION NETWORKS

Edited by
Chandra Singh, Rathishchandra R Gatti, K.V.S.S.S. Sairam
and Ashish Singh


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implemented to read sensor data in the cloud. To make the utilization more reliable, an app is designed for this specific application of WBAN.

Chapter 7 Analysing a Microstrip Antenna Sensor Design for Achieving Biocompatibility

This chapter discusses about the different design structure like Split Ring Resonator (SRR), Circular Ring Resonator (CRR) and Triangular Ring Resonator. The designed antenna perform accurately without harming any any muscle tissue.

Chapter 8 Photonic Crystal Based Routers for all Optical Communication Networks

In this chapter, we focus our topic exploring the optical network component - router using photonic crystals, which will be a perfect candidate to be integrated in Photonic integrated circuits (PIC) for optical communication and networking systems. Different configurations of photonic crystal based routers have been detailed and reviewed based on the performance.

Chapter 9 Fiber Optic Communication: Evolution, Technology, Recent Developments, and Future Trends

This chapter discusses fiber-optic communication systems and their fundamental technologies. It also discusses current developments as well as technological trends for the foreseeable future.

Chapter 10 Difficulties of Fiber Optic Setup and Maintenance in a Developing Nation

This chapter focuses on the difficulties associated with fibre cable deployment in India, with a particular emphasis on the economic, regulatory, and managerial difficulties. It is possible that external causes, such as dig-ups during road building, are a result of the problems associated with frequent fibre cutting. A lack of fibre deployment and management regulatory guidelines and policies poses a significant challenge to fiber management in the region.

Chapter 11 Machine Learning-Enabled Flexible Optical Transport Networks

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.

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Machine Learning-Enabled Flexible Optical Transport Networks

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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

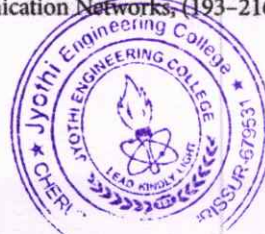
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Chandra Singh, Rathishchandra R Gatti, K.V.S.S.S. Sairam and Ashish Singh (eds.) Modeling and Optimization of Optical Communication Networks, (193–216) © 2023 Scrivener Publishing LLC

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Two-Dimensional Nanomaterials-

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Two-Dimensional Nanomaterials-Based Polymer Nanocomposites

PROCESSING, PROPERTIES AND APPLICATIONS

Edited by

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and Chaudhery Mustansar Hussain

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Two-Dimensional Nanomaterials-Based Polymer Nanocomposites for Gas and Volatile Organic Compound Sensing

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Abstract

The ever-growing interest in controlling environmental pollution due to volatile organic compounds (VOCs) has led the researchers to develop sensors for monitoring and thus controlling VOCs emission. Flexible sensors based on two-dimensional (2D) nanomaterials reinforced polymer nanocomposites with superior sensing capacities to trace VOCs at parts per billion levels are fascinating and may find myriads of applications. The 2D nanomaterials are preferred reinforcements in various polymer matrices due to their unique physicochemical properties. The inorganic/semiconducting nanomaterials-based chemoreceptors with different morphological and structural characteristics such as nanosized particles, nanofibers, nanocrystals, and nanocomposites, are the most preferred sensor reinforcements. These chemoreceptors are attractive because of their cost-effectiveness coupled with tunable and diverse properties besides their environmentally benign nature. Currently, extensive research is being reported in the field of VOCs and gas sensing using polymer composites reinforcing 2D layered allotropes of carbon such as graphene and their oxides, MXenes, layered silicates, and transition metal dichalcogenides (TMDs). Carbon allotropes are widely used in sensors due to their exceptional physical and mechanical properties, and flexibility to develop different designs of sensors. Moreover, the metal oxides are front runners in the chemoreceptors-based sensors, but they are used as multilayer composite sensor films. Sensors based on hybrid carbon-metal oxide nanomaterials are the recent development in this field, and they show improved sensitivity as chemoreceptors. The carbon/metal-oxide chemoreceptors exhibit improved response owing to the increased gas diffusion which is controlled by the high surface area and the presence of nanoheterojunctions. Nowadays metal/metal oxides, carbon-based, MXenes, and TMDs are reinforced into the polymer matrix to develop flexible VOCs and gas sensors. This chapter outlines the various 2D nanomaterials-based polymer composites for gas and VOCs sensing, detailing the peculiarities of each class of 2D reinforcements and providing insights for future research on gas and VOCs sensing.

Keywords: VOCs and gas sensing, polymer composites, chemoresistors, 2D-layered nanomaterials

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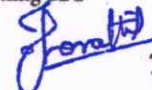

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Synthesis of Calcium Fluoride from Discarded Egg Shell - A Potential Solid Lubricant

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Keywords: Egg-Shell powder, Solid Lubricants, Calcium Fluoride, Crystallinity, Ion exchange method

Abstract. Solid lubricant is an environment-friendly alternative to liquid lubricants, which can be applied in extreme environmental conditions like high temperature and pressure where liquid lubricants fail. In this work, an attempt was made to synthesize calcium fluoride, a solid lubricant material from scrap eggshell powder by using the ion exchange method. The prepared eggshell powder was treated with 40% concentric hydrofluoric acid and was manually mixed using a mortar and pestle. The synthesized CaF_2 powder was characterized by using SEM and XRD. The degree of Crystallinity was calculated from the XRD data by using Origin Pro and Excel software. The Crystallinity of the prepared CaF_2 powder was found to be 78.01%. The crystal size of the synthesized CaF_2 powder was calculated using Scherer's formula. The crystal size was found to be between 9–22 nm ranges. The synthesized calcium fluoride XRD intensity peaks were matching exactly with the JCPDS card of the standard CaF_2 powder, confirming the presence of CaF_2 .

Introduction

The two main challenges faced by various industries around the globe are friction and wear. They occur due to rubbing or sliding actions of the engineering materials. Around one-fourth of the total world's energy losses happen due to friction and wear [1]. It is estimated that out of the total world's energy consumption, around 23% of energy is lost due to tribological contacts. In that, approximately 20% of energy is wasted to combat friction and the remaining 3% is used to remanufacture spares and worn-out parts which are subjected to wear-related problems [2]. A global level comparison of the impact of friction and wear in terms of energy consumption, cost, and carbon dioxide emission is shown in Figure.1. From Fig. 1, it is clear that the impact of friction is very high in all aspects. Usually, friction and wear-related problems are addressed using liquid lubricants. However, the application of liquid lubricants becomes futile in intense environmental conditions like high temperature, pressure, and vacuum [3]. Generally liquid lubricants can be classified as water-based and oil-based. Water-based lubricants evaporate at low-pressure environmental conditions like the environment in space applications. So water-based liquid lubricants are not advisable in space applications. [4, 5].

Further owing to various issues of environmental pollution caused by the disposal of liquid lubricants, most countries are not encouraging the usage of liquid lubricants. It is estimated that from the wood harvesting industry alone, around 117,576,000 litre of lubricating oil is discharged into the environment annually [6]. Thus, there is a need to find an alternative lubrication system that can replace conventional liquid lubrication. The usage of liquid lubricants can be reduced by either switching to minimum quantity lubrication or by using proper solid lubricants.

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