Arch. Metall. Mater. **69** (2024), 2, 525-534

DOI: https://doi.org/10.24425/amm.2024.149779

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EXPERIMENTAL INVESTIGATION ON WIRE ELECTRIC EROSION BEHAVIOUR OF SILICON DIOXIDE PARTICULATE REINFORCED COMPOSITE

The intend of current study was focused on the prediction of material removal rate (MRR) and surface roughness (SR) for the AA7050-SiO_2 composite during wire electric erosion or discharge machining (WEDM) process using a brass (Br) wire electrode. Here, stir casting process was employed to develop the AA7050 matrix composite with inclusion of 10wt.% SiO_2 particle reinforcement. The multi-objective optimization method of Technique for order preference by similarity to ideal solution (TOPSIS) approach has been applied to find out the optimal setting of input machining parameters such as peak current (I_p), pulse-on time (T_{on}) and pulse-off time (T_{off}). Furthermore, the significant effects of parameters were identified by analysis of variance (ANOVA). Taguchi L_9 (3^3) orthogonal design has been formulated to perform the experimental work. TOPSIS results stated that the optimal setting of I_p at 30 amps, T_{on} of 130 µs and T_{off} of 55 µs provide the better MRR with lesser SR. The ANOVA results noticed that I_p has the prime noteworthy parameter over the adopted responses having a contribution of 45.67%, followed by T_{on} (32.34%) and T_{off} (12.26%), respectively. The confirmation test was carried out by the optimal parameters setting to verify the predicted results. Finally, the scanning electron microscopy (SEM) test was carried out for the machined surface of the composite specimen and it was reveals that the formation of craters and recast layer thickness in the machined surfaces.

Keywords: AA7050; SiO_2; Stir casting; WEDM; Surface Roughness; TOPSIS; ANOVA

1. Introduction

Composite materials have evolved in prominence over the past several decades due to their adaptability in various sectors. Metal matrix composites (MMCs) are consistently in demand because of their unique features that set them apart from other types of materials [1]. MMCs are a feasible option for cast iron, which is often exploited in the manufacture of engines and brakes in the transportation sector, owing to their improved properties [2,3]. Aluminium, magnesium, and titanium are the metals that have been employed for MMCs in the majority of prior investigations. Aluminium matrix composites (AMCs) is the most prevalent form of MMCs. Due to their better performance in numerous industrial applications, aluminium and its alloys have been the subject of extensive investigation during the past decade. They are employed in the majority of automotive and aerospace applications because of their great strength and low weight and less cost, which result in lower fuel economy and good performance [4,5]. All of these characteristics increase the appeal of using aluminium and its alloys as the matrix phase for producing MMCs. In comparison to conventional materials, the AMCs with different reinforcements like SiC, TiO_2, ZrB_2, Al_2O_3, and B_4C has excelled in numerous sectors [6,7]. To make AMCs more affordable, a lot of research is being done to lower the price of reinforcing particles, which are expensive. AMCs are used more often for a variety of reasons, one of which is that they have lower cost requirements than other MMCs. As a result, AMCs potential for developing new applications is expanding. AMCs are often manufactured using a number of techniques, including powder metallurgy, stir casting, squeeze casting and spray deposition. Among these, stir casting is one of the most popular methods for making AMCs because of its ease of use, adaptability, cost-effectiveness, ability to produce large quantities, and ability to promote uniform distribution of reinforcing particles through stirring action [8]. The machining of AMCs seems to be very different from the machining of conventional metals in a number of ways. The material performance in the machining of AMCs is not only non-homogeneous and aniso-

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Interactions (2024) 245:256
https://doi.org/10.1007/s10751-024-02108-4

CONFERENCE PROCEEDING

Analysis of metal removal rate on nitinol alloy using electrochemical honing process

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Accepted: 25 August 2024

Abstract
In recent years, machining of hard material is difficult and its applications are also increased due to their excellent substance properties. At the same time, better quality machined surface was not achieved through conventional machining techniques. The superior quality of machined surface was attained through Electro Chemical Honing (ECH) process. The machining rate has been increased through the combined action of electrical and chemical energy. The Cubic Boron Nitride (CBN) inserts have been used to enhance the machining rate. The chromel metal matrix composite (MMC) has chosen as a work material for ECH process. The chromel composite was machined through ECH with different control factors such as voltage, electrolyte flow rate and pressure. The optimal factors were studied through Taguchi method. The optimal MRR was attained at voltage of 30 V, electrolyte flow rate of 9 lpm, electrolyte pressure of 5 bars. From variance analysis and area plots, the voltage was made the largest causes on MRR. The voltage contribution in MRR was 75.22%.

The contribution factor which affects the responses such as Material Removal Rate (MRR) was determined through variance analysis. The optimal MRR was attained at voltage of 30 V, electrolyte flow rate of 9 lpm, electrolyte pressure of 5 bars. The largest effect on MRR was produced by voltage (75.22%).

Keywords Electro chemical honing · Chromel metal matrix · Tantalum carbides · SEM · Electrolyte flow rate · Material removal rate

1 Introduction

ECH was used power generation and chemical industries. It was used to increase the life of machine components such as rollers, gears, dies and sleeves. Very hard materials were also easily machined with close tolerances. It was best suitable process for surface finish and shaping of the materials. The honing process offers advantages of high metal removal rates, and extreme accuracy of 0.001 mm in a wide variety of materials. Chromel alloy has able to resist high temperatures. Hence, it can be used for temperature measurement devices, heating

Extended author information available on the last page of the article

Original article

Institution of MECHANICAL ENGINEERS
Journal of PROCESS MECHANICAL ENGINEERING

Proc IMechE Part E:
J Process Mechanical Engineering
1–10

DOI: 10.1177/09544089231207457
journals.sagepub.com/home/pie
Sage

Improvement on the wire EDM characteristics of zirconia filled Al7050 (Al-Zn-Cu-Mg) alloy composite using Taguchi coupled TOPSIS method

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Abstract

Wire electrical discharge machining (WEDM) is an cutting edge non-traditional techniques for producing complicated 3D forms in rigid materials with greater dimensional accuracy. The aim of the investigation was, to predict the WEDM characteristics of ZrO_2 ceramic addition of Al7050 alloy composite by employing Taguchi coupled Technique for order preference by similarity to ideal solution (TOPSIS) approach. The work material was manufactured by stir casting process utilizing 12 wt.% of ZrO_2 particulates in Al7050 alloy matrix. The experimental work was carried out as per the L_9 (3^3) orthogonal array design by taking input parameters like pulse current (I_p), pulse on-time (T_{on}) and pulse off-time (T_{off}), respectively. The impact of the WEDM parameters on the material removal rate (MRR) and surface roughness (SR) were determined by analysis of variance (ANOVA). Based on the TOPSIS approach, the higher MRR (0.32251 g/min) with lesser SR (3.982 µm) were achieved at the 'I_p' of 25 amps, 'T_{on}' of 115 µs and 'T_{off}' of 60 µs. ANOVA results explored that the 'T_{on}' was identified as the primary impact factor on MRR and SR, subsequently by 'I_p' and 'T_{off}' with contribution of 44.23%, 36.53%, and 12.16%, respectively. Moreover, the surface topography of the machined composite surface was analyzed through scanning electron microscopy (SEM). It was clearly revealed the formation of surface defects such as craters, micropores, cracks and also the appearance of a recast layer on the machined surface.

Keywords

Al7050 alloy, ZrO_2, WEDM parameters, Taguchi method, TOPSIS, ANOVA

Date received: 14 June 2022; accepted: 11 June 2023

Introduction

Metal matrix composites (MMCs) have the interest of various sectors in last few decades owing to their intriguing mechanical and structural characteristics. Aluminium matrix composites (AMCs) are one among the greatest representations of MMCs due to its weight to strength ratio, high stiffness, superior toughness, higher abrasion and wear resistance.[1,2] These distinctive features have led to a wide range of applications in the aviation, automotive, and defence industries, as well as several other industries producing auxiliary parts.[3] AMCs are manufactured through various processing methods such as powder metallurgy, stir casting, squeeze casting and pressure in-filtration. Among these, stir casting route is a simple and more economical method for mass production of composite.[4,5] The serious issues in the machining of AMCs, when reinforced particles penetrate between the tool edge and the work surface; it produces rapid tool wear and poor surface integrity.[6] Hence, the conventional machining processes are more difficult due to tremendous hardness and strength of the AMCs. Non-traditional cutting processes are a potential choice for cutting these kinds of materials because no contact between the work piece and tool during machining.[7] WEDM is one of the key cutting processes employed in modern industries due to its capacity to generate precision intricate profiles and better surface finish.[8] WEDM is an electrical spark erosion method that uses a succession of repeated electrical sparks to remove work piece material. The MRR and SR are the most essential performance characteristics in WEDM.[9] These two metrics of product quality have a substantial influence on product cost. MRR with a high value will lower manufacturing costs, whereas SR

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Journal of Current Research in Engineering and Science
Bi-Annual Online Journal (ISSN : 2581 - 611X)

Volume 6 –Issue 2, August 2023
Paper:86

An Experimental Investigation of Design and Fabrication of Quadcopter Frame With 3d Printing Technology for Enhanced FlightPerformance

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Abstract This project aims to investigate the design and fabrication of a quadcopter frame using 3D printing technology to enhance its flight performance. The project will focus on the development of a lightweight and durable frame structure that can withstand the stress of high- speed flight and maneuverability. The experimental approach will involve the use of different3D printing techniques and materials to optimize the frame's weight, strength, and stability. Flight tests will be conducted to evaluate the performance of the 3D printed quadcopter framein terms of its stability, speed, and agility. The results of this project will provide valuable insights into the potential of 3D printing technology in the design and manufacture of quadcopter frames for enhanced flight performance.

The unique characteristics of quadcopters make them ideal for various applications such as surveillance, traffic updates, and warfare, particularly in dense areas where conventional flying objects may not be effective. The design of quadcopters is a critical aspect that involvesmodelling and analysis, which are essential during manufacturing. This study focuses on the modelling and structural analysis of quadcopter frames. The modelling process was conductedusing CATIA V5 software, while ANSYS 2022 IR2 software was used for the analysis of various parts.

Keyword: UAV, obstacle avoidance, ultrasonic sensor, drone, ESP32, Aurdino platform

I. INTRODUCTION

Drones are unmanned aerial vehicles that have rapidly gained popularity over the last few years. They are designed to operate remotely or on an autopilot basis, and they can performa wide range of functions. These functions range from recreational use to commercial applications, such as aerial photography, agriculture, and surveillance.

Initially, drones were primarily used by militaries for intelligence, surveillance, and reconnaissance missions. However, with the advancement in technology and miniaturization of components, drones are now accessible to the public for recreational and other commercialuse. With more affordable prices and user-friendly controls, drones have become a popular tool for various industries, businesses, and individuals. Drones come in various sizes, from small handheld drones to large industrial drones with the ability to carry heavy cargo. The size, cost,and capabilities of a drone typically depend on its intended use. Small drones, such as the DJIMavic Mini or the Parrot Anafi, are designed for recreational use and are popular among enthusiasts, vloggers, and travellers who want to capture aerial footage of their adventures. Onthe other hand, larger drones like the DJI Matrice 600 or the Freefly Alta X are intended for commercial use. These industrial-grade drones are designed to lift heavy equipment, conduct aerial surveys, and even perform logistics work in industries like oil and gas.

The popularity of drones has led to significant advancements in technology. Today, drones are equipped with an array of sophisticated sensors such as GPS, sonar, and optical sensors, which allow them to navigate and position themselves accurately. They

IJCSPUB.ORG ISSN : 2250-1770
INTERNATIONAL JOURNAL OF CURRENT SCIENCE (IJCSPUB)
IJCS PUBLICATION (IJCSPUB.ORG) An International Open Access, Peer-reviewed, Refereed Journal

Comparative Analysis on Degradation of Thermocol Using Orange Peel and Acetone

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Abstract

This paper presents a comparative analysis of the degradation of thermocol using two different agents: orange peel and acetone. The study aims to determine the effectiveness of these agents in degrading thermocol and their environmental impact.

1. INTRODUCTION

Expanded polystyrene (EPS), commonly known as Thermocol, has become a widely used material in many industries due to its light weight and excellent insulating properties. Despite its effectiveness, Thermocol's non-biodegradability causes environmental problems and requires the search for effective degradation methods. For this purpose, various reagents and methods have been investigated to promote the decomposition of Thermocol into environmentally friendly chemicals. Among these, natural substances such as orange peel and chemical solvents such as acetone have shown promise in previous studies. This article aims to make a comparison to examine the effectiveness of orange peel and acetone as a Thermocol disintegrant. This study aims to clarify the rate and extent of Thermocol degradation promoted by these chemicals and to evaluate their environmental impact. By conducting this comparative analysis, this study aims to understand the sustainable way of Thermocol waste management and contribute to the general debate on environmental well-being.

1.1 Background

Thermocol, commonly known as expanded polystyrene (EPS), has become an indispensable material in many industries due to its deep and excellent insulating properties. Its versatility makes it the first choice for packaging, design and insulation purposes. However, Thermocol's impact on the environment is concerning. Because it is not biodegradable, Thermocol waste has become a major source of environmental pollution. If not disposed of properly, it can remain in the environment for hundreds of years, causing

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INTERNATIONAL JOURNAL OF CURRENT SCIENCE (IJCSPUB)
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FABRICATION OF SEMI-AUTOMATIC TOMATO HARVESTER MACHINE

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ABSTRACT:

This article describes the design, construction and production of the semi-automatic tomato harvester. The machine is equipped with new features that increase efficiency and reduce physical labor during harvesting. Various products and methods are explained in detail, demonstrating the machine's ability to select ripe tomatoes while reducing damage to the crop.

1. INTRODUCTION

Tomato harvest is full of problems that hinder work and production. In the traditional method, extensive efforts are made to identify and collect ripe tomatoes, which leads to intense labor and time loss. Labor contingency not only increases production costs but also exposes crops to damage from handling. To solve these problems, it is necessary to switch to a semi-automatic solution in tomato harvesting. Semi-automatic technology promises to increase the efficiency of some harvesting methods. These innovations can make the process more competitive and faster by reducing dependence on manual labor. Semi-automated solutions that combine technologies such as crop selection systems and advanced technology can increase accuracy and improve resource utilization. The shift to automation not only solves problems associated with traditional methods, but also puts agriculture on the path of sustainability and increased productivity. While meeting the needs of today's agriculture, the integration of semi-automatic tomato harvesters becomes a revolutionary and future-proof system. Stupid for the harvesting process.

IJCSPUB.ORG ISSN : 2250-1770
INTERNATIONAL JOURNAL OF CURRENT SCIENCE (IJCSPUB)
IJCS PUBLICATION (IJCSPUB.ORG) An International Open Access, Peer-reviewed, Refereed Journal

GENERATING ELECTRICITY FROM AGRI THERMO GEN

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ABSTRACT: our project explores a novel approach to harnessing agricultural waste heat by employing Peltier modules to produce electricity. The Peltier modules, which capitalize on temperature differentials, are integrated with various agricultural waste heat sources. Through experimentation and analysis, we demonstrate the system's efficiency in converting waste heat into usable electricity. Our findings reveal the potential environmental and economic benefits of this sustainable energy solution, emphasizing its significance in mitigating waste and promoting sustainable energy practices in agriculture. A majority of thermal energy in the Agri waste is dissipated as waste heat to the environment. This waste heat can be utilized further for power generation.

KEYWORDS: Peltier plate , Temperature differentials , Sustainable Energy

I. INTRODUCTION

At the nexus of agricultural sustainability and clean energy innovation, the project "Generating Electricity from Agricultural Waste Heat Using Peltier Modules" endeavors to address pressing challenges in waste management while simultaneously contributing to the growing global demand for renewable energy. Agriculture, a cornerstone of human civilization, yields not only sustenance but also copious amounts of waste, often disposed of through environmentally taxing methods like open burning. Simultaneously, the world faces an increasing need for cleaner, more sustainable energy sources. This project unfolds as a response to this dual challenge, seeking to revolutionize the way we perceive and utilize agricultural waste. The transformative potential of this initiative lies in its core technology—the Peltier module, also recognized as a thermoelectric generator. This solid-state device operates on the Seebeck effect, converting temperature differentials into electricity. By strategically integrating Peltier modules into the system, we aim to capture and convert the heat generated during the combustion of agricultural waste into a usable and sustainable form of energy. This not only addresses the environmental concerns associated with waste disposal but also aligns with the broader global imperative of transitioning towards renewable energy sources. In conclusion, this project stands not only as a technical exploration of heat recovery from agricultural waste combustion but as a visionary endeavor to redefine our approach to waste, energy, and sustainability. By aligning technological innovation with environmental responsibility, it aspires to contribute to a more sustainable future where agricultural waste is not merely disposed of but rather transformed into a valuable asset for clean energy generation. Through this multifaceted exploration, we endeavor to illuminate a path toward harmonizing the critical realms of agriculture and energy, fostering a paradigm shift that holds the promise of a more sustainable and interconnected world.

IJCSPUB.ORG ISSN : 2250-1770
INTERNATIONAL JOURNAL OF CURRENT SCIENCE (IJCSPUB)
IJCS PUBLICATION (IJCSPUB.ORG) An International Open Access, Peer-reviewed, Refereed Journal

FABRICATION OF SPINACH BUNDLER

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ABSTRACT: The fabrication of a Spinach Bundler Machine represents a pivotal advancement in agricultural technology. This innovative device is engineered to streamline the harvesting and packaging of spinach crops efficiently. The machine employs a series of conveyors, cutters, and bundling mechanisms to automate the process. As spinach plants are fed into the system, it precisely cuts and trims the leaves to a uniform size, ensuring consistency in the bundles. These neatly bundled spinach bunches are then wrapped and secured with biodegradable materials, optimizing presentation and shelf life. The machine's automation reduces the labor-intensive tasks associated with manual bundling, significantly increasing productivity and minimizing human error. Additionally, it promotes sustainability by using eco-friendly packaging materials. The Spinach Bundler Machine is poised to revolutionize spinach farming practices, enhancing efficiency, reducing production costs, and contributing to the overall sustainability of agriculture while meeting the increasing demands of the market for high-quality, neatly packaged spinach products.

KEYWORDS: Lever based mechanism, uniform binding quality, eco-friendly material, compression spring, torsion spring.

I. INTRODUCTION

The introduction of the Spinach Bundler Machine represents a significant leap forward in modern agriculture. With the ever-growing demand for fresh produce and increased efficiency in farming practices, this innovative device offers a solution that addresses both productivity and sustainability. Spinach, a staple in many diets, is renowned for its nutritional value and versatility in culinary applications. However, the harvesting and bundling of spinach leaves have traditionally been labor-intensive and time-consuming tasks, often resulting in unevenly sized bundles and wasted resources. The Spinach Bundler Machine seeks to revolutionize this process by automating the harvesting and bundling of spinach crops. Through a combination of conveyors, precision cutters, and sustainable bundling materials, this machine promises to streamline spinach farming operations, reduce labor costs, minimize waste, and enhance the overall quality of spinach products. This innovation not only meets the demands of a growing market but also aligns with the global push towards sustainable and efficient agricultural practices. As we delve deeper into the workings and benefits of this groundbreaking technology, we uncover a transformative solution poised to reshape the landscape of spinach farming and distribution.

II. EXISTING SYSTEM

The existing system for harvesting and bundling spinach predominantly relies on manual labor and basic, labor-intensive methods. In this traditional approach, farm workers manually harvest spinach leaves, sort them, and bundle them by hand. This process is time consuming, highly dependent on labor availability, and often results in unevenly sized bundles. Additionally, it is prone to human error, leading to inconsistent product quality and wastage. The reliance on manual labor not only increases production costs but also limits the scalability of spinach farming operations. Furthermore, the lack of automation hampers the industry's ability to meet the rising demand for

Design And Fabrication of Weighing And Packing System

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Abstract- *The concept of fabrication of weighing-packing machine for industrial application is designed for the higher end manufactures were exports and imports packing should be done for the each and every boxes. The concept can be implemented where the Automatic or Semi automatic process should be carried out. Our model consists of a motor and worm gear arrangement and roller setup. In most of the small industries, the material packing is done by manually. This process takes more time and large human labours. There are number of packing machines are available in market. The cost of those machines is very high. Now the project has mainly concentrated on this difficulty, and hence a suitable electronic control unit has been designed such that the material can be packing in proper condition. The fabrication part of it has been considered with almost case for its simplicity and economy, such that this can be accommodated as one of the essential tools on Industrial Applications.*

Keywords- Packing, Food Materials, Adruino, Spur Gear,Digital Weighing.

I. INTRODUCTION

This is an aera of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased. Degrees of automation are of two types, viz.

- Full Automation
- Semi Automation

In semi automation a combination of manual effort and mechanical power is required whereas in full automation human participation is very negligible.

II. PACKAGING

Mass production of the product, the machining operations decide the sequence of machining. The machines designed for producing a particular product are called transfer machines. The components must be moved automatically from the bins to various machines sequentially and the final component can be placed separately for packaging. Materials can also be repeatedly transferred from the moving conveyors to the work place and vice versa. The moving conveyor is used to laminate the work piece automatically.

III. OBJECTIVES

1. To design and Fabricate the weighing and packing machine
2. To analysis the efficiency of the weighing and packing machine
3. To compare the efficiency of weighing and packing machine with Manual packing method.
4. To analyze the estimation of weighing and packing.

IV. METHODOLOGY

V. DESIGN AND ANALYSIS

We design weighing and packing system to perform continuous process of weighing and packing system for reduce to inspection time and fatigue.

In weighing and packing process, they required more labor's to complete the work . It takes more time to weighing and packing by humans. For that we design weighing and packing machine. In this design, we introduce that time to

Engineering Research Express

PAPER

Impact analysis of ceramic tile powder aggregates on self-compacting concrete

RECEIVED
17 February 2023

REVISED
5 June 2023

ACCEPTED FOR PUBLICATION
13 June 2023

PUBLISHED
21 June 2023

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Keywords: ceramic tile powder, self-compacting concrete, permeability, compressive strengths, flexural strengths, split tensile strengths

Abstract

Waste ceramic tile (CT) powders are used to improve the workability, mechanical properties, and durability of self-compacting concrete (SCC). The waste CT powder is prepared by mixing construction tiles, sanitary fittings, and electrical insulators, with different weight percentages mixed into the SCC. Experiments have been conducted to evaluate the workability, mechanical, and durability of SCC. The optimum compressive, flexural, and tensile strengths were predicted to be 52.5 MPa, 8.5 MPa, and 7.8 MPa. SCC's durability and workability characteristics are achieved by mixing 50% CT powder, which increases interlocking properties and meets EFNARC standards. It is concluded that CT powder can be substituted for conventional fine aggregate in concrete, increasing compressive, flexural, and split tensile strengths by 12.5%, 9.33%, and 28.76% compared to conventional SCC. The 50% CT powder mixed SCC is the optimum value for achieving optimal mechanical, durability, and workability characteristics. Samples of 50% CT powder-mixed SCC with 7, 28, and 90 days of curing processes and microstructure are also illustrated.

1. Introduction

Concrete is an important building material, used in large quantities in the construction industry and involving cement, fine aggregate, and coarse aggregate. Aggregate is a non-renewable natural resource that is essential for concrete strength and volume, but resources are being overexploited and natural supplies are decreasing. Waste tile can be used to reduce overexploitation and manage waste. Tile waste is sufficient for use as aggregate in concrete, made from natural materials sintered at high temperatures. There are no harmful chemicals in tiles, causing only pollution [1]. Rapid industrial development is causing serious problems, such as depletion of natural aggregates and the generation of waste from construction and demolition activities. Recycling waste is an important way to reduce global waste, with construction and demolition waste accounting for the highest proportion of global waste at 75% [2]. Ceramic materials account for 54% of construction and demolition waste. Ceramic waste can be used to create fine aggregate, which is similar to regular concrete in terms of properties. It falls within the range of values for aggregates used in concrete. Ceramic waste is increasingly being used in fine aggregate concrete due to its advantages, but there is no way to recycle it. According to estimates, 30% of the ceramics sector's daily output is wasted [3].

Ceramic waste is tough, resilient, and resistant to biological, chemical, and physical deterioration. The ceramic industries are under pressure to find a solution for the disposal of the waste, as the global supply of conventionally crushed stone aggregate is rapidly running out. Concrete made with inorganic industrial waste will have a more sustainable design and contribute to a greener world [4]. Recycling and reusing crushed waste aggregate from demolished buildings has been used for a while, but it has been limited to pipe bedding, site fill, subbase, or a capping layer. Ceramic tile can be used as various types of aggregate, making it an effective alternative [5, 6]. Solid waste is a major issue in the modern world, and the building industry needs to address the

Journal of Intelligent & Fuzzy Systems 46 (2024) 4621–4639
DOI:10.3233/JIFS-235721
IOS Press

Deep iterative fuzzy pooling in unmanned robotics and autonomous systems for Cyber-Physical systems

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Abstract. Unmanned robotics and autonomous systems (URAS) are integral components of contemporary Cyber-Physical Systems (CPS), allowing vast applications across many domains. However, due to uncertainties and ambiguous data in real-world environments, ensuring robust and efficient decision-making in URAS is difficult. By capturing and reasoning with linguistic data, fuzzy logic has emerged as a potent tool for addressing such uncertainties. Deep Iterative Fuzzy Pooling (DIFP) is a novel method proposed in this paper for improving decision-making in URAS within CPS. The DIFP integrates the capabilities of deep learning and fuzzy logic to effectively pool and aggregate information from multiple sources, thereby facilitating more precise and trustworthy decision-making. This research presents the architecture and operational principles of DIFP and demonstrates its efficacy in various URAS scenarios through extensive simulations and experiments. The proposed method demonstrated a high-performance level, with an accuracy of 98.86%, precision of 95.30%, recall of 97.32%, F score of 96.26%, and a notably low false positive rate of 4.17%. The results show that DIFP substantially improves decision-making performance relative to conventional methods, making it a promising technique for enhancing the autonomy and dependability of URAS in CPS.

Keywords: Unmanned robotics, autonomous systems, cyberphysical systems, decision-making, fuzzy logic, deep learning, iterative fuzzy pooling, information aggregation, uncertainty handling, reliability, and autonomy

1. Introduction

Unmanned Robotics and Autonomous Systems URAS has transformed diverse industries and sectors by providing novel solutions for intricate tasks necessitating remote operation, precision, and adaptability [1, 2]. URAS encompasses various technologies and systems that can function independently or with limited human intervention. These systems comprise a wide range of applications, which include Unmanned Aerial Vehicles (UAVs) [3], Unmanned Ground Vehicles (UGVs) [4], Autonomous Underwater Vehicles (AUVs) [5], and manipulative robots [6].

Cyber-Physical Systems (CPS) is a burgeoning area of study that lies at the confluence of computer science, engineering, and physical systems [7]. This interdisciplinary field amalgamates computing, communication, and control technologies to facilitate the harmonious interplay between the digital and physical realms. CPS can perceive, evaluate, and react to real-time data derived from physical phenomena, facilitating astute decision-making and adaptable control mechanisms [8, 9]. These systems

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ISSN 1064-1246/$35.00

WOMEN PROTECTION DEVICE USING STUN GUN DRESS

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Abstract— **Empower Her is a groundbreaking women's safety system built upon Raspberry Pi technology. It integrates GPS for precise location tracking, flex sensors to detect private touch incidents, a webcam for image capture, an LCD display for real-time feedback, and GSM communication for instant alerts. The primary objective of this system is to provide women with a comprehensive safety solution in potentially dangerous situations, fostering a greater sense of security.**

When a flex sensor identifies unwarranted physical contact, it triggers the Raspberry Pi to capture images and transmit them, along with the GPS location, to a remote server. Simultaneously, alert messages are dispatched to predetermined contacts through GSM technology, ensuring prompt assistance when needed. The LCD display serves as a visible deterrent to potential threats, further enhancing personal security.

Empower Her embodies a holistic approach to women's safety, merging cutting-edge technology, connectivity, and proactive measures to create a protective environment, offering women the confidence and peace of mind they deserve in various circumstances, day or night.

Keywords- LCD, Python, Raspberry pi, Flex Sensor,Web Camer,GPS/GSM.

I. INTRODUCTION

Empower Her is a pioneering women's safety system that leverages the capabilities of Raspberry Pi technology to address the critical issue of women's safety in contemporary society. Women's safety is a paramount concern, and empowering women with innovative solutions can provide them with the security and confidence they deserve. This system is designed to be a proactive and comprehensive response to various safety challenges that women may face.Utilizing Raspberry Pi as its foundation, Empower Her integrates essential components such as GPS for precise location tracking, flex sensors to detect private touch incidents, a webcam for image capture, an LCD display for real- time feedback, and GSM communication for immediate alerts. Thecombination of these technologies results in a versatile and multifaceted safety system that can be a game-changer for women'ssecurity.Empower Her embodies a holistic approach to women's safety, merging cutting-edge technology, connectivity, and proactive measures to create a protective environment, offering women the confidence and peace of mind they deserve in various circumstances, day or night.

II. LITERATURE SURVEY

In this paper there is an endeavor to develop an effective self-defense gadget which would provide protection to women in case of any assault or unsolicited contact. The major merit of this product is its simplicity and is also economical and effective handy device for women who travel alone. This gives more confidence to the women about their safety. Since it is implemented in the form of a ring the device can be easily concealed and extremely accessible in dangerous situations. But there is always room for improvement. Some improvements can be made so that it expects to enhance the performance without altering the existing design. Presently the application is compatible only to android smart phones. So, by making it compatible with any OS, can improve the system. The system can be further developed by adding few sensors to sense the fear and anxiety and thus automatic response can be obtained. Addition of a voice recognition system for the access will also help to improve the performance.[1]. In this project an alternative approach for device switching which combines fingerprint identification technique with Web server and GPS functionalities has been proposed. This approach allows more than one person to control the device functionality and the authentication facility provided by the switch helps to reduce the fault correction time.[2]. The node MCU is the main component that connects the pulse, temperature, GPS module, and LCD. The vibration sensor, ESP32cam, and FTDI are connected to the Arduino. This paper IoT based Wrist Band for Women safety uses an Arduino UNO module used to connect the sensors and other components. The node MCU is the main component that connects the pulse, temperature, GPS module, and LCD. [3]. Connecting with GSM Module and Prompting for Fingerprint.Once the user activated the device with her fingerprint, the continuous monitoring begins, which keeps on checking for fingerprint on the fingerprint module. In case, there is no finger impression for one-minute buzzer starts to beep as shown in Figure2.15 When the buzzer starts to beep, the GSM module sends message to all in case of emergency (ICE) numbers along with the latitude and longitude values. [4]. In this paper, SMS will be received to only one person, e-mails can be sent to 4 members, and voice messages through call will be received to the people who downloaded the app and login with those Credentials of the smart locket. Using this smart locket, we can alert many people at a time so that we can say that we have more percentage to save us from that situation. [5].

The prototype's architecture consists of ATMEGA 2560 Arduino incorporated with the GSM module, location accessing protocol, IOT module, buzzer, heart-beat sensor, neuro-stimulator, SOS button, zig-bee module and buzzer. The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (ofwhich 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and areset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.[6]. The main purpose of this project is to ensure the woman safety by a device to act as a rescue and prevent any harm at the time of hazard especially for women. Through the proposed system a smart device for women's safetywhich automates the emergency alert system is designed. Through the process of customization, this prototype can be modified to wearable like smart watches, bracelets, necklaceetc. The main advantage of our proposed system is that both

Smart Shopping Trolley with Chatbot

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Abstract **- The initiative known as "Smart Shopping Trolley with Chatbot" is an innovative project that aims to transform supermarket shopping. This project aims to introduce intelligence and innovation into the custom of grocery and other product shopping in an era where technological advancements are changing many aspects of our daily lives. Essentially, the "Smart Shopping Trolley with Chatbot" project presents a clever way to improve the grocery store shopping experience. With its many clever features, this state-of-the-art shopping trolley aims to simplify and improve the entire shopping experience. The ability of this cutting-edge trolley to automatically scan items as they are placed within it is one of itsmain features.**

Keywords - R F I D, ChatBot, Raspberry Pi Pico, LCD Display,Keyboard.

I. INTRODUCTION

In today's fast-paced world, where convenience and efficiency are paramount, the traditional shopping experiencehas been ripe for innovation. The project "Smart Shopping Trolley with Chatbot" introduces a cutting-edge solution designed to transform the way we shop in supermarkets. This innovative approach leverages modern technology to enhance every aspect of the shopping journey, from item selection to payment. Our Smart Shopping Trolley is not just a means to transport groceries; it's a sophisticated tool that seamlessly integrates intelligent features to elevate the overall shopping experience. Through this project, we aim to revolutionize the way consumers interact with supermarkets, making it more convenient, efficient, and enjoyable.

Key elements of this innovative trolley include the ability to scan items as they are placed inside, automatic bill generation, and streamlined payment facilities. These features eliminate the need for conventional checkout lines and offer shoppers a hassle-free and time-saving alternative. Customers can now enjoy a smoother, more efficient shopping experience, allowing them to focus on selecting the products they need while reducing the time spent waiting in line.

In this introduction, we will delve further into the details of the Smart Shopping Trolley project, exploring the technology behind it, the benefits it brings to both shoppers and retailers the potential it holds to shape the future of supermarket shopping. Additionally, we are interfacingchatbot in this project to enhance the interaction between users.

II. LITERATURE REVIEW

The smart trolley system, with its intricately designed components, seamlessly combines RFID technology, an advanced RFID reader, a user-friendly LCD screen, and wireless communication through a Wi-Fi module to create an efficient and versatile solution for real-time identification and tracking of items[2].

The RFID reader utilized in this system is specifically chosen for its compatibility with passive RFID tags, providing a cost-effective alternative to active tags. Passive tags do not require an internal power source and rely on the energy transmitted by the RFID reader for communication. This makes them ideal for applications where cost and power efficiency are paramount. The RFID reader is adept at initiating communication with tags within its coverage range, making it a reliable tool for identifying articles placed within the smart trolley[3].

Notably, the bidirectional communication capability of the RFID reader allows it not only to retrieve information from the RFID tags but also to write data back to the tags. This feature adds a layer of flexibility

IJRAR.ORG E-ISSN: 2348-1269, P-ISSN: 2349-5138

INTERNATIONAL JOURNAL OF RESEARCH AND ANALYTICAL REVIEWS (IJRAR) | IJRAR.ORG

An International Open Access, Peer-reviewed, Refereed Journal

Enhanced IoT-Based Healthcare Monitoring System with Security Measures

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Abstract—A healthcare communication system utilizing IoT technology and a PIC18F46K22 microcontroller as a gateway for sensor data transmission. Sensors like temperature and pulse oximeters provide real-time healthcare parameter monitoring accessible to doctors remotely. A buzzer alerts caretakers of sensor output variations, ensuring timely intervention. Data security is ensured through AES128 encryption via a password-protected Wi-Fi module (ESP8266), enabling only authorized access to transmitted data. In emergencies, a GSM module alerts doctors for swift action. This system boasts low power consumption, easy setup, high performance, and rapid response capabilities for efficient remote patient monitoring.

Keywords— Remote patient monitoring, IoT-based, PIC18F46K22 microcontroller, Data security, Low power consumption, Rapid response.

I. INTRODUCTION

The internet has become an integral part of daily life, transforming how people engage in education, finance, business, entertainment, and more. One emerging mega-trend within the internet realm is the Internet of Things (IoT), envisioning a world where objects communicate and share information over IP or public networks. This interconnected network of objects collects data, analyses it, and initiates actions, facilitating intelligent decision-making. While commonly associated with machine-to-machine connectivity, the true essence of IoT lies in creating a seamless, programmable network of interconnected devices. Projections suggest that billions of devices will be connected by 2020, revolutionizing lifestyles, communities, and healthcare. The core of IoT lies in sensors, gateways, and wireless networks, enabling seamless communication and access to applications and information.

In the realm of healthcare, IoT holds immense promise, offering secure monitoring systems that enhance well-being. Developing smart healthcare systems involves sensors capturing user data, which is then transmitted securely to the cloud via Wi-Fi, with access restricted to authorized users. As the adage goes, "Health is wealth," leveraging technology for better health outcomes is paramount. Therefore, the development of IoT infrastructure for healthcare monitoring is imperative, ensuring data security and empowering individuals to make informed decisions about their well-being.

II. PROBLEM DEFINITION

In the current healthcare system, patients recuperating at home rely on caregivers or nurses for post-operative monitoring, but continuous surveillance is often impractical. With rapid changes in health parameters, delays in caregiver presence can lead to significant harm. Leveraging today's internet-dominated era, there's an opportunity to develop a smart healthcare system enabling real-time patient monitoring. This innovation aims to bridge the gap, ensuring timely and continuous surveillance, thus enhancing patient safety and well-being.

III. PROPOSED SYSTEM

The system is designed for continuous patient monitoring via the internet. It comprises a PIC18F46K22 Microcontroller, DS18B20 Temperature sensor, TCRT1000 Pulse Oximeter Sensor, 16x2 Liquid Crystal Display, GSM Modem, Piezo Electric Buzzer, Wi-Fi Module, Max232, and Regulated Power Supply. The microcontroller gathers sensor data and transmits it using Wi-Fi. Doctors access the protected data by inputting the unique IP address into any internet browser on their device. A GSM Modem notifies caretakers when heart rate exceeds 90 or drops below 60, or when temperature is below 20 or above 35, activating a buzzer alert. A connected LCD displays transaction process and healthcare data. The user interface webpage auto-refreshes every 15 seconds, ensuring continuous patient data monitoring. This system enables seamless and continuous monitoring of patient health status.

Automated segmentation of focal liver segment on CT scan using machine learning based on ANN

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Abstract- **This project is based on deep machine learning to perform automatic segmentation of liver cancer cases depicted in computed tomography (CT) images. The segmentation results obtained through this approach were then compared to those generated using atlas-based automatic segmentation. A U-Net neural network with an encoder-decoder architecture was developed. The deep ANN (Artificial Neural Network) that underwent training successfully conducted automatic segmentation of CT images for 36 instances of liver cancer.**

Keywords- **ESP8266, ANN, Arduino Uno, Python Software, GSM/GPS module.**

I. INTRODUCTION

The subdivision of the human liver into anatomical regions is a regular task for radiologists, particularly when it comes to accurately localizing focal liver lesions before surgery. The choice of hepatectomy is largely based on the segmental localization of the lesion. Additionally, identifying the liver segment is crucial to minimize the risks associated with liver surgery. Due to the heterogeneous nature of certain liver diseases, quantitative parameters like liver fat fraction and value need to be measured at a segment level. Currently, radiologists rely on visual interpretation or manual segmentation, which are time-consuming, labor-intensive, and prone to variations between observers. Therefore, there is a strong demand for an automated liver segment segmentation tool that is practical for clinical use. Over the past two decades, extensive research has been conducted on computer-assisted liver segment segmentation. However, most of these studies have utilized traditional machine learning techniques that do not meet the performance and efficiency requirements for clinical applications. The initial step in this process involves segmenting the hepatic vessels using the skeletonization process, followed by extracting the main direction of the largest vessels to achieve separation of different liver segments. Nevertheless, the entire procedure lasted for over 8 minutes, and achieving satisfactory outcomes heavily relied on precise vascular segmentation. This task proved to be challenging due to the intricate and intertwined vascular anatomy within the liver. In order to address this issue, our team introduced a novel approach based on multiple features. This innovative method significantly enhanced the accuracy of vessel separation and consequently, it was anticipated to enhance the segmentation of liver segments as well. However, the quantitative results pertaining to the segmentation of liver segments were not provided in the aforementioned publication. Additionally, their method required an average of 20.8 seconds per case to obtain liver segments.

Liver diseases can be categorized into three stages: firstly, liver inflammation; secondly, liver scarring (cirrhosis) and finally, liver cancer or failure. These conditions are commonly observed in cases of liver sick

This paper examines the strategies that indicate liver sicknesses at an acceptable degree of accuracy and determines the methods that produce the great accuracy. This examine selects a single facts set of liver sufferers with 5 supervised getting to know techniques which can be applied to that data set in R.

In this paper, the techniques that indicate liver diseases at an acceptable level of accuracy and determines the methods that produce the best accuracy. This study selects a single data set of liver patients with five supervised learning techniques that are applied to that data set in R.

Moreover, our model showcases a remarkable performance in terms of accuracy, dice similarity coefficient, and specificity parameters when compared to established algorithms. Additionally, it exhibits exceptional adaptability across various datasets

II.LITERATURE REVIEW

The research paper focuses on a hierarchical convolutional neural network (CNN) framework that aims to automatically detect and classify focal liver lesions (FLLs) in multi-phasic computed tomography (CT). Diagnostic

IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

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Design and Implementation of Sustainable Turf Management Robot

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Abstract

The Robotic Solar Grass Cutter is an advanced lawn maintenance solution that harnesses solar power for eco-friendly, cost-effective operation. Equipped with ultrasonic sensor and Arduino IDE, it autonomously navigates lawns, avoiding obstacles and ensuring precise grass cutting. This innovative device operates quietly, requires minimal maintenance, and significantly reduces its environmental impact by eliminating the need for gas or electricity from non-renewable sources. Its user-friendly interface allows homeowners and landscapers to customize settings and schedules easily. Our Robotic Solar Grass Cutter offers a sustainable and efficient approach to lawn care, combining renewable energy with Bluetooth module for a well- manicured, eco-conscious yard.

Keywords: Arduino IDE, Bluetooth Module, Solar power, Ultrasonic sensor, Grass cutter

Introduction

The Robotic Solar Grass Cutter represents a cutting-edge solution for modern lawn maintenance. This innovative device combines the power of robotics and solar energy to efficiently trim and maintain grassy areas. Powered by clean and renewable solar energy, it operates silently and without emitting harmful emissions, making it an eco-friendly choice for landscaping. Equipped with advanced sensors and AI technology, the robotic grass cutter navigates the terrain autonomously, avoiding obstacles and ensuring precise and even grass cutting. Its efficient design and precision cutting blades make it ideal for both residential lawns and larger commercial spaces. One of the key benefits of the Robotic Solar Grass Cutter is its low maintenance requirements. It operates with minimal human intervention, reducing the need for manual labor and fuel-powered equipment. Additionally, its solar panels harness energy from the sun, reducing operational costs and environmental impact.

This robotic innovation not only saves time and effort but also contributes to a greener and more sustainable future. With its ability to maintain lawns efficiently and eco-consciously, the Robotic Solar Grass Cutter is poised to revolutionize the way we care for our outdoor spaces, offering a glimpse into the future of landscaping technology.

Literature Review

Today people are too busy from day to day to cut the grasses at the house lawn. In order to be more convenience on doing the jobs with fast cut without hassle during cutting the grasses, a device is created which make the process easier. The machine gives the advantages such as easy to handle environmentally, fast without standing under the sunlight [17]. The solar panel is used for charging the battery when it gets discharged. Here the grass cutter is controlled with the help of Android phone to any shape without much human efforts. For the simulation, the proteus software is used where the obstacle gets near to Ultrasonic sensors and distance between the obstacle and robot is displayed on the LCD [1]. DC motors are connected to the wheel of the device through the motor driver circuitry. The working prototype designed for the Grasscutter system that is controlled through Android mobile through the Blynk application [6]. The torque of the DC motor interfaced to control the blade of Grasscutter to shear the grass [10]. Customized Harvard architecture with 8 bits Reduced Instruction Set Computer processor (RISC)

An Enhanced approach for Smart Wheelchair Safety System for Physically Disabled People

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Abstract— The Raspberry Pi serves as the central processor for this project. The main goal of achieving automated movement is accomplished through various interfaces. The first type of interface is a touchscreen that displays arrow keys, enabling the user to move in any desired direction. Additionally, the wheelchair can be controlled using Hand gestures, Voice commands, or an android phone. The wheelchair circuit includes an RF and Bluetooth receiver, which receives these commands and operates the wheelchair motors accordingly to achieve the desired movement. This system allows disabled individuals to easily operate the wheelchair, while also enabling another person to control it from a distance of 3-4 meters. By incorporating automation and safety features, the Raspberry Pi-based wheelchair safety system takes the wheelchair system to a new level.

Keywords—Raspberry Pi 4 model B, Ultrasonic Sensor, Touch screen display, RF Bluetooth module, GSM/GPS module, DC Motor.

I. INTRODUCTION

The introduction to an improved smart wheelchair safety system utilizing Raspberry Pi could commence as follows. In recent times, there has been an increasing demand for innovative solutions to enhance the safety and mobility of individuals who depend on wheelchairs for their daily transportation requirements. Conventional wheelchairs often lack advanced safety features and real-time monitoring capabilities, thereby leaving users susceptible to accidents and emergencies. To tackle these challenges, we propose an enhanced approach for a smart wheelchair safety system, harnessing the power and versatility of the Raspberry platform.

This system aims to revolutionize the notion of wheelchair safety by integrating state-of-the-art technology, such as sensors, communication modules, and intelligent algorithms. By doing so, our objective is to not only provide wheelchair users with heightened safety but also grant them greater independence and peace of mind in their everyday lives.

Within this document, we will delve into the design, components, and functionalities of our smart wheelchair safety system. We will explore how the Raspberry Pi, a single board computer renowned for its adaptability and affordability, serves as the central hub of our solution.

Furthermore, we will discuss the diverse sensors and peripherals that we have incorporated to monitor and respond to environmental conditions, user health, and potential hazards.

This paper will also emphasize the crucial role of data analysis and real-time communication in our system. Through these capabilities, we enable caregivers and healthcare professionals to remotely monitor wheelchair users, promptly address emergencies, and make well-informed decisions to ensure user safety.

II. LITERATURE REVIEW

The focus of the research paper revolves around enhancing the functionality of a motorized wheelchair to cater to a greater population of individuals with disabilities. This objective is accomplished through the integration of a DC motor, motor drivers, and a microcontroller system. The control circuit, which is based on the Android platform, effectively manages the wheelchair's movement. Bluetooth technology is employed to establish communication between the control circuit and an Android phone that is already in use.

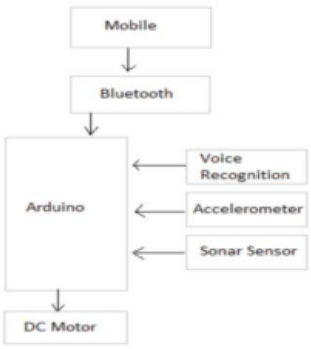

Figure 1. Block diagram of SMART WHEELCHAIR

An Iot Based Non-Invasive Glucose Level Monitoring System

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Abstract— **Diabetes is a condition that affects one's blood glucose levels. It is important to monitor one's blood glucose levels. In this project, we will introduce a non-invasive device that can be used with the Raspberry Pi to test and monitor glucose levels. The classification model was used to identify the characteristics of individuals with diabetes. The data collected from this project were then used to develop a one-factor analysis framework that can be used to analyze the different aspects of the disease. In addition to the development of a non-invasive device, the challenges encountered by the researchers in developing this model are also related to the various aspects of the disease**

Keywords— **LCD display, Raspberry pi module, Raspberry, pi Camera, Wi-fi module, 3d printed Case**

I. INTRODUCTION

Diabetes mellitus refers to a set of sicknesses that have an effect on how the frame makes use of blood sugar (glucose). The principal motive of diabetes varies through type. But irrespective of what sort of diabetes you have, it could result in extra sugar withinside the blood. Too tons sugar withinside the blood can result in extreme fitness problems. Non-Invasive glucose monitoring is the measurement of blood glucose levels, required by people with diabetes to prevent both the chronic and acute complications from the disease, without drawing blood, Puncturing the skin, or inflicting ache or trauma.

In these methods, a light beam is directed to human tissue, and the energy absorption, reflection or scattering is used to estimate the glucose concentration Commonly, optical methods are preferred due to their simplicity and that small laser diodes can be used to construct portable and inexpensive devices.

Technologies which gained attention in this paper are Near infrared Raman, Fourier transform infrared and spectroscopy using different sensors, microcontrollers, Raspberry pi and signal processors. Using an IOT-based monitoring framework for non-invasive blood glucose monitoring is describe. Data for the non-invasive monitoring is acquired taking a picture of the user's fingertip using the camera of the raspberry pi and then data is processed by a neural network implemented using the tenser flow libraries in a Flask microservice. The envisioned glucose values may be harvested with the aid of using a quit device

II. LITERATURE REVIEW

Blood glucose monitoring is vital for controlling the complications of diabetes. This paper deals withnon-invasive blood glucose monitor featuringmulti- detector conflation, which functions well for rapid-fire- fire yet accurate blood glucose monitoring and netting of diabetes. Although diabetes can't be cured, its complications can be reduced via blood glucose monitoring and applicable drug intervention. thus, the blood glucose monitoring plays a critical part in controlling the complications of diabetes. A fingertip blood glucose monitor is presently the good choice for blood glucose monitoring as its invasive croquette poking sample- taking system will beget pain, vitiate the cases' jitters and indeed lead to infections, this system can minimize the trouble cerebral burden on cases and encouraging them to tone- monitor blood glucose several times a day using multi sensor conflation.

This paper proposes a novel multi-sensor fusion method for monitoring blood glucose that includes temperature, humidity, blood flow, and photoelectric sensors. It aims to improve the accuracy of this method and enable quick detection of diabetes.A fine model for metabolic heat conformation- grounded blood glucose monitoring was erected, and its delicacy was vindicated by trials with a cardiopulmonary function instrument. The characteristic parameters of diabetics were uprooted by applying the one- factor analysis of friction(ANOVA) and establishing a bracket model to work out whether the subjects suffer from diabetes.Diabetics were classified

ISSN No:-2456-2165

Automatic Gear Lock System for Motorcycles at Traffic Signals

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Abstract:- With the ever-increasing traffic congestion in urban areas, efficient and safe management of vehicles at traffic signals has become paramount. Motorcycles, being one of the most popular modes of transportation, pose unique challenges at traffic signals, especially when riders fail to engage neutral or shut off the engine, leading to accidental throttle engagement and safety hazards. This abstract presents an innovative solution :an Automatic Gear Lock System(AGLS)for motorcycles designed to engage the gear lock when the traffic signal turns red, enhancing safety, reducing fuel wastage, and minimizing air pollution. The AGLS comprises a microcontroller, sensors, and an actuator system integrated into the motorcycle's trans mission system. When the motorcycle approaches a traffic signal and the red light is detected by the system's sensors, the microcontroller sends a signal to engage the gear lock mechanism. This mechanism prevents the motorcycle from changing gears and ensures it remains in neutral. The gear lock disengages automatically when the signal turns green or when the rider applies throttle pressure. Moreover, the system incorporates safety features to prevent unintended activation and ensures rider control is prioritized.

Keywords:- *Micro Controller, Sensors And Actuators, Embedded And Calibration Software, Mounting Brackets.*

I. INTRODUCTION

In today's fast-paced world, urban traffic congestion continues to grow, especially in densely populated areas. Motorcycles have become an increasingly popular mode of transportation due to their agility and fuel efficiency. However, when motorcycles come to a halt at traffic signals, there is a safety concern that often goes unnoticed - the risk of unintentional acceleration or motorcycle rollback, which can lead to accidents, injuries, and even fatalities Key elements of this innovative trolley include the ability to scan items as they are placed inside, automatic bill generation, and streamlined payment facilities.

To address this critical issue, we present the concept of the "Automatic Gear Lock System for Motorcycles at Traffic Signals. "This innovative system is designed with one primary goal in mind: to enhance safety and convenience for motorcycle riders at traffic signals.

By the end, we hope to provide a comprehensive understanding of this technology and its potential to transform the way motorcycles interact with traffic signals.

II. LITERATURE REVIEW

An automatic gear lock system aims to mitigate these risks by automatically engaging the gear when the motorcycle comes to a stop at a red light. This prevents the motorcycle from being ridden away unintentionally or forcefully, providing an extra layer of security for riders.

The heart of the system lies in the gear lock mechanism, seamlessly integrated into the existing gear shifter A solenoid-operated locking mechanism is integrated into the gear shifter This solenoid-powered unit locks the gear in place when activated, preventing any unwanted gear changes.

The system's eyes on the road are the signal detection unit. Strategically positioned, it accurately identifies red lights, triggering the gear lock activation. Depending on the chosen technology, two main options.

Dedicated sensors like LiDAR or radar can detect specific wavelengths emitted by traffic light signals, offering a more weather-resistant solution.

Traffic lights, a mundane aspect of the daily commute for many, present a unique vulnerability for motorcycle riders. Balancing at standstills often requires dismounting, leaving riders exposed to theft, accidental rolling, and even falls. While existing security measures offer partial protection, they often lack immediacy and require conscious activation, leaving gaps in rider security at the most critical moment.

Beyond immediate safety, the system offers convenience and rider confidence. With the gear locked, riders can relax at red lights, focusing on the road ahead instead of constantly worrying about security. This paper not only presents the technical details of the system, but also analyzes its impact on user experience and the overall riding experience.

MEDICAL DISPENSER WITH PORTABLE ECG

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ABSTRACT: This article explores the integration of portable electrocardiogram (ECG) technology with medical devices to provide a solution for monitoring medication adherence and cardiac problems in clinical practice. This new approach aims to improve patient health, improve treatment outcomes and simplify health management by combining the advantages of two technologies.

1. INTRODUCTION:

Global healthcare is undergoing a transformation due to the increasing number of chronic diseases and aging populations. As the burden of long-term health management increases, there is an urgent need for new solutions that will not only address the challenge of adherence to medication regimens but also provide important health services. In response to this urgent need, our article delves into the principle of integrating portable electrocardiogram (ECG) technology with medical dispensers. This integration is designed to create a healthcare and integration system that combines the accuracy of medication delivery with instantaneous information from continuous heart monitoring. The integration of these two technologies represents a revolution in patient care and provides greater opportunities for health management. As the population ages and chronic diseases become more of a problem, this combination has the potential to not only improve clinical outcomes but also improve patient well-being overall. In this regard, we have created a framework for detailed research on how the integration of portable ECG technology with medical devices can transform health and provide solutions to the complex problems posed by chronic diseases in today's healthcare.

2. MEDICAL DISPENSER TECHNOLOGY:

Medical technology has made significant changes in recent years that have transformed medication management and compliance. This review covers the key capabilities and innovations that define the current landscape of medical delivery systems and highlights their roles in automated drug delivery, medication scheduling, and similar connections. These features form the basis for the integration of medical devices with portable ECG equipment, improving overall patient care.

1. Automatic Medication:

Precision and Accuracy: Modern medical devices use advanced technology to provide accurate and precise drug therapy. Automated drug delivery systems, such as robots and sensors, enable distributors to deliver medications at the right time.

Customization: Many systems allow personalized delivery schedules based on the patient's needs. This change improves patient compliance and ensures that the medication is administered at the correct time for effectiveness.

2. Treatment planning:

Alarm and warning: The treatment machine is equipped with an alarm and warning. These features help patients adhere to their medication regimen through timely reminders. Some devices also use visual and auditory cues to detect colors; This makes them especially useful for people with different levels of technology awareness.

Schedule Adjustment: Some dispensers may adjust their schedules based on changes in patient prescriptions or medications. Health. This variation ensures that the distribution system always meets the changing needs of the customer.

3. Smart Connectivity:

Integration with Mobile Applications: Many medical devices are now equipped with mobile applications that allow patients and Doctors to remotely monitor medication compliance. These apps often encourage healthcare collaboration by providing push notifications, dose history, and follow-up instructions.

Cloud Connectivity: Some delivery systems use cloud technology to securely store and synchronize medication information. This not only enables remote monitoring, but also facilitates communication with other medical devices, creating a healthier environment.

Compatibility with Wearable Devices: Integration of medical devices with wearable devices such as smart watches enables more comprehensive healthcare services. Patients can receive medication alerts directly to their devices, enhancing the accessibility of important messages.

4. Integration with Portable ECG Devices:

Data Synergy: Integrating medical devices with portable ECG devices enables healthcare services. Information from medication adherence and EKG readings can be interpolated to provide doctors with a more comprehensive view of a patient's health.

Automatic Reporting: Integrated systems can produce automatic reports showing the relationship between medication adherence, body negativity and ECG data. This will help you make more informed decisions and respond in a timely manner in unusual situations.

IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

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SMART CROP GROWTH MONITORING BASED ON SYSTEM ADAPTIVITY AND EDGE AI

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Abstract: Agriculture is a critical sector for sustaining human life, and the demand for increased crop yield, quality, and resource efficiency has never been higher. To address these challenges, this research presents a novel approach to crop growth monitoring through the integration of system adaptivity and edge Artificial Intelligence (AI) technologies. The proposed system leverages a combination of advanced sensors, edge computing, and AI algorithms to provide real-time monitoring and analysis of crop growth. Traditional approaches to crop monitoring rely heavily on centralized data processing, which can lead to latency issues, data security concerns, and increased operational costs. In contrast, our approach utilizes edge AI to process data directly at the source, reducing latency and ensuring data privacy.The system's adaptability is achieved through a smart system management mechanism that dynamically adjusts cryptographic functions based on security needs and resource constraints. This approach ensures that the system can safeguard sensitive sensor data without compromising performance or energy efficiency.

Keywords – Agriculture, Crop growth monitoring, Edge Artificial Intelligence (AI), Advanced sensors, Edge computing, Adaptability.

I. INTRODUCTION:

Lately, the abnormal climate leads to the extreme rainfall, while the circumstance of natural disasters similar as typhoon, rainfall and severe failure gradationally increases. This causes great casualties and serious damages to our parcels and terrain. For agriculture, the extreme rainfall also makes the growth of crops unstable, and the problem of food deficit therefore becomes further and more serious. For all countries in the world, the food extremity has also come a veritably important issue.

Until now, most crops are still planted in the out-of-door. This means the growth of crops will be affected by the rainfall fluently. This also makes the yield and quality of ranch crops unstable. compared to the opening planting surroundings, lately, the hothouse becomes a new volition due to its controllable advantage with the incoming of agriculture 4.0, new ways similar as Cyber Physical Systems (CPS) and Internet-Of-effects (IOT)

IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

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SMART BOREWELL CHILD RESCUE SYSTEM IN WIRELESS MONITORING USING AI

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Abstract: This paper introduces a groundbreaking Smart Borewell Child Rescue System, a comprehensive solution designed to tackle the growing concerns surrounding borewell-related accidents involving children. The system integrates advanced hardware, wireless monitoring technologies, and Artificial Intelligence (AI) to offer a proactive and intelligent approach to borewell safety. Employing a network of strategically placed sensors and wireless communication protocols, the hardware architecture enables real-time data processing at a central control unit. The incorporation of AI algorithms enhances the system's intelligence, allowing it to discern between routine activities and emergencies by analyzing sensor data patterns. This intelligent approach minimizes false alarms and ensures timely responses to critical situations. Notably, the system not only focuses on monitoring but actively assists in rescue operations, providing real-time data on the child's location within the borewell. This information aids rescue teams in optimizing efforts, reducing response times, and increasing the likelihood of successful rescue missions. The paper underscores the significance of technology-driven solutions in proactively addressing child safety, showcasing the transformative power of innovation in tackling societal challenges. The Smart Borewell Child Rescue System not only sets a benchmark for borewell safety but also exemplifies a commitment to leveraging technology for the greater good.

Keywords - Borewell Safety, AI Algorithms, Wireless Monitoring, Child Rescue System, Remote Monitoring, Machine Learning

I. INTRODUCTION:

Borewells, traditionally a vital source of water, have unfortunately become synonymous with a growing safety concern, particularly regarding incidents where children accidentally fall into these deep and often inadequately secured structures. The escalating frequency of such tragic events underscores the urgent need for innovative solutions that can not only enhance monitoring but also revolutionize rescue operations. This paper introduces a groundbreaking initiative: the Smart Borewell Child Rescue System, an integrated solution that harnesses wireless monitoring technologies and Artificial Intelligence (AI) to provide a comprehensive and intelligent safety net around borewells.

Borewells are ubiquitous in both urban and rural landscapes, serving as indispensable sources for water extraction. However, the inherent dangers associated with their openings pose significant threats to child safety, demanding a paradigm shift in safety measures. The objectives of the proposed system go beyond conventional approaches, aiming to leverage state-of-the-art hardware, wireless connectivity, and AI algorithms to transform the landscape of borewell safety. By doing so, the system seeks to achieve real-time monitoring, early hazard detection, and active support for rescue operations, ultimately reducing response times and increasing the likelihood of successful outcomes.

Integrated Coolwarm Jacket

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Abstract - **The Integrated Cool Warm Jacket represents a wearable technology, which seeks to give consumers with a personalized and adaptable comfort experience. In response to the challenges posed by varying environmental conditions, this innovative jacket seamlessly integrates intelligent heating and cooling elements to maintain an optimal body temperature. Equipped with Arduino UNO, Peltier module, Bluetooth module, Lithium ion Battery, Relay, Temperature sensor, LCD display, User Interference with fabric insulation materials. The jacket's design incorporates a network of embedded sensors that continuously monitor ambient temperature, humidity levels, and the wearer's body temperature. These sensors relay real-time data toa control unit, which employs sophisticated algorithms to analyse and interpret the information. Based on the analysis, the system dynamically adjusts the jacket's thermal features, ensuring the wearer remains comfortable in any environment. The integration of these features allows for a fine-tuned balance, offering users a customizable and responsive thermal management system.**

Keywords – Arduino UNO, Bluetooth module, lithium ion battery, LCD display, Peltier module, Relay, Temperature sensor, User Interface, Fabric and insulation material.

I. INTRODUCTION

The Integrated Cool Warm Jacket stands at the forefront of innovation in wearable technology, redefining the concept ofpersonal comfort in changing climates. This suit seamlessly integrates smart textiles with heating and cooling elements, offering users dynamic and personalized thermal experience. Equipped with advanced sensors that monitor ambient temperature, humidity, and the wearer's body temperature in real-time, the jacket's control unit employs sophisticated algorithms to adjust heating and cooling elementsaccordingly. This intelligent system ensures optimal comfort, addressing individual preferences and environmental demands. This coupled with a user-friendly control via mobile application. The Integrated Cool Warm Jacket marks a significant leap in the evolution of smart apparel, promising unparalleled adaptability and control over one's thermal well-being in various scenarios, from outdoor activities to everyday wear.

II. LITERATURE REVIEW

The system is a battery powered heating/cooling suit, wherein the suit's integrated controls and thermo-electric gadgets allow the user to regulate the temperature. The reason for starting this project is that such a suit is practical and beneficial. Our ultimate goal was to create a body suit that was comfortable, easy to put on, and had sufficient controls so that any user could use it as needed[1]. This system is more handy because it is lighter, smaller, and uses less electricity. We can wear this jacket in both seasons like summer and winter. Instead of using a standard battery, we employ a lithium-ion battery, because the lithium-ionbattery experiences faster rates of charging and draining. This enables soldiers to perform their duties even in the most severe weather. This jacket is very efficient, inexpensive, and simple for use with Internet of Things applications[10].

The jacket is to provide cooling mechanism. The reservoir's water is chilled via a thermoelectric cooler. The line tube in the chilled jacket absorbs body heat. The liquid in lined tube is passed through expansion valve, then pressure of liquid reduces. This liquid is then transferred to the fluid reservoir. Thermoelectric cooler is used to absorb heat from liquid stored in reservoir and transfer to the atmosphere, which causes the liquid held in the reservoir to cool, and vice versa[4]. A design that combines a thermoelectric cooler with a copper box has been developed to

International Journal of communication and computer Technologies, Vol. 12, No. 1 , 2024 (pp. 27-32) IJCCTS
RESEARCH ARTICLE WWW.IJCCTS.ORG

Wearable Device for Heart Rate Monitoring

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Keywords:
LCD, Python,
Raspberry pi,
Temperature Sensor,
Heartbeat Sensor,
GPS/GSM.

DOI:10.31838/IJCCTS.12.01.03

Received: 10.01.2024

Revised: 15.02.2024

Accepted: 03.03.2024

Abstract

The miniaturization and energy optimization of sensors opens up new possibilities in the field of sleep research. Wearable sensors are capable of recording vital parameters during sleep in a simple and unobtrusive manner. In order to analyze sleep architecture and sleep disorders, continuous monitoring of movements and cardiorespiratory parameters in high resolution is of central importance. In this paper a novel wearable sensor device based on impedance plethysmography (IPG) is presented, which is able to continuously monitor movements and cardiac pa rameters at the wrist. The sensor is designed to realize high resolution measure ments up to 48 hours constantly. Measurements during sleep show that up to 98% of the pulse intervals are correctly detected. Furthermore, the comparison of the heart rate variability (HRV) parameters between IPG and the gold standard ECG demonstrate the potential of the sensor as a valid tool for ambulant sleep analysis.

How to cite this article: M.Sudha, Karthikeyan.S, Daniel J, Muthupandian R (2024). Implement A System For Crop Selection And Yield Prediction Using Random Forest Algorithm. International Journal of communication and computer Technologies, Vol. 12, No. 1, 2024, 27-32

Introduction

The Real-time Monitoring System for Cardiovascular Disease Using Intelligent Sensors. This innovative system merges cutting-edge sensor technology with advanced data analytics to provide continuous and proactive cardiovascular health monitoring. In this era of personalized healthcare, our system empowers individuals and healthcare professionals alike to track and respond to cardiac health in real-time, potentially revolutionizing the way we manage and prevent cardiovascular diseases. Explore the future of heart health with our intelligent sensor-based monitoring system. We are working on a technology that, through early heart attack detection, will contribute to a reduction in the death rate from heart attacks. We will be employing readily accessible smart bands and health bands in our system. These intelligentbracelets will continually track a user's heart rate. The nearby smart phone will be alerted when a user's heart rate falls below a danger level, and the application placed on the smartphone will alert the user's worried family members and friends as well as the ambulanceservice. Through Bluetooth, the smart band and the program will be linked with the use of a sensor, this device can frequently measure temperature and pulse. The threshold for each parameter is chosen bythe doctor.

Literature Survey

A literature survey on real-time monitoring systems for cardiovascular disease utilizing intelligent sensors reveals a growing interest in leveraging advanced technologies for early detection and continuous assessment. Studies highlight the significance of incorporating intelligent sensors, such as ECG and pulse oximeters, to capture real-time physiological data for improved diagnosis and management of cardiovascular conditions. Machine learning and data analytics are frequently explored for enhancing the predictive capabilities of these systems, aiding in the early identification of anomalies and potential cardiac events. Furthermore, the literature underscores the importance of user-friendly interfaces, secure data transmission, and compliance with healthcare regulations. The surveyed literature collectively emphasizes the potential of intelligent sensor-based monitoring systems in revolutionizing cardiovascular healthcare by providing timely insights, personalized patient care, and facilitating remote monitoring for enhanced accessibility and convenience.

[1] The Heart is an important organ in the human body. It is used to pump blood and oxygen in the entire body through the circulatory system, keeping the functionality of the body organized.

IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
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ELECTRONIC DIRECTION INDICATOR USING EMBEDDED SYSTEM

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Abstract - **This project proposes an innovative electronic direction indicator using Bluetooth with dual input (voice and touch) for a user-friendly navigation system. Utilizing an Arduino board and 12V power supply, the LED display shows directions based on voice commands. The system caters to diverse users, accommodating the illiterate or hearing-impaired with LCD screen visuals. Users navigate by vocalizing their destination, with the system displaying directions on the LED board and producing voice output. This multifaceted solution enhances accessibility, providing real-time guidance through both audio and visual cues, making navigation inclusive for various user needs.**

Keywords –Bluetooth, Ardunio interface, Automatic voltage regulator

I. INTRODUCTION

The Electronic Direction Indicator, designed for versatility, proves beneficial in educational institutions, shopping malls, and roadways, streamlining navigation without reliance on traditional road maps. With the prevalence of smartphones and Google Maps, this device offers a portable solution for city and town navigation.

The system efficiently converts 12V to 5V for optimal power supply. In a modern approach, it integrates with Android devices via Bluetooth, eliminating the need for a separate voice recognizer. Users install a mobile application for voice input, expanding accessibility.

The development tools include an emulator for testing Android applications, enhancing the design process. The system's adaptability to diverse environments underscores its utility in various settings, from academic institutions to public spaces.

Developed in Java using the Android SDK, the application's compatibility with Eclipse and the Android Development Tools (ADT) plugin ensures a robust and user-friendly interface.

Overall, this Electronic Direction Indicator stands as a sophisticated, mobile-driven solution, marking a shift from traditional navigation methods to a technologically advanced and accessible approach for users on the go.

II. LITERATURE REVIEW

Electronic direction indicators have become crucial in various environments, including schools, colleges, malls, and roadways, to provide efficient navigation without relying on traditional road maps.

This literature survey explores the existing research and developments in the field, focusing on technologies such as Bluetooth, Arduino boards, voice recognition, and embedded systems.

This system comprises diverse components, including a power supply, GSM modem, IR sensor, coin port, relay, and LCD, which collectively enable controlled dispensing, monitor napkin availability, and facilitate user communication. Central to its functionality is the coin acceptor, responsible for validating inserted coins.

Bluetooth technology has been widely adopted in navigation systems due to its wireless capabilities. Researchers have explored the use of Bluetooth in the unlicensed 2.4 GHz band for reliable communication over short distances. The literature discusses the advantages of Bluetooth, such as its resistance to interference and robust data transmission using frequency hopping.

Arduino, a versatile open-source microcontroller platform, plays a pivotal role in the proposed electronic direction indicator. The literature survey delves into the applications of Arduino boards in designing digital devices and interactive objects.

Discussions include the use of Arduino as a voltage regulator and its integration into navigation systems.

Embedded Based Automatic Board Clean Robot

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Abstract - **The project aims to develop an automated board cleaner to reduce teaching time and increase lecture delivery time. The construction and model were validated using manual and AutoCAD software, using components like whiteboards, dusters, frames, rods, lead screws, servo motors, bush, switch and copper wires, IOT modules, and AI integration. The designing and engineering of an automated board cleaner have been published to incorporate a new advanced mechanism for erasing the board. In earlier projects, the erasing mechanism faced challenges in achieving its full efficiency in terms of reducing erasing time and thereby maximizing lecture length. The explanation for this was that if the lecturer wrote a small word on the paper, the duster would delete the whole board, not just that part. This automation system enhances the quality of smart classrooms and reduces the workload for board users.**

Keywords - IoT, AI, AutoCAD, Servo motors, Bush.

I. INTRODUCTION

In classrooms, meeting rooms, and other educational or professional settings, boards play a crucial role in facilitating communication and learning. However, these boards can quickly become covered in chalk dust, marker residue, or other contaminants, which can affect readability and visual clarity.

Cleaning these boards manually can be time-consuming, and it may not always result in a perfectly clean surface. The Automatic Board Clean Project addresses these challenges by introducing an automated solution that combines various technologies to clean boards effectively. This project leverages the advancements in robotics, sensors, and control systems to create a device capable.

II. LITERATURE REVIEW

It is a technique that is often used to automatically wipe the whiteboard with the help of a duster. We can save time and energy by using this automated process. This project intends to create a boar cleaning system with a motorized wiper to control the total mechanism in a reciprocating motion, with control accomplished by attaching a battery for an external power supply. The duster attachment moves in a reciprocating manner thanks to the lead screw[1].

A whiteboard or dry-erase board is a name for a glossy surface, most commonly colored white, where non-permanent markings can be made. Whiteboards operate analogously to chalkboards in that they allow markings to temporarily adhere to the surface of the board. The popularity of whiteboards increased rapidly in the mid-1980s and they have become a fixture in many offices, meeting rooms, school classrooms, and other work environments[2].

Education is the backbone of a nation. Education comprises teaching and learning. The resources and materials used in teaching are updated along with the teaching and learning techniques. The writing was earlier done on the sand, walls, slates made out of wood, chalkboards, and in recent times on white-boards and electronic boards. Chalk dust scatter causes serious health problems. Because of these reasons, the whiteboard has been widely implemented in many other sectors of human endeavor besides teaching[3].

Due to ghosting on the whiteboard only the surface dust is removed when it is erased conventionally (Ill no is tool works Inc., 2006). Chemically synthesized surfactants are derived from petrochemical sources and these compounds have been extensively developed for large-scale industrial applications, mainly in the area of products such as detergents and surface cleaners[4].

Whiteboards are also similar to chalkboards, allowing rapid marking and erasing of markings on the surface. The use of whiteboards in learning environments can affect learning in many ways, including raising the level of interaction in a classroom, inspiring students,

JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
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Wireless Electronic Notice Board With MultiPoint Receiver Using Radio Frequency

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ABSTRACT

The project "Wireless Electronic Notice Board with Multipoint Receiver Using Radio Frequency" aims to create an efficient and versatile communication system for disseminating information wirelessly. Utilizing radio frequency technology, this system enables seamless transmission of messages to multiple display units, eliminating the need for physical notice boards. The multipoint receiver ensures synchronized and real-time updates across various locations. The wireless nature of the system enhances flexibility, allowing for easy installation and management. This project combines the reliability of radio frequency communication with the convenience of electronic displays, providing an innovative solution for dynamic information sharing in diverse environments

Keywords : *RF module, Raspberry Pi Pico, LED Display units,Keyboard.*

I. INTRODUCTION :

In an era defined by rapid technological advancements,communication plays a pivotal role in our daily lives. To streamline and modernize the process of disseminating information, we introduce the "Wireless Electronic Notice Board with Multipoint Receiver Using Radio Frequency." This innovative project leverages cutting-edge wireless technology to revolutionize the way information is shared and displayed in public spaces, institutions, and organizations.

Traditional notice boards often suffer from limitations like static content, time-consuming updates, and restricted accessibility. Our solution aims to overcome these challenges by utilizing radio frequency communication to enable seamless, real-time updates to a digital notice board. Multiple receivers strategically placed in different locations can access and display information simultaneously, ensuringthat important messages reach their intended audience with efficiency and accuracy. This project not only promotes efficient communication but also reduces paper wastage, making it environmentally friendly. In this age of information, the Wireless Electronic Notice Board with Multipoint Receiver offers a versatile and sustainable solution to enhance communication in diverse settings

II. RELATED WORKS

The Wireless Electronic Notice Board with Multipoint Receiver Using Radio Frequency aims to revolutionize conventional notice board systems by leveraging wireless technology for seamless communication.

SMART WASTE MANAGEMENT SYSTEM USING IOT

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Abstract **– In India , The amount of waste has been increasing due to the increase in human population and urbanization. In cities, the overflowed bin creates an unhygienic environment. Thus degrades the environment, to overcome this situation "Automatic Waste Segregator" is developed to reduce to work for the ragpickers the wastes are segregated by the human beings which leads to health problems to the workers. The proposed system separates the waste into three categories namely "wet, dry and metallic waste". Each of the wastes are detected by the respective sensors and gets segregated inside the bins which is assigned to them the details of amount of waste disposal is updated in the server regularly.**

Keywords **– Segregation, motor, IR sensor, Metal detector, Moisture sensor, pic microcontroller**

I. INTRODUCTION

The abundant increase in population led to the improper waste disposal. Managing the garbage consumes more time and requires a lot of man power. In recent years the waste disposal is becoming a huge cause.The most of common method of waste disposal is unplanned and it is dumped at the landfill sites this method causes ill effects to all living beings. This method can generate liquid leachate and other fungus which pollute the surface and underground water also accelerates harmful dieases which leads to the degradation of a aesthetic value of environment.In India recycling of solid waste is done by the ragpickers who play an important role in this process while doing the ragpickers get affected with many health problems such as skin infections ,respiratory problems the dependent of ragpickers can be reduced if the automatic waste segregation takes place in the dustbin..

The wastes is segregated into basic main streams such as metallic ,dry and wet these waste has a large potential of recycled and reused . even through there are multiple industrial waste segregators present , it is always better to segregate the waste at source itself. The advantage of doing this type of segregation is, there is no need of rag pickers to segregate the waste. In addition to it the segregated waste can be directly sent to the recycling plant, instead of sending the waste to segregation plant and then to recycling plant

Therefore, the Currently there is no such system for the automatic segregation of waste into dry, wet and metallic waste, the main purpose of this project is compact, low cost and user friendly waste segregation system for urban cities to streamline the waste management process.

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II. LITERATURE REVIEW

The project centers on the explores the implementation of an automated wastage separation system, advancing the efficiency of waste management through IoT technology.

This system comprises diverse components, including a power supply, GSM modem, IR sensor, coin port, relay, and LCD, which collectively enable controlled dispensing, monitor napkin availability, and facilitate user communication. Central to its functionality is the coin acceptor, responsible for validating inserted coins.

Studies discuss the ESP32's capabilities for sensor integration, real-time data processing, and wireless communication, enabling efficient identification and segregation of different types of waste.

The reviewed literature emphasizes the importance of accurate sensing technologies and robust algorithms to optimize waste separation, contributing to sustainable and environmentally friendly waste disposal practices

The Additionally, researchers have addressed challenges such as power consumption, scalability, and system reliability, providing insights into potential improvements and future directions for ESP32-based automatic wastage separation syst Some proposed smart garbage management system using IR sensor, microcontroller and Wi-Fi module. This system assured the cleaning of dustbins soon when the garbage level reached its maximum. If the dustbin was not cleaned in specific time, then the records were sent to the higher authority who took appropriate action against the concerned contractor. This system also helped to monitor the fake reports and hence helped to reduce the corruption in the overall management system.

IJCRT.ORG ISSN : 2320-2882

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SIGN LANGUAGE TO SPEECH CONVERSION USING ARDUINO

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Abstract: This innovative initiative in India represents a significant leap forward in addressing communication barriers for the deaf population. The glove-based device, integrating flex sensors and an Arduino Nano control unit, facilitates the recognition of intricate sign language gestures. The system's ability to convert these gestures into text, displayed on an LCD, demonstrates a tangible bridge between sign language and written communication. The wireless transmission of information to a PC or cellular phone for subsequent text-to-speech conversion underscores the adaptability and potential widespread use of the technology. Moreover, the ongoing prototype development indicates a commitment to expanding the system's capabilities beyond basic alphabets and numeric characters. This forward-looking approach suggests a vision for a comprehensive communication tool that can accommodate a broader range of sign language expressions and linguistic nuances. Additionally, the initiative's impact extends beyond individual communication, potentially influencing societal perceptions and inclusivity. The incorporation of machine learning and continuous improvement in gesture recognition algorithms could further enhance the system's accuracy, promoting a more seamless and natural interaction between the deaf community and the larger population. Overall, this groundbreaking initiative not only addresses immediate communication challenges but also sets the stage for a more inclusive and technologically advanced future for individuals with hearing impairments in India.

Keywords – Sign language, Arduino, ASL, Sound Glove, Dumb, Gesture recognition, Deaf, Flex.

IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

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DIVERSE IOT BASED GADGETS TO UPDATE A MODERATE CONDITION OF FARMERS IN INDIA

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Abstract: Under the vast Indian sky, where the rhythm of seasons dictates the farmer's dance with the land, a new melody is emerging. It's a symphony of interconnected sensors, automated systems, and data-driven insights, orchestrated by the Internet of Things (IoT). This transformative technology promises to uplift the moderate conditions of millions of farmers, addressing the age-old challenges that have long plagued Indian agriculture. Imagine fields where soil sensors whisper secrets of nutrient deficiencies, their data relayed to smartphones, empowering farmers to make precise fertilizer decisions. Envision water stress woes fading away as smart irrigation systems, guided by real-time weather data, deliver life-giving drops directly to thirsty roots, optimizing water usage and maximizing yields. Picture crops flourishing under the watchful eye of IoT-powered drones, their high-resolution images revealing pest infestations or diseases before they can wreak havoc. This is not a futuristic fantasy, but the very real potential that diverse IoT gadgets hold for Indian agriculture. These marvels of technology go beyond mere data collection. They are instruments of empowerment, equipping farmers with knowledge that was once out of reach. Real-time weather updates gleaned from connected weather stations help farmers prepare for impending storms or adjust sowing schedules based on changing precipitation patterns. Market price information streamed directly to their mobile devices allows them to navigate the complexities of fluctuating demand and secure better returns for their produce. The symphony extends beyond individual farms, connecting farmers to experts and agricultural communities through online platforms, fostering knowledge sharing and collaborative problem-solving. However, the adoption of this transformative technology is not without its challenges. Limited access to the internet, particularly in remote rural areas, can act as a roadblock. The initial cost of some gadgets might pose a hurdle for resource-constrained farmers. Overcoming these challenges requires a multi-pronged approach. Government initiatives like subsidizing IoT devices and establishing digital infrastructure in rural areas can play a crucial role. Collaborations between private companies, NGOs, and research institutions can develop

IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

MALICIOUS NODE DETECTION

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ABSTRACT

There are a lot of inexpensive, tiny sensor nodes in Wireless Sensor Networks (WSN) that can send data. limited memory, limited processing power, low power supply, and short communication range are the limitations of wireless sensor nodes. Due to these limitations, this network is susceptible to numerous attacks, particularly the bwdos_sinkhole_attack attack. A type of attack known as a "bwdos sinkhole attack" involves the hacked node attempting to draw in network traffic by promoting its bogus routing update. A bwdos_sinkhole_attack attack has the ability to initiate spoofing, selective sharing, and removing or modifying routing data, among other impacts. It might also be used to send fictitious data to the base station. In this paper, time-varying in wireless sensor networks, bwdos_sinkhole_attack attack detection technique based on snapshot-based Neighbour-controlled Traffic-centric (TSNT) technology is used to address these issues and enhance service quality. The base station monitors the traffic using the TSNT algorithm, and it keeps track of the list of sensor devices the packet has passed through over time. The presence of bwdos_sinkhole_attack is identified from this list using a snapshot of the WSN captured at different times. In parallel, the base station receives assistance from a reliable outside source within the WSN network to identify the bwdos_sinkhole_attack attack through message digest hash-based data integrity verification. The experimental outcome demonstrates that, in comparison to other current techniques, the suggested method efficiently detects bwdos_sinkhole_attack.

Keywords: Network vulnerability, Bwdos_sinkhole_attack attack, Fake data, Dropping, Service quality

1.INTRODUCTION

One of the most well-known types of networks is the wireless sensor network (WSN), which is utilized in a variety of applications, including industrial surveillance, environmental remote sensing, health monitoring, and area surveillance. It is possible to use the WSN in an unsecure, hostile work environment. sensors that monitor the surroundings and send the data they collect back to the base station. Due to their inherent characteristics, WSNs are vulnerable to many security threats. Such communication encourages data leaks, which lead to security lapses. As such, the primary difficulty in WSNs continues to be security. Many sensor networks have relatively basic routing protocols, which makes them vulnerable to network attacks most of the time. The wormhole attack, black hole assault, hello flood attack, bwdos sinkhole attack, and selective forwarding attack are a some of the WSN's vulnerable security vulnerabilities.

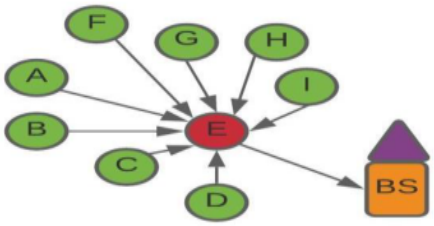

Fig. 1: Bwdos_sinkhole_attack attack in Wireless Sensor Network

An attacker gains access to a device on the network and uses it to launch an attack in the bwdos sinkhole attack. The hacked device attempts to draw all traffic from the closest nodes based on the routing metric used in the routing protocol. The hacked equipment is equipped with a strong radio transmitter capable of taking down a large wide area network. Unaware of this, the adjacent gadget will trick with these devices. A bwdos_sinkhole_attack attack poses a major threat to higher-layer applications by preventing the base station from getting accurate and comprehensive sensed data. Because it is difficult to verify routing information supplied by a device, Bwdos sinkhole attacks are challenging to defend against. The black hole, Sybil, flood, wormhole, and selective forwarding attacks are all carried out by a Bwdos sinkhole assault once it has gained access to a network. Many methods

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 1, June 2023

Review on Linear and Non - Linear Filter

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Abstract: *Image denoising is the operation of the image data to produce a visually high quality image. The existing or current denoising algorithms or approaches are filtering approach, multifractal approach and wavelet based approach. Different noise models include noise as additive and multiplicative type. They include Gaussian noise, salt and pepper noise (impulsive noise), Brownian noise and speckle noise. Noise arises due to various factors like bit error rate, speed, dead pixels. Denoising algorithm is application dependent i.e. the application of a specific filter is beneficial against a specific kind of noise. The filtering approach has been proved to be the best when the image is corrupted with salt and pepper noise. In the filtering approach Median filter provides best result against impulsive noise i.e. salt and pepper noise. The wavelet based approach finds applications in denoising images corrupted with Gaussian noise. If the noisecharacteristics are complex, then multifractal approach canbe used.*

Keywords: Image denoising, mean filter, adaptive filter, median filter, Moving Window.

I. INTRODUCTION

A very large portion of digital image processing is devoted to image restoration. This includes research in algorithm development and routine goal oriented image processing. Image restoration is the removal or reduction of degradations that are incurred while the image is being obtained. Degradation [1] comes from blurring [1] as well as noise due to photometric and electronic sources. Blurring is a form of bandwidth contraction of the image caused by the imperfect image formation process such as relative motion between the camera and the original scene or by an optical system that is out of focus. A noise [2] is introduced in the transmission medium due to noisy channel, errors during the measurement process and during sampling [2] and quantization [2] of the data for digital storage (in the form of arrays).

Representation of digital image:

A 2-dimensional digital image can be represented as a 2- dimensional array of data s(x, y), where (x, y) represent the pixel [2] position. The pixel value corresponds to the brightness of the image at position (x, y). Some of the most frequently used image types are binary, gray-scale and color images. Binary images [14] are the simplest type of images and can take only two discrete values, black and white. Black is represented with the value "0" while white with "1". They are also referred to as 1 bit/pixel images. Gray-scale images [14] are known as monochrome or one-color images. They represent no color information but represent the brightness or intensity of the image. This image contains 8 bits per pixel data, which means it can have up to 256 (0 to 255) different brightness levels. A "0" represents black and "255" denotes white. As they contain the intensity information, they are also referred to as intensity images.

Color images

[14] are called as three band monochrome images, in which each band is of a different color. Each band provides the brightness or intensity information of the corresponding spectral band. Normal color images are red, green and blue images and are also referred to as RGB images. This is 24 bits per pixel image.

Denoising Concept

The image s(x, y) is blurred by a linear operation and noise n(x, y) is added to make the degraded image w(x, y). w(x, y) is then convolved with the restoration procedure g(x, y) to generate the restored image z(x, y).

IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A NOVEL ALGORITHM FOR RELIABLE CRIME RECORD TRANSMISSION

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Abstract:

In today's digital age, ensuring sensitive information's security and confidentiality is paramount. Steganography, a subfield of information security, offers a unique approach to concealing data within innocuous carriers to protect it from prying eyes. This paper presents a novel technique for hiding encrypted text within digital images through the art of steganography. The proposed method begins with the encryption of the plaintext using a secure cryptographic algorithm, ensuring that the original message is transformed into an unintelligible form. Subsequently, the ciphertext is embedded within an image file, carefully altering the pixel values to accommodate the hidden data while preserving the visual quality of the image. The choice of the image as a carrier medium is advantageous, as it leverages the ubiquity of images in digital communication, making the concealed information less conspicuous. An application used for this approach is NetBeans IDE an integrated development environment that supports application development, it highlights source code syntactically and semantically. Furthermore, our approach provides an additional layer of security by using steganography to hide the encrypted data within the cover file, making it difficult for unauthorized parties to detect the presence of sensitive data.

Keywords:

Confidentiality, Integrity, Encryption, Steganography, Symmetric key, Netbeans, Heidi SQL, Decryption, Secret key, User Interface.

1. INTRODUCTION

In our increasingly interconnected world, the safeguarding of sensitive critical actual as information has never been more than as individuals, organizations, and governments rely on digital means to communicate and store their data, the need for robust security measures has grown exponentially. A mid this digital landscape, steganography emerges as a discreet yet powerful tool in the arsenal of information security. It offers an ingenious approach to cloak valuable data within the seemingly innocuous facade of everyday digital content, shielding it from the prying eyes of potential adversaries. At its core, this method combines the strengths of encryption, which renders plaintext into an indecipherable form, and steganography, which expertly hides this encrypted treasure within the realm of digital imagery. The paper's approach is meticulous. It commences with the secure encryption of the plaintext using a robust cryptographic algorithm, ensuring that the original message undergoes a metamorphosis into a form that defies comprehension. Subsequently, the ciphertext is strategically embedded within an image file, all the while preserving the visual integrity of the image. ` The choice of images as the carrier medium holds the advantage of ubiquity in digital communication, rendering the concealed information inconspicuous and thus, less susceptible to unwanted attention. Balancing the scale between security and imperceptibility, this research delves into a variety of steganographic techniques, from the subtle embedding of data in the Least Significant Bit (LSB) to the employment of frequency domain approaches. The evaluation of the proposed method is grounded in empirical metrics, such as the Peak Signal-to-Noise Ratio (PSNR) and the Structural Similarity Index (SSI). These metrics ensure that the steganographic process maintains the quality of the image, reducing any noticeable degradation.The results of this study demonstrate not only the successful concealment of encrypted text within digital images but also underscore the technique's potential for safeguarding sensitive information, particularly in the realms of secure communication and data protection.

Nonetheless, as with any technological advancement, challenges and limitations persist. This paper devotes attention to these obstacles and considers the countermeasures that adversaries may employ. Furthermore, it delves into the ethical considerations surrounding the deployment of steganography, emphasizing the need for its responsible and lawful applications.

2. RELATED WORK

Poonams.Garg, Rajkumar Yadav etal,…[1] In the fast-paced digital age we find ourselves in today, the need for secure communication and data protection is more critical than ever. In this context, the field of image steganography takes center stage as a powerful tool in safeguarding sensitive information. This review paper is dedicated to providing an in-depth exploration of image steganography, shedding light on the many approaches employed to covertly hide data within digital images. Its primary objective is to offer readers valuable insights and background information on this

J Opt
https://doi.org/10.1007/s12596-023-01503-4

RESEARCH ARTICLE

Optoelectronic devices based on configurable hysteresis of Schmitt trigger circuit control with the employment of CMOS technology

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Received: 9 September 2023 / Accepted: 21 October 2023

Abstract This study has clarified the optoelectronic devices based on configurable hysteresis of Schmitt trigger circuit control with the employment of CMOS technology. Schmitt trigger (ST) is an electronics circuit, widely used in a sensor network to detect a signal with low amplitude in a noisy environment. It converts a variable input signal to a constant output level. In contrast to the comparator, an ST offers two independent switching voltages with positive feedback that enhances the depth of the switching threshold. Hysteresis width is an inbuilt feature of the trigger circuit, removing the irregularities or noise near the threshold region and shaping it into smooth output. The hysteresis width can be adjusted by a suitable variation in the aspect ratio of input and feedback transistors. In this work, conventional ST architecture modifies by configuring the series and/or parallel connection of n-channel and p-channel MOS devices to adjust the hysteresis voltage. The simulation result is obtained with Cadence Spectra with BSIM3V3 device models at 90 nm CMOS technology, and hysteresis width falls by reducing the feedback ratio of the increase with feedback ratio.

Keywords Schmitt trigger · Hysteresis · Process corner · Switching voltage · PVT · In-memory-computation

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International Journal of Scientific Research in Science and Technology
Available online at : www.ijsrst.com
Print ISSN: 2395-6011 | Online ISSN: 2395-602X
doi : https://doi.org/10.32628/IJSRST

Implementation of Automatic Vehicle License Plate Detection Using Python, Opencv and Tesseract OCR

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ARTICLEINFO

Article History:

Accepted: 01 Jan 2024
Published: 12 Jan 2024

Publication Issue :
Volume 11, Issue 1
January-February-2024
Page Number :
108-117

ABSTRACT

The rapid growth of vehicle populations necessitates efficient methods for automating tasks related to vehicle identification and surveillance. This paper presents a novel approach for automatic license plate detection from live input video streams using the OpenCV computer vision library and the Tesseract Optical Character Recognition (OCR) engine. The proposed system aims to enhance the accuracy and reliability of license plate recognition while catering to real-time processing requirements. The methodology involves a multi-step process. Initially, frames are captured from the live input video feed, and then preprocessed using OpenCV techniques such as resizing, noise reduction, and edge detection. Subsequently, region-of-interest (ROI) extraction is performed to isolate the candidate license plate regions within each frame. The extracted ROIs are further refined using contour analysis and geometric properties to improve the accuracy of license plate detection. Following the detection phase, the Tesseract OCR engine is employed to perform character recognition on the detected license plate regions. The system's architecture facilitates seamless integration between OpenCV and Tesseract, allowing for efficient data exchange and processing. The recognized characters are then validated using post-processing techniques to ensure accurate license plate number extraction. Experimental results on a diverse set of live input video scenarios demonstrate the effectiveness of the proposed system in accurately detecting and recognizing license plates in real time.

Keywords: OCR, Tessearact, Number plate, Vehicle, ALPR etc.

Journal of Intelligent Systems and Internet of Things
Vol. 11, No. 02, PP. 97-110, 2024
DOI: https://doi.org/10.54216/JISIoT.110209

Enhanced Jaya Optimization Algorithm with Deep Learning Assisted Oral Cancer Diagnosis on IoT Healthcare Systems

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Abstract

Recently, healthcare systems integrate the power of deep learning (DL) models with the connectivity and data processing capabilities of the Internet of Things (IoT) to enhance the early recognition and diagnosis of disease. Oral cancer diagnosis comprises the detection of cancerous or pre-cancerous abrasions in the oral cavity. Timely identification is essential for successful treatment and enhanced prognosis. Here is an overview of the key aspects of oral cancer diagnosis. One potential benefit of utilizing DL for oral cancer detection is that it analyses huge counts of data fast and accurately, and it could not need clear programming of the rules for recognizing abnormalities. This can create the procedure of detecting oral cancer more effective and efficient. Thus, the study presents an Enhanced Jaya Optimization Algorithm with Deep Learning Based Oral Cancer Classification (EJOADL-OCC) method. The presented EJOADL-OCC method aims to classify and detect the existence of oral cancer accurately and effectively. To accomplish this, the presented EJOADL-OCC method initially exploits median filtering for the noise elimination. Next, the feature vector generation process is performed by the residual network (ResNetv2) model with EJOA as a hyperparameter optimizer. For accurate classification of oral cancer, a continuously restricted Boltzmann machine with a deep belief network (CRBM-DBN) model. The simulated validation of the EJOADL-OCC algorithm is tested by the series of simulations and the outcome demonstrates its supremacy over present DL approaches.

Received: August 23, 2023, Revised: December 17, 2023 Accepted: January 29, 2024

Keywords: Healthcare; Oral cancer; Deep learning; Computer-assisted diagnoses; Internet of Things; Jaya Optimization Algorithm; Medical imaging

Journal of Intelligent Systems and Internet of Things
Vol. 12, No. 01, PP. 70-83, 2024
DOI: https://doi.org/10.54216/JISIoT.120106

Automated EEG based Emotion Detection using Bonobo Optimizer with Deep Learning on Human Computer Interaction

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Abstract

Recently, Emotion detection utilizing EEG signals develops popularity in domain of Human-Computer Interaction (HCI). EEG (electroencephalography) is a non-invasive approach, which processes electrical action from the brain through electrodes located in the scalp. An emotion recognition approach could not only be significant for healthy people among them disabled persons for detecting emotional changes and is utilized for different applications. It is significant to realize that emotion recognition in EEG indications is a difficult task owing to difficult and subjective nature of emotions. In recent times, Machine learning (ML) algorithms like Random Forests or Support Vector Machines (SVM) and Deep Learning (DL) systems namely Recurrent Neural Network (RNN) or Convolutional Neural Network (CNN) are trained on EEG feature extracted and connected emotional labels for classifying the user emotional state. This study presents an Automated EEG-based Emotion Detection using Bonobo Optimizer with Deep Learning (AEEGED-BODL) technique on HCI applications. The goal of the study is to analyze the EEG signals for the classification of several kinds of emotions in HCI applications. To achieve this, the AEEGED-BODL technique uses Higuchi fractal dimension (HFD) approach for extracting features in the EEG signals. Besides, the AEEGED-BODL technique makes use of the quasi-recurrent neural network (QRNN) approach for the detection and classification of distinct kinds of emotions. Furthermore, the BO system was demoralized for optimum hyperparameter selection of QRNN model, which helps in attaining an improved detection rate. The simulation validation of AEEGED-BODL algorithm was simulated on EEG signal database. The comprehensive result stated best outcome of the AEEGED-BODL algorithm over other recent approaches

Received: August 22, 2023 Revised: November 18, 2023 Accepted: February 23, 2024

Keywords: Brain-Computer Interface; Emotion Recognition; Human-Computer Interaction; EEG signals; Deep learning

JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Proactive Anti Agent against Ransomware Threats Using RanGAN and Hash Conceal

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Abstract: Ransomware attacks have become a pervasive and evolving threat in the digital landscape, demanding innovative defensive strategies to protect organizations and individuals. Ransomware creators continually refine their tactics, rendering traditional signature based detection methods ineffective. Additionally, ransomware is often delivered through a variety of vectors including phishing emails, malicious attachments and compromised websites. Detecting and thwarting these diverse delivery methods presents a significant challenge. This proposed method introduces a proactive defense strategy against ransomware threats, leveraging "RanGAN (*Ransomware Generative Adversarial Network*)" for early detection and "Hash Conceal" for data protection. RanGAN employs advanced machine learning to detect ransomware behavior patterns in real time, while Hash Conceal secures critical data from malicious encryption. So we can provide a robust defense, ensuring rapid threat identification and minimizing data loss. By using a real time ransomware sample, the experiment result shows that our proposed method protects the files from the attack in an effective manner.

Index Terms- Ransomware, Cybersecurity, Defense mechanism, Machine Learning

I. INTRODUCTION

Ransomware is a malware designed to hack files on the computer or other devices of a user or organization. By demanding a payment to user for rescue the file and cracking the files using decryption key, cyber bushwhackers place association in a position where paying the rescue is the easiest and cheapest way to recapture access to their files. Ransomware attacks are via malicious links or attachments in emails having 45% and 21% of attacks are from a remote attack on servers, according to the Sophos survey [4]. The remaining attacks are through misconfigured systems and USB devices. Attackers continually come out with novel techniques to get around systems for detection. Although the effectiveness of detection methods have three abecedarian boundaries, as understood by studies suggesting detecting mechanism or researching the action of ransomware:

1. The efficiency of static and dynamic analysis techniques decrease with the ongoing development of evasion techniques through malware developers [11].
2. File loss may occur from behavior based detection methods until detection is accomplished [12].
3. The detection mechanism may become ineffective, if the monitoring process is interrupted [13].

Previous ML algorithms and other methods for ransomware detection, classification and prevention encountered several challenges and problems. One of the foremost issues has been the imbalance in the dataset used for training and testing these models. Imbalance datasets made it challenging for algorithms to learn effective patterns and often resulted in biased models. This project is to develop and implement a proactive defensive strategy against ransomware threats using a combination of RanGAN and Hash Conceal. The primary goal is to create a robust and innovative approach to prevent, detect and mitigate ransomware attacks effectively, including unknown and evolving variants, while also enhancing data protection and privacy.

II. LITERATURE REVIEW

Ransomware detection based related works are mostly on either static or dynamic analysis or a few hybrid analyses, which consist both static and dynamic. Here we discuss some of those related works.

"Smart Sensor Infrastructure For Environmental Air Quality Monitoring"

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***Abstract*–**In India, the rapid urbanization and industrialization of modern society have led to an alarming increase in air pollution levels, posing a severe threat to human health and the environment. In response to this critical issue, this project introduces an innovative Smart Sensor Infrastructure for Environmental Air Quality Monitoring. Our sensor network employs a diverse range of sensors, including particulate matter (PM), volatile organic compounds (VOCs), carbon monoxide, and nitrogen dioxide(NO2)detectors.

***Keywords*–**Particulate matter, Volatile organic compounds,

I. INTRODUCTION

The Internet of Things has revolutionized the way we interact with our environment, and one critical application is the development of air pollution monitoring systems. With the alarming rise in air pollution levels globally, there is a pressing need for efficient and real-time monitoring solutions. This project aims to leverage IoT technology to create a robust air pollution monitoring system that can provide accurate data on various pollutants. By deploying a network of smart sensors across different locations, the system will collect real-time information on pollutants such as particulate matter, carbon monoxide, and ozone. The data will be transmitted wirelessly to a central server, allowing authorities and the public to access timely and comprehensive information.

This innovative approach not only enhances the monitoring process but also facilitates quicker response mechanisms to mitigate pollution impacts. Through the integration of IoT, this project strives to contribute to a healthier and more sustainable future by promoting awareness and informed decision- making

Furthermore, the IoT-based air pollution monitoring system offers scalability, allowing for the expansion of the sensor network to cover a wide geographical area. The sensors will not only capture pollutants but also provide environmental parameters like temperature and humidity, aiding in a more holistic understanding of air quality dynamics. The real-time nature of the system ensures that sudden spikes in pollution can be promptly identified and addressed. Additionally, the collected data can be analyzed over time to identify trends, contributing valuable insights for long-term environmental planning and policy-making.

This project aligns with the global commitment to sustainable development and environmental stewardship, showcasing the power of technology in addressing contemporary challenges. By fostering a data-driven approach to air quality management, this IoT-based solution holds the potential to significantly improve public health outcomes and create a more resilient and environmentally conscious society.

II. LITERATUREREVIEW

The causes of pollution measured carbon dioxide gas carbon monoxide gas, pollutants, Particulate Matter, and Ground Level gas. The Internet of Things permits objects to be detected or dominant. Things in the IoT refer to the creation of devices like vehicles with intrinsic sensors, etc. The development of a pollution observance system wills facilitate to control of and live pollution-connected parameters.

IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

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CHRONIC HEART DISEASE PREDICTION USING ARTIFICIAL INTELLIGENCE

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Abstract-The chronic heart disease finder (CHDF) is an AI-based system designed to assist healthcare professionals in the early detection and diagnosis of chronic heart diseases. By analyzing patient data such as medical history, symptoms, and diagnostic test results, the CHDF aims to accurately identify individuals at risk of or already affected by chronic heart conditions. The system leverages machine learning algorithms to process and interpret vast amounts of medical information, offering quick and reliable insights to facilitate timely intervention and personalized treatment plans. Ultimately, the CHDF strives to improve patient outcomes by enabling healthcare providers to identify, monitor, and manage chronic heart diseases more effectively through the power of artificial intelligence.

Keywords—Heart, AI, K Neighbors, Risk Factors, Algorithms

I. INTRODUCTION

Chronic heart disease, also known as coronary artery disease, is a pervasive and pressing health concern in real time. As a leading cause of morbidity and mortality worldwide, it poses a significant challenge to individuals, healthcare systems, and society as a whole. In real time, the prevalence of chronic heart disease continues to rise, driven by factors such as sedentary lifestyles, unhealthy dietary habits, and an aging population. The impact of chronic heart disease is felt daily, affecting the lives of countless individuals and placing a substantial burden on healthcare resources.

In real time, the complexities of chronic heart disease extend beyond the individual level to encompass broader public health, diagnostic, preventive, and management considerations From timely diagnosis and personalized treatment strategies to long-term disease management and resource allocation, chronic heart disease demands real-time attention and innovative solutions.

Real-time efforts to address chronic heart disease must therefore integrate cutting-edge medical advancements, technological innovations, and proactive public health initiatives to effectively combat this pervasive and evolving health challenge. By understanding the real-time dynamics of chronic heart disease and adapting interventions to the current landscape, we can work towards mitigating its impact and improving outcomes for individuals and communities.

II. LITERATURE REVIEW

With growing development in the field of medical science alongside machine learning various experiments and researches has been carried out in these recent years releasing the relevant significant papers.

[1] Purushottam, et, al proposed a paper “Efficient Heart Disease Prediction System “using hill climbing and decision tree algorithms. They used Cleveland dataset and preprocessing of data is performed before using classification algorithms. The Knowledge Extraction is done based on Evolutionary Learning (KEEL), an opensource data mining tool that fills the missing values in the data set. A decision tree follows top-down order. For each actual node selected by hill-climbing algorithm a node is selected by a test at each level. The parameters and their values used are confidence. Its minimum confidence value is 0.25. The accuracy of the system is about
86.7%.

IJRAR.ORG E-ISSN: 2348-1269, P-ISSN: 2349-5138

INTERNATIONAL JOURNAL OF RESEARCH AND ANALYTICAL REVIEWS (IJRAR) | IJRAR.ORG

An International Open Access, Peer-reviewed, Refereed Journal

OPTIMUM HYBRID ENERGY SYSTEM USING MICROCONTROLLER

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Abstract : In the coming years, ships will rely on hybrid power management systems that combine fuel cells (FCs) and batteries as their driving power sources. These systems are composed of an FC, a converter, an inverter, and a battery. The FC is responsible for providing a consistent supply of energy, while the battery plays a crucial role in supplying dynamic energy during the ship's start-up phase, ensuring smooth operations. Additionally, the battery is capable of absorbing or providing peak or dynamic power when the load fluctuates and the FC cannot respond instantaneously. Due to the wide voltage range of the FC, it cannot be directly connected to the inverter. To address this, our paper proposes a power management strategy and design process that incorporates a unidirectional converter, a bidirectional converter, and an inverter. This approach takes into account the ship's operating conditions as well as the power requirements of the FC and the battery. The experimental results presented in this study have been validated through simulation.

Index Terms : Fuel cell- battery -Microcontroller- AC-DC converters- Inverters.

I. INTRODUCTION

This paper presents a novel power management scheme designed for a hybrid power system that utilizes both a fuel cell (FC) and a battery. The hybrid power system is specifically designed for small ships and comprises an FC, converters, an inverter, and a battery to drive the propulsion system. While FCs have certain limitations in terms of energy storage, response capability, cold start, and voltage fluctuation under peak load conditions, these challenges can be overcome by integrating auxiliary energy systems such as batteries or ultra-capacitors. However, battery systems lack the ability to control their charging and discharging current. To address this issue, the installation of a converter between a DC bus and the battery is necessary to regulate the charging/discharging current. The hybrid power system being proposed consists of two power sources: a fuel cell (FC) and a battery system serving as an auxiliary source. The battery system is directly connected in parallel to the DC bus, with its primary purpose being to boost the peak power capacity and provide power to the load during a cold start. Both the FC and the battery system are linked to the same DC bus using an appropriate unidirectional converter (UDC) and bidirectional converter (BDC), respectively.

International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET)

| e-ISSN: 2319-8753, p-ISSN: 2347-6710| www.ijirset.com | Impact Factor: 8.423| A Monthly Peer Reviewed & Referred Journal |

|| Volume 13, Issue 4, April 2024 ||

| DOI:10.15680/IJIRSET.2024.1304277 |

Wirelessly Connecting the Final Stretch: Lora's Last Mile Impact on IoT

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ABSTRACT: Savvy, High-power and remote network are among the critical contemplations for interconnecting the end-hubs or end-gadgets in the Web of Things (IoT) applications. While remote advancements, for example, WiFi, Bluetooth, Zigbee have been well known options for last-mile availability, they anyway confine the distance between the conveying elements. existing of One of the principal downsides in taking on EV vehicles is the last mile availability issue. There is dependably an opportunity that the client/rider might get abandoned without EV charge and no EV charging stations close by. Determined to settle such an exigency, this paper proposes ause of extra organization gear like repeaters or higher transmission power would expand the scope of these remote correspondence interfaces, the ensuing expansion in the expense has been a basic justification for not promptly utilizing them in WAN based IoT applications like Savvy Urban communities. The rise of the LoRa (Long Reach) standard and the Low Power Wide Region Organization (LPWAN) innovation, lately, have anyway enlarged the extension and furthermore expanded the sending situations of the IoT end-hubs including the feasibility of the battery-controlled and non-fixed ones. One more meaning of these new lengthy distancelow-power interconnect guidelines is the strengthening for more extensive and autonomous Machine to Foundation (M2I) and Machine to Machine (M2M) correspondence for the end-hubs.

KEYWORD: LoRa and LoRaWAN, Last Mile Connectivity, IoT,Mobile Nodes, Wireless Communication.

I. INTRODUCTION

In the quickly growing scene of Web of Things (IoT) organizations, accomplishing consistent network across all endpoints presents a critical test. Conventional remote advancements like WiFi, Bluetooth, and Zigbee have been instrumental in empowering correspondence between IoT gadgets. Nonetheless, they frequently miss the mark with regards to connecting the last mile hole, especially in remote or difficult to-arrive at regions. The requirement for extra organization foundation, for example, repeaters or higher sign transmission power, has impeded the broad reception of these advancements in wide-region IoT applications like Shrewd Urban communities. Enter LoRa (Long Reach) innovation and Low Power Wide Region Organization (LPWAN) arrangements, which have arisen as huge advantages in the domain of IoT network. Offering unrivaled long-range correspondence abilities combined with low power utilization, LoRa and LPWAN innovations have reformed how IoT frameworks are planned and conveyed. By disposing of the requirement for expensive foundation upgrades, they give a financially savvy and versatile answer for remotely associating the last stretch in IoT organizations. This paper investigates the groundbreaking effect of LoRa's keep going mile network on IoT framework engineering. We dive into the reconciliation of LoRa innovation into existing IoT organizations and its suggestions for stretching out network to beforehand difficult to reach regions. Through an exhaustive assessment of framework engineering, we feature the key parts, work processes, and advantages of utilizing LoRa innovation in IoT organizations. Furthermore, we examine genuine applications and use situations where LoRa's long-range correspondence capacities have had a massive effect, preparing for more brilliant, more associated conditions. Go along with us on an excursion to investigate how LoRa's last mile influence is reshaping the scene of IoT framework design, opening additional opportunities for network and development in different businesses and applications.

This paper dives into the groundbreaking effect of LoRa's keep going mile network on IoT framework design. We investigate how the combination of LoRa innovation into existing or new IoT arrangements can stretch out availability to beforehand distant regions, enabling associations to open additional opportunities and drive development. Through a

A Comprehensive Survey of Performance Analysis in Heterogeneous Networks Using OPNET Modeler

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ABSTRACT: Wireless networking stands out as an appealing solution owing to its adaptability, mobility, and hassle-free installation, especially crucial in preserving the architectural integrity of historically significant buildings. Technologies like WLAN, WIMAX, and UMTS are experiencing significant growth, necessitating robust support for multimedia applications. The popularity of wireless networks has soared in recent years, spanning from digital cellular telephony to satellite broadcasting. As the demand for wireless services continues to rise, users now anticipate Quality of Service (QoS) and performance on par with fixed networks. Moreover, wireless networks offer seamless connectivity, accommodating the fluid movement of users across different locations. However, meeting QoS requirements such as optimal throughput and minimal access delay poses notable challenges.

Keywords: WLAN, WIMAX, UMTS, Quality of services.

I. INTRODUCTION

Wireless communication, utilizing radio waves to transmit voice and data, enables seamless connectivity without physical network connections. This technology has emerged as a pivotal means of connecting people globally. Cellular systems, experiencing exponential growth, boast approximately two billion users worldwide. Evaluating the performance of wireless networks like WLAN, WiMAX, and UMTS has been a primary focus, with applications ranging from voice communication to video conferencing and FTP usage. The demand for robust network access capable of swiftly supporting various tasks has escalated. Critical parameters such as MOS (Mean Opinion Score), end-to-end delay, jitter, and packet delay variation have been analyzed to ensure optimal network performance.

WLAN:

WLANs have transformed the way individuals utilize their computers for communication. By eliminating the need for physical wires, WLANs offer convenient access to network services. A wireless LAN, or WLAN, connects two or more computers without the use of cables. This enables users to move freely within a wide coverage area while remaining connected to the network. The popularity of wireless stems from its simplicity of installation and mobility. Wireless networks function similarly to wired Ethernet, facilitating the transfer of information from source to destination. The data transfer speed of WLAN, or Wireless Local Area Network, varies depending on several factors such as the specific technology being used (e.g., 802.11a/b/g/n/ac/ax), the frequency band (2.4 GHz or 5 GHz), the distance between the device and the access point, the number of users connected to the network, and environmental interference.

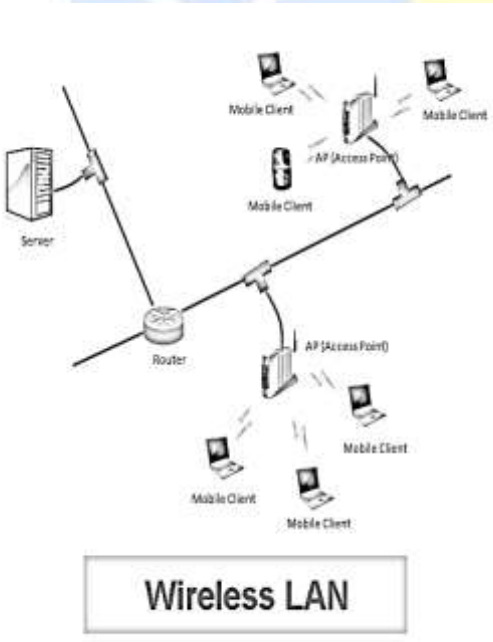

Fig No. 1.1 WLAN

IJRAR.ORG E-ISSN: 2348-1269, P-ISSN: 2349-5138

INTERNATIONAL JOURNAL OF RESEARCH AND ANALYTICAL REVIEWS (IJRAR) | IJRAR.ORG

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A Survey on Comparative Study of Network Topologies in Wireless Sensor Networks

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Abstract : Mobile Wireless Sensor Networks are now widely used in many applications and are regarded as a new developing research technology in the distributed computing environment. A mobile wireless sensor network is typically described as a group of sensor nodes arranged into a cooperative network that can sense and regulate the environment while facilitating human communication. Because sensor nodes can be installed in any environment and can quickly adapt to changes in the network topology, MWSNs are more adaptable than WSNs. Network topology, which specifies how network elements are directly associated with one another and hence defines how information may flow, is the theoretical underpinning and implementation basis of fault-tolerant redundancy and elastic scaling in the data center. Applications can range from inventory tracking to tactical military surveillance to environmental monitoring, depending on the topologies. A survey based on various network topologies, which are one of the branches in the taxonomy of mobile wireless sensor networks, can be conducted in this paper. The comparison between those topologies has been listed based on their adaptability and processing power in the current computing environment.

IndexTerms **- MWSN, Network topologies - types analysis.**

I. INTRODUCTION

MWSN is a key part of monitoring and collecting data from fields that can sensed.

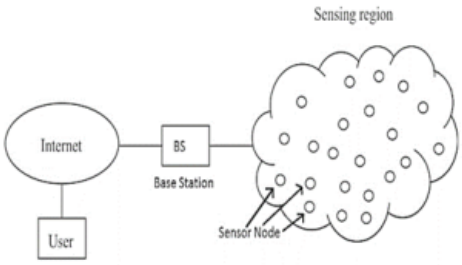

Fig1 Systematic diagram of MWSN

Fig 1represents Mobile sinks (MS) and mobile sensor nodes (MSN) are both moving parts of the MWSN. You can make these sensors move by attaching them to things that move, such as animals or vehicles, the job of the mobile sink node to collect data from other nodes and send it to the host computer.

The most important thing about how well a network works is how it is set up, which is called its topology. It controls how data moves from one node to another.The word "topology" comes from Greek words.Topomeans place, and Logy means research.So, topology is how the computers in a network share information and connect to each other.

JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

WIRELESS VIDEO SURVEILLANCE AND COMMAND THROUGH AUDIO TRANSMITTING SYSTEM IN AERIAL VEHICLE

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ABSTRACT

A drone is defined as an aerial vehicle which uses aerodynamic forces to provide vehicle lift, can be recoverable or expandable, can be piloted remotely or fly autonomously, does not carry a human operator, and can carry a non-lethal or lethal payload. Beforehand, drones were used only for military applications like spying on both international and domestic threats because they do not put the life of a pilot at risk in combat zones. In addition, they do not need rest, which enables them to fly as long as there is fuel in the craft. Currently, the developed drones can be used in a vast number of applications, such as deliveries, policing, monitoring flooded areas, and many others that were discussed in this report. The mechanism described in this report targets multiple disciplines that fall under the Mechatronics umbrella, which comprises mechanical, electrical, and digital components. This project focuses on designing and developing Wireless video surveillance and command through Audio Transmitting system in aerial vehicle that can be used in different applications, specifically in Monitoring and for conversation. Different analyses were made on the drone to choose the best available material, guarantee its longevity, and ensure its safety.

Keywords: UAV technology (drone), Flight Mechanism, Aerial Vehicle

1.INTRODUCTION

The UAV technology (drone) has gained a lot of interest in the last couple of years. It is one of the fastest growing sectors related to IT. The concept of using drones to hover around crime scenes to collect information and evidence in order to speed up remote investigations and to provide fast-response units is already implemented in the United States. Nowadays, drones are able to use sensors such as laser, infra-red, and optical sensors to keep track of its environment from multiple angles to imitate the human eye. By taking advantage of this technology, a drone is able to navigate on its own to accomplish any task that it was set to perform. With the advancements in technology, more precisely intelligent systems, it is now possible to customize and increase the autonomy of drones.

This amazing advancement of an astonishing technology in drones has produced and developed applications that led to new fields. Now, drones can be used for several purposes

sustainability

MDPI

Article

Frequency Regulation of Interlinked Microgrid System Using Mayfly Algorithm-Based PID Controller

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Abstract: The primary goal of this article is to design and implement a secondary controller with which to control the system frequency in a networked microgrid system. The proposed power system comprises of Renewable energy sources (RESs), energy-storing units (ESUs), and synchronous generator. RESs include photovoltaic (PV) and wind turbine generator (WTG) units. The ESU is composed of a flywheel and a battery. Because renewable energy sources are not constant in nature, their values fluctuate from time to time, causing an effect on system frequency and power flow variation in the tie line. The nonlinear output from the RESs is balanced with the support of ESUs. In order to address this situation, a proportional integral derivative (PID) controller based on the Mayfly algorithm (MA) is proposed and built. Comparing the responses of controllers based on the genetic algorithm (GA), differential evolution (DE), and particle swarm optimization (PSO) technique-optimized to demonstrate the superiority of the MA-tuned controller.. The results of the validation comparisons reveal that the implemented MA-PID controller delivers and is capable of regulating system frequency under various load demand changes and renewable energy sources. A robustness analysis test was also performed in order to determine the effectiveness of the suggested optimization technique (1%, 2%, 5%, and 10%) step load perturbation (SLP) with ±25% and ±50% variation from the nominal governor and reheater time constant).

Keywords: frequency deviation; load frequency control; Mayfly algorithm; PID controller; secondary control

Citation: Boopathi, D.; Jagatheesan, K.; Anand, B.; Samanta, S.; Dey, N. Frequency Regulation of Interlinked Microgrid System Using Mayfly Algorithm-Based PID Controller. *Sustainability* **2023**, *15*, 8829. https://doi.org/10.3390/su15118829

Academic Editor: Noradin Ghadimi

Received: 2 May 2023
Revised: 23 May 2023
Accepted: 25 May 2023
Published: 30 May 2023

1. Introduction

The installation of renewable energy sources addresses the problems caused by conventional energy sources in the environment during electric power generation and the matching of sudden load-demand situations. Pollution (air, water, and noise) and global warming are major issues for the environment, and one source of pollution is electric power generation. The traditional techniques of generating electricity cause environmental degradation. In order to reduce pollution, RESs (solar and wind power plants) are being introduced into the power generation sector. One of the key causes for the penetration of RESs is the shortage of fossil fuels. The inclusion of RESs is a difficult undertaking because RESs are typically nonlinear power-generation sources. When incorporating RESs into the electricity grid, numerous quality challenges arise—notably, the oscillation of system frequency. In order to overcome this crisis, the load frequency control (LFC) method is used to maintain frequency standards in the power system, and a secondary controller must be implemented into the scheme in order to preserve frequency stability [1–3]. In particular, the secondary controller maintains the frequency stands and important parameters within

Results in Control and Optimization 11 (2023) 100218

Contents lists available at ScienceDirect

Results in Control and Optimization

journal homepage: www.elsevier.com/locate/rico

Fractional order $PI^{\lambda}D^{\mu}$ controller for microgrid power system using cohort intelligence optimization

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ARTICLE INFO

Keywords:
Cohort Intelligence
Genetic algorithm
Particle Swarm Optimization
Load Frequency Control
Fractional order PID controller

ABSTRACT

Microgrids are the future of energy management systems. Effective deployment and integration of microgrids can provide energy independence to many communities. The effectiveness of a microgrid primarily depends on its stability and reliability. Fractional regulators offer promising solutions to ensure stable microgrid performances. This article proposes a Fractional order Proportional–Integral–Derivative (FOPID) based secondary Load Frequency Control (LFC) for single area and dual-area AC microgrid systems. Cohort Intelligence (CI) based optimization was employed to tune the five major gain values of fractional PID regulators. The performance of the proposed CI tuned FOPID regulator was compared with that of the traditional PID controller tuned by Genetic Algorithm (GA) and Particle Swarm Optimization (PSO) on the same single and dual control area microgrid systems. Four different cases of AC microgrid simulations were explored for LFC performance assessments and effective comparisons among different controllers and tuning algorithms. The first case considered load changes in single area AC microgrid with and without distributed energy system. The second case considered load variations in the two area AC microgrid system. The third and fourth cases included variations in random step load and system parameters respectively. Primary results affirm the superiority of the CI tuned FOPID regulator over its GA and PSO tuned PID counterparts in terms of its better steady-state precision, expressed in terms of the Integral Time Absolute Error (ITAE) selected as the objective function.

1. Introduction

Microgrids offer a viable energy management alternative to the operators and consumers of the electrical power sector. Microgrids are classified as DC microgrids, AC microgrids, and AC/DC hybrid microgrids based on their voltage and power specifications. The AC microgrid is designed to function as a standalone grid in a locality where either electrical power is not available or there is insufficient supply from a larger distribution network of electrical power supply. Different kinds of distributed energy utilities such as electric vehicles, heat pumps, and freezer pumps are very much expected to perform reliably, regardless of the abnormalities in power supply and/or demand. Plug-in electric vehicles are becoming widely popular among consumers, reducing the consumption of fossil fuels and the associated greenhouse issues and contributing to a greener environment. LFC is important for maintaining the quality of electrical power distribution within tolerable limits economically and feasibly from generation to distribution.Fluctuations in load requirements necessitates corresponding adjustments in the AC microgrid running point. Due to demand fluctuations, the grid frequency diverges from the standard limit and strays towards the unstable region. Hence, the essential function of the LFC is

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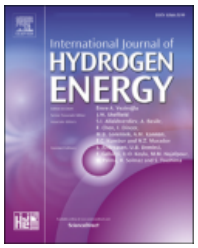
https://doi.org/10.1016/j.rico.2023.100218
Received 14 October 2022; Received in revised form 4 January 2023; Accepted 13 February 2023
Available online 16 February 2023

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/he



The charge transfer pathway of g-C_3N_4 decorated Au/Bi(VO_4) composites for highly efficient photocatalytic hydrogen evolution

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HIGHLIGHTS

- g-C_3N_4 decorated Au/Bi(VO_4) composite was first constructed via facile hydrothermal method.
- Proposed Z-scheme mechanism elaborates the high-efficiency charge carrier transfer.
- The nanocomposite preserves excellent photostability and reusability.

ARTICLE INFO

Article history:
Received 26 January 2023
Received in revised form
4 March 2023
Accepted 11 March 2023
Available online 1 April 2023

Keywords:
g-C_3N_4/Au/$BiVO_4$
Hydrogen evolution
Cocatalyst free
Z-scheme
Surface plasmon resonance effect

ABSTRACT

In this report, a novel g-C_3N_4/Au/$BiVO_4$ photocatalyst has been prepared successfully by assembling gold nanoparticles on the interface of super-thin porous g-C_3N_4 and $BiVO_4$, which exhibits outstanding photocatalytic performance toward hydrogen evolution and durable stability in the absence of cocatalyst. FESEM micrograph analysis suggested that the intimate contact between Au, $BiVO_4$, and g-C_3N_4 in the as-developed photocatalyst allows a smooth migration and separation of photogenerated charge carriers. In addition, the XRD, EDX and XPS analysis further confirmed the successful formation of the as-prepared g-C_3N_4/Au/$BiVO_4$ photocatalyst. The photocatalytic hydrogen production activity of the developed photocatalyst was evaluated under visible-light irradiation ($\lambda > 420$ nm) using methanol as a sacrificial reagent. By optimizing the 5-CN/Au/$BiVO_4$ composite shows the highest H_2 evolution rate (2986 $\mu molg^{-1}h^{-1}$), which is 15 times higher than that of g-C_3N_4 (199 $\mu molg^{-1}h^{-1}$) and 10 time better than bare $BiVO_4$ (297 $\mu molg^{-1}h^{-1}$). The enhancement in photocatalytic activity is attributed to efficient separation of the photoexcited charges due to the anisotropic junction in the g-C_3N_4/Au/$BiVO_4$ system. The enhancement in photocatalytic activity is attributed to efficient separation of the photo-excited charges due to the anisotropic junction in the g-C_3N_4/Au/$BiVO_4$ system.

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https://doi.org/10.1016/j.ijhydene.2023.03.152

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Modern PID/FOPID controllers for frequency regulation of interconnected power system by considering different cost functions

Mohamed Ahmed Ebrahim Mohamed[1]✉, K. Jagatheesan[2] & B. Anand[3]

This article presents frequency regulation of an interconnected three-area power system (Thermal + Wind + Hydro). Fractional Order PID (FOPID) and Proportional-Integral-Derivative (PID) controllers are applied as subsidiary regulators to control the electrical power interconnected system at the time of sudden load variation. To accomplish this study, Genetic Algorithm (GA), Grey Wolf Optimizer (GWO), Sine Cosine Inspired Algorithm (SCIA) and Atom Search Inspired Algorithm (ASIA) are implemented to optimize the secondary regulators' gains (PID and FOPID) by considering various cost functions such as Integral Absolute Error (IAE), Integral Time Absolute Error (ITAE), Integral Square Error (ISE), and Integral Time Square Error (ITSE). Performance analysis in this work is conducted using various cost functions based on GA, GWO, SCIA and ASIA. The comparative analysis of the attained results reveals that GWO-PID and ASIA–PID settle at (83.83 s) and (30.31 s), respectively and ASIA-FOPID at (25.12 s). The controllers based on ITSE as a cost function outperform the comptrollers with other cost functions (ISE, IAE and ITAE). In addition, the ISE-based GA–PID and SCIA–PID settle at (113.92 s) and (35.1 s), respectively and SCIA-FOPID at (24.78 s). The ISE-based regulators yield improved response equated to other cost functions (ITSE, IAE and ITAE) optimized controllers. The robustness test also is carried out to validate the effectiveness of the proposed optimization techniques by changing the system parameters within ± 25% and ± 50% from their nominal values as well as changing the load pattern.

The primary aim of a power-generating system is to monitor and control the supply frequency, ensure stable power flow in the tie line of interconnected systems, maintain voltage profile and ensure stability of load flow conditions between areas within the desired value. The load-generation equilibrium ensures that customers are always provided with reliable and secure power. During nominal loading conditions, each power plant has self-control of stability and operating point. If sudden load demand arises, it will disturb the system supply frequency and power flow in the tie-line between interconnected power systems[1,2]. Thus, the frequency response contains oscillations that produce errors. To maintain the stability of the power generating system, a primary control loop (speed governor) and secondary controller are also introduced to ensure that the system parameters are kept within the specified limits[1,2]. The role of Automatic Generation Control (AGC) in a power system is to adjust the generated power output of several generators at dissimilar power generating plants, in response to modification in the load demand. In the AGC of the power system, area control error acts as the input for the controller to generate the required control signal that complies with the desired output response during the sudden load disturbance in the system.

Based on the literature review, it is found that many secondary controllers are introduced based on Bio- computation Inspired Algorithms (BIA). The authors of[3] investigated the optimal gain value of PID controller using the Stochastic Particle Swarm Optimization technique for single-area AGC including Super Magnetic Energy Storage (SMES) and Redox Flow Battery (RFB) units with Integral Time Absolute Error (ITAE) and Integral

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RESEARCH ARTICLE | AUGUST 18 2023

Attendance management system using smartcards and biometric authentication

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AIP Conf. Proc. 2857, 020022 (2023)

https://doi.org/10.1063/5.0164340

Keeping track of attendance is an important part of any institution's record-keeping process. There are various methods for keeping track of attendance, ranging from a manual system in which attendance is recorded on sheets to an automated one based on Finger prints. Use of Radio frequency identification (RFID) in conjunction with biometric system was intended to increase the documents' security and integrity. The created solution not only simplifies the work but also increases the institutions efficiency in manpower and time. The system not only simplifies the process of taking attendance, but it also lowers faults and enables for faster confirmation of student presence, all while requiring little human intervention. The authorities will be able to handle the attendance system in an extra structured, well organized, and time saving using this technique. The system's preparation is simple and moveable, production it an excellent choice for profitable and speculative use. To make the arrangement suitable with PCs and mobile devices, a graphical user interface and an app-based version were designed. The system is designed with several degrees of security and access rights. The system was put to the test with a small class of 35 people, and it was discovered that it provided correct attendance marking for all users.

Topics

Graphical user interface, **Telecommunications engineering**, **Students**

RESEARCH ARTICLE | AUGUST 18 2023

People flow management using computer vision & deep learning

Janani Rakshandha Chinnusamy ✉; Kavitha Krishnaswamy Pillai Ranganathan; Vijayalakshmi Sekar; Murali Babu Balasundaram

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AIP Conf. Proc. 2857, 020029 (2023)

https://doi.org/10.1063/5.0164341

In recent years, the human population has reached its peak in both the developing countries and developed countries like India and China. An increase in personnel density ended up being a hard task to maintain or manage people flow in socio-public places. However, people flow management is out of control for humans, which may also cause some safety damages. This paper aims to give an optimal solution for people flow with the help of machine learning, deep learning, and also AI-cameras are used for counting the number of people entering and leaving a user-defined place. Here, also the centroid tracking and centroid detecting algorithms are used to count the number of people together with their direction. This technique helps to replace manual security,in-store traffic management, and much more.

Topics

Deep learning, **Artificial intelligence**, **Machine learning**

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Chemical Physics 573 (2023) 112000

Contents lists available at ScienceDirect

Chemical Physics

journal homepage: www.elsevier.com/locate/chemphys

Hybridization of graphene into $NiCo_2S_4$ hybrid composites as electrode materials for high performance supercapacitors

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ARTICLE INFO

Keywords:
$NiCo_2S_4$/graphene composites
High specific capacitance
Electrode material
Synergistic effect
Asymmetric supercapacitor

ABSTRACT

$NiCo_2S_4$ is one of the most promising bimetallic sulfides for use in energy-storage systems, but more studies are needed to endow $NiCo_2S_4$ (NCS) with a high electrochemical reaction capability and reversibility. In this work, we present rationally materials design of an optimal $NiCo_2S_4$ nanoparticle in a graphene (G) matrix as a $NiCo_2S_4$/graphene nanocomposite (NCSG). A uniform composite with $NiCo_2S_4$ nanoparticles anchored on graphene sheets is fabricated through an innovative one-step hydrothermal method. The XRD, Raman, XPS, SEM, HRTEM and EDS analyses are performed for characterizing the morphology and microstructure of the as-prepared $NiCo_2S_4$/graphene composite. Furthermore, we report the improvements in the materials technology, demonstrating the $NiCo_2S_4$/graphene (NCSG) nanocomposite electrode with an excellent specific capacitance of 1500 Fg^{-1} at 2 Ag^{-1}, high capacitance retention of 85.6 %, and long cycle life of 6500 cycles. The practical application is showcased in an asymmetric supercapacitor with a high active-material loading. Tremendously, the produced $NiCo_2S_4$/AC asymmetric supercapacitor has a high energy density of 43.2 Wh kg^{-1} at a power density of 920 W kg^{-1}.

1. Introduction

The increasing demand for high-performance energy-storage systems is attracting increasing numbers of researchers to develop advanced high-power-density supercapacitors with a high charge-storage capability, a long cycle life, and high cycle rates [1,2]. Supercapacitors are categorized according to their charge-storage mechanisms into two classes: electric double-layer capacitors and pseudocapacitors. An electric double-layer capacitor typically contains carbon-based materials and stores charges at the electrode/electrolyte interface, whereas a pseudocapacitor is composed of an electrochemical active material (e.g., conducting polymers [3,4], transition metal oxides [5–7], or transition metal sulfides [8,9]), in which rapid faradaic surface reactions occur [10] through multiple redox states [11]. Therefore, the electrochemical pseudocapacitor electrodes would offer a 10–100 times higher specific capacitance than that of electric double-layer capacitor electrodes. The performance of electrochemical supercapacitors depends on the characteristics of their active materials. Transition metal sulfides are often used, as their fast electrochemical-reaction kinetics and reversible redox reactions lead to high capacitances and a long cycle life. In particular, bimetallic sulfides exhibit synergies between the bimetallic ions and have various oxidation states, resulting in high electrochemical activities and excellent capacitances.

Supercapacitors utilise pseudocapacitance [12–14]. Metal sulphides are a promising supercapacitor material [15–17]. NiS_x and CoS_x offer greater capacitance, reduced cytotoxicity, and structural and morphological plasticity, but their electrochemical activity needs development. Ni-Co sulphates exhibit a richer redox response than binary metal sulphides. $NiCo_2S_4$ is a promising electrode material. $NiCo_2S_4$ has low resistivity and poor electrochemical stability. Mixing metal sulphides with high-conductivity compounds improves electrochemistry [18–20]. Graphene is the most promising material for generating metallic nanoparticles due to its conductance, electrochemical durability, large surface area, and mobility. Graphene and other nanoparticles may boost electrocatalytic activity [21,22]. $NiCo_2S_4$/graphene supercapacitor electrode combinations are seldom discussed. $NiCo_2S_4$ nanosheets on graphene were created by Peng et al. Li's group synthesised $NiCo_2S_4$/graphene for asymmetric supercapacitors [23]. Gao et al. [24] discovered energy-storing $NiCo_2S_4$/graphene composites. $NiCo_2S_4$/graphene composite has a high specific capacity (1040.61 Fg^{-1}) and great stability

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https://doi.org/10.1016/j.chemphys.2023.112000
Received 9 February 2023; Received in revised form 27 May 2023; Accepted 12 June 2023
Available online 16 June 2023

Electrochimica Acta 462 (2023) 142742

Contents lists available at ScienceDirect

Electrochimica Acta

journal homepage: www.journals.elsevier.com/electrochimica-acta

Ultra-thin nanosheets of $Ti_3C_2T_x$ MXene/$MoSe_2$ nanocomposite electrode for asymmetric supercapacitor and electrocatalytic water splitting

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ARTICLE INFO

Keywords:
MXene
$MoSe_2$
Supercapacitor
Water splitting
Energy storage devices

ABSTRACT

Nanohybrid anode materials for highly efficient asymmetric supercapacitors are developed with a hydrothermal approach using organ-like ($Ti_3C_2T_x$) MXene as a main basis. The $MoSe_2$/$Ti_3C_2T_x$ hybrid supercapacitor has a high specific capacitance of 1531.2 Fg^{-1} at 1 Ag^{-1} and a low potential of 200 mV at 10 mAg^{-1}. Additionally, the Tafel slope of 37.7 mV dec^{-1} for the hydrogen evolution reaction (HER) makes this supercapacitor an excellent electrochemical performer. The supercapacitor with $Ti_3C_2T_x$/$MoSe_2$nanohybrid as the positive electrode shows excellent performance. Even after 10,000 cycles, it retains a capacitance of 94.1% with a high current density of 5 Ag^{-1}, a high specific energy of 58.8 $Whkg^{-1}$ and a high specific power of 800.3 Wkg^{-1}. In comparison with unmodified $MoSe_2$, it increases conductivity, speed of charge transfer, and active sites which is explained by the strong interfacial connection between MXene and $Ti_3C_2T_x$ crystals.

1. Introduction

The growth of society's energy dilemma has prompted a lot of emphasis on the development of high-efficiency energy storage and production technologies [1,2]. SCs have emerged as a viable energy storage solution because of their high power density, long cycle life, and ability to recharge and discharge rapidly [3]. Sustainable and cheap hydrogen has been hailed as a potential solution to global problems. The hydrogen Evolution Process (HEP) has recently been deemed one of the most cost-optimal methods of energy conversion [4]. SCs and HEP, two of the most novel technologies for electrochemistry in power capacity or reconfiguration, are still primarily dependent on noble metals [5,6]. These materials are highly limited in their potential implementation due to their limited storage and high cost. Therefore, noble metals can be replaced in storage and for sustainable energy by non-metal-based materials with high capacitance and low activation energy [7–9]. In addition, inventing a material that can store and convert energy could reduce costs making integration easier. Several recent studies have shown that transitional metal oxides [10,11], hydroxides and their hybrids [12,13] can be used for both supercapacitors, proving their potential use. The fascinating lamellar structure, remarkable electrical conductivity, and abundance of active sites [14–16], transition metal carbides and nitrides ($M_{n+1}X_nT_x$) have been actively studied for high-performance supercapacitor electrodes.

The cyclic and rate performance of 2D ($Ti_3C_2T_x$) MXene is very impressive [17,18]. There is almost a 100% capacitance retention rate for MXene ($Ti_3C_2T_x$) after 20,000 charge-discharge cycles [19]. Conversely, pure MXene ($Ti_3C_2T_x$) films have a relatively low capacitance (246 F/g) [20]. Due to their high conductivity (15,000 S cm-1), distinctive intercalation structure, abundance of surface functional groups, significant mechanical performance, and superior thermal stability, MXenes, a novel nanomaterial of 2D transition metal carbides and nitrides, have shown prominent potential for electrode materials. The transition metals (Ti, Ta, V, Cr, etc.) and the C/N elements, respectively, are represented by M and X in their illustrative form, $M_{n+1}X_nT_x$ (n = 1–4), while the functional groups (-OH, -F, etc.) of the terminal surface are denoted by T. Due to their exceptional electrical and thermal conductivity, stable structure, broad interlayer spacing, and the specific area, $Ti_3C_2T_x$- based MXene supercapacitor electrodes exhibit relatively excellent rate properties and higher cycling stability when compared to other homologous series. Additionally, the $Ti_3C_2T_x$-MXene, which is confirmed to be an effective and promising energy material, has an abundance of precursors and favourable hydrophilic properties. HF is a quick and easy etchant for preparation processes, but its risk prevents it

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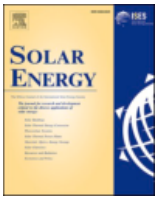
https://doi.org/10.1016/j.electacta.2023.142742
Received 5 May 2023; Received in revised form 10 June 2023; Accepted 13 June 2023
Available online 14 June 2023

Solar Energy 262 (2023) 111833

Contents lists available at ScienceDirect

Solar Energy

journal homepage: www.elsevier.com/locate/solener



Highly effective Pt-free counter electrode constructed by break bone-like CoTe@graphite carbon thin films dye-synthesized solar cell

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ARTICLE INFO

Keywords:
CoTe
CVD
Break bone
Dye synthesized solar cell
Pt free electrode

ABSTRACT

To boost the efficiency of dye-sensitized solar cells (DSSCs) at a cheaper cost than currently available counter electrodes, platinum (Pt)-based CEs are necessary. We demonstrate the creation of thin films with different aspect ratios made of molybdenum ditelluride (CoTe) combined with graphitic carbon nitrides (g-C_3N_4) using the chemical vapour deposition technique on an FTO glass substrate. According to XRD, Raman, SEM, and TEM examination, the 2D nanosheets of g-C_3N_4have a polycrystalline nature and uniform nanograins that break human bone like the morphology of CoTe. The optical band gap and charge transfer efficiency of the films was assessed using UV and PL spectroscopy. In experiments, the modification of DSSCs with g-C_3N_4 significantly increased their photoelectric conversion efficiency. The DSSC incorporating CoTe@g-C_3N_4CE achieved high-power conversion efficiency (PCE) of 8.52% compared to DSSC with bare CoTe CE (2.67%).Furthermore, the upgraded CoTe@g-C_3N_4CE exhibited improved electron lifetime compared to other CEs, significant reduction towards I_3^-, and good electrocatalytic activity. Additionally, CoTe@g-C_3N_4 shows excellent electrocatalytic activity and prolonged electron lifetime, which is supported by experimental work using Tafel polarisation, EIS, and CV.

1. Introduction

A long-standing concern has been how to meet the world's expanding energy needs, which has fueled research into solar energy use. In this regard, solar cells with their constant conversion efficiency have proven to be a great success [1–4]. Among the most promising low-cost solar cell technologies is dye-sensitized technology [5]. More academics have recently become interested in this area because of the simplicity of manufacturing dye-sensitized solar cells (DSSCs). The four basic components of DSSCs are light sensitizer (dye), photoanode, counter electrode (CE) and redoxcouple.The counter electrodes in DSSCs are the topic of this discussion since they are crucial in completing the external circuit by absorbing an electron from the photoanode while still playing a part in all components' contributions to the high efficiency of thedevice.For this process to be successful, the counter electrode must have high electrocatalytic qualities that allow it to collect electrons and transport them to the liquid electrolyte from the photoanode. Despite having excellent electrocatalytic capabilities toward liquid electrolytes, the Pt electrode has certain drawbacks (less common, expensive, and damaging to iodine) [6]. A noble metal like platinum (Pt), which has great electrical conductivity and strong catalytic activity, is typically chosen as a counter electrode (CE) material because it decreases the oxidised electrolyte, which is essential for high-efficiency DSSCs [7–9]. Therefore, finding a substitute for Pt CE is crucial for the development of DSSCs. Given their abundance and superior electrocatalytic characteristics that are comparable to Pt, chalcogenides are very interesting to study as a result of the research being done on Pt-free DSSCs. In this regard, transition metal sulphides have been identified as an important class of materials [10–12]While waiting for Pt-free CE materials with excellent performance, chemical stability, and affordability, several experiments have been done on inorganic compounds, carbonaceous materials and conducting polymers [13,14].

Transition metal dichalcogenides (TMDs), a family of two-dimensional (2D) layered crystals that have attracted significant interest as potential substitutes for graphene, have recently shown promise in research. Compared to conventional Pt CE iodine-based electrolytes, TMD-based CEs have been shown to have much higher electrochemical stability [15,16]. Recently, dye-sensitized solar cells (DSSCs) were

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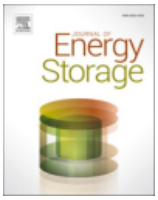
https://doi.org/10.1016/j.solener.2023.111833
Received 5 May 2023; Received in revised form 23 June 2023; Accepted 26 June 2023

Journal of Energy Storage 68 (2023) 107710

Contents lists available at ScienceDirect

Journal of Energy Storage

journal homepage: www.elsevier.com/locate/est



Research papers

Enhanced electrochemical performance of $CoMoO_4$ nanorods/reduced graphene oxide (rGO) as asymmetric supercapacitor devices

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ARTICLE INFO

Keywords:
$CoMoO_4$
Hydrothermal
rGO
Supercapacitor energy storage device

ABSTRACT

The efficiency of a supercapacitor depends heavily on the materials used to create its electrodes. Physicochemical properties have piqued interest in using transition metal molybdates as electrode materials in supercapacitors. Monodisperse $CoMoO_4$ nanorods with a modest dimension (about 40–60 nm in width and 1.5–2 μm in length) were created on reduced graphene oxide (rGO) nanosheets were synthesized via a facile hydrothermal method. Hybrid $CoMoO_4$@rGO electrodes have shown exceptional electrochemical properties, especially when compared to pure $CoMoO_4$ in an alkaline electrolyte. In particular, the maximum specific capacitance of $CoMoO_4$@rGO is 1425 Fg^{-1} at a current density of $1Ag^{-1}$, while the greatest specific capacitance of $CoMoO_4$ is 751 Fg^{-1} at the same current density. Both the pure and hybrid electrodes show excellent rate capability and long-term cyclic stability, even at high current densities of 20 Ag^{-1}. Also, at a current density of 20 Ag^{-1}, the constructed asymmetric supercapacitor generated a maximum power density of 4.5 $kWkg^{-1}$, and at a current density of 1 Ag^{-1}, it generated a high energy density of 51.2 $Whkg^{-1}$. Based on their promising electrochemical performance, the hierarchical $CoMoO_4$@rGO nanocomposites were discovered to provide for a promising electrode material in the creation of highly effective supercapacitors for power storage.

1. Introduction

Electrochemical capacitors (ECs) or supercapacitors, which deliver better power densities than standard battery and capacitor technologies, are the most promising current energy storage technology. Because of their excellent properties such as quick refilling, high power density and a long life cycle [1–3], supercapacitors have attracted a lot of research attention for use in applications such as hybrid electric cars and portable mobile apps. As a result of their rapid charge and discharge kinetics, high power density, and extended cycle life, supercapacitors have the potential to replace battery cells [4]. Electrode materials for modern supercapacitors are required to have high specific capacity. The electrical characteristics of binary metal oxides are significantly improved over those of solo metal oxides [5].

Continuous efforts have been made in the form of the development of new electrode materials in an effort to enhance the capabilities of SCs [6–8]. However, it has come to light that TMOs such as $MnMoO_4$, $CoMoO_4$, and $NiMoO_4$ are appropriate for use as electrocatalysts [9]. $CoMoO_4$, with to its increased electrochemical activity and higher high efficiency, has emerged as a candidate for inclusion among them as a desirable material. Despite this, the low electrical conductivity of the $CoMoO_4$ electrode material continues to prevent their widespread deployment [10]. Hence, it is very challenging to fabricate $CoMoO_4$ electrode material with improved electrical conductivity in a size and form that can be controlled at the present time [11]. In order to enhance the electrochemical capabilities of the $CoMoO_4$ electrode material, a number of purposeful initiatives have been made, including the fabrication of hierarchy nanostructures with a variety of morphologies [12]. Despite this, the procedures described above were only capable of producing a marginal increase in the material's specific capacitance. Recent research [13] has focused on developing a method for fabricating nanocomposite materials that contain high conductivity carbon compounds and mimic graphene. This is as a direct result of the fact that graphene is the material of choice for many applications. Reduced graphene oxide (RGO)@$CoMoO_4$ nanocomposites, in instance, showed significantly enhanced electrochemical performance in comparison to pure $CoMoO_4$ [14]. The combination of all the components worked together to produce this result. Good electrochemical characteristics

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https://doi.org/10.1016/j.est.2023.107710
Received 28 February 2023; Received in revised form 28 April 2023; Accepted 13 May 2023

Priyadarshni et al. 2023. *Int. J. Vehicle Structures & Systems*, 15(3), 1-4
ISSN: 0975-3060 (Print), 0975-3540 (Online)
doi: 10.4273/ijvss.15.3.07

International Journal of Vehicle Structures & Systems
Available online at https://yanthrika.com/eja

Design of Superlift Luo Converter for Electric Vehicle Applications

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ABSTRACT:

In recent trends, electric vehicles (EVs) are replacing conventional vehicles in the automobile industry because of the serious problems they pose to the environment and human life. An energy storage device (battery) plays a major role in providing a power supply to the vehicle. Due to automotive constraints, the power supply should be highly efficient and have low current and voltage ripple. DC-DC converters indeed provide the same. The design of 12V-60V DC-DC SLLC (Super-lift LUO converter) is proposed in this paper, with an emphasis on electric vehicle (EV) applications. The low output voltage ripple is a benefit of the SLLC topology. The basic boost converter (12V-60V) is modelled and analysed in Matlab Simulink and the output voltage ripple is calculated. A three-stage super-lift LUO-converter is then designed and modelled in Matlab Simulink. The voltage output is analysed for each stage and the ripple voltage is calculated. The comparison of voltage ripple between the CBC and SLL converter shows that, the output ripple gets reduced in the proposed SLLC.

KEYWORDS:

Electric Vehicle System; DC to DC Converters; Super-lift LUO Converter; Ripple Voltage

CITATION:

M. Sabarimuthu, N. Priyadharshini, M. Arunkumar, D.S. Reddy, B. Naveenkumar and D. Boopathi. 2023. Design of Superlift Luo Converter for Electric Vehicle *Int. J. Vehicle Structures & Systems*, 15(3), 1-4. doi:10.4273/ijvss.15.3.07.

1. Introduction

DC-DC conversion is crucial in energy conversion process. Using power electronic converters, electrical energy from the power supply is converted into a form that may be used by a motor [1, 2]. The power electronic converter can be selected depending on the power supply and driving motor available. Lighting control, industrial heating, speed control of fans drives, AC switches are some of the applications of the converters. The driving of electrical machines, which were originally used primarily for industrial applications, is one of the most essential applications. In an electric car, super-lift converters will greatly improve the voltage transfer gain, which will increase geometrically stage by stage. In power series, it efficiently improves the level of the voltage gain. The SLLC are used in DC-DC converters to overcome the ripple-free voltage [3]. Filters are also utilized to minimize the ripple. In this case, converter efficiency will be high, total harmonic distortion will be reduced and power density will be high. In EVS (Electric Vehicle System), DC-DC converters will be positioned around the vehicle's propulsion system, where they will be exposed to high temperatures. As a result, DC-DC converters developed for electric vehicle applications should be able to perform successfully in hot environments [4, 5]. Fig. 1 shows that the classification of the converters is used in power electronics.

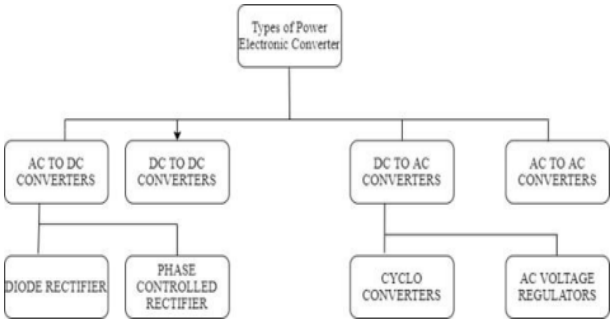

Fig. 1: Classification of converters

2. DC-DC converter

An electrical circuit that converts an AC or DC input to a different voltage AC or DC output is known as a converter [6]. These converters are used in computer power supplies, DC motor control circuits and a variety of other applications. DC choppers are another name for DC-DC converters. The fixed DC voltage is converted to a variable DC voltage by a device called a chopper [7]. As a result, it's also referred to as a DC transformer since it rapidly changes electricity from a source to deliver varied or chopping voltage at the output. On the other side of the chopper, the DC voltage level can be increased or lowered. The chopper performs the same function as the helicopter. The three major types of DC-DC converters are boost, buck and buck-boost converters [8]. The boost converter is essential in electric car applications. A step-up converter is a DC-DC power converter that enhances

Chemical Papers
https://doi.org/10.1007/s11696-023-03094-7

ORIGINAL PAPER

Improved photovoltaic and high performance lithium-ion batteries based SnS/rGO hybrid nanocomposites electrodes synthesized from facile hydrothermal route

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Received: 13 February 2023 / Accepted: 22 August 2023

Abstract
The SnS/rGO composite was demonstrated with sphere-like structure assembled by SnS/rGO sheets. Each SnS/rGO sheet was characterized with the negative electricity of reduced graphene oxide (rGO) causing monodisperse SnS nanoparticles to be anchored uniformly on its surface. XRD results indicated a pure hexagonal phase of SnS NPs and all SnS/rGO NCPs with space group P 6/m. SEM and TEM images reveal that SnS nanoparticles have diameter of round 30–40 nm, which is uniformly anchored on the surface of rGO sheets (average diameter of around 2–2.5 µm). UV results demonstrate that the incorporated RGO could significantly narrow the band gap energy (2.33 to 1.81 eV) and efficiently improve the charge transfer efficiency of the sample. The rGO incorporated SnS (SRG-15) sample showed high surface area of 108.21 m^2/g, which is higher than that of pure SnS (84.27 m^2/g). The prepared SnS/rGO samples were used as photoanode, which are appliedin in dye-sensitized solar cells (DSSCs), and the power conversion efficiency (PCE) of 7.7% is obtained, which is higher than 5.4% in the case of bare SnS, indicating a faster reaction rate of charge transfer and excellent catalysis of iodide ion for SnS/rGO. It shows that SnS/rGO is a promising composite material in the field of DSSCs. The nanocomposite has a specific capacity of 780 $mAhg^{-1}$ after 600 cycles at 100 mAg^{-1}. The electrochemical impedance spectroscopy results show that adding rGO to the electrode can lower the transfer resistance, and that the increased lithium storage capabilities are owing to the synergistic action of SnS and rGO.

Keywords SnS · Reduced graphene oxide · Electrochemical · DSSCs · Photo conversion efficiency

Introduction

Due to rising energy consumption and the diminution of existing energy means (natural gases and fossil fuels), solar power has gotten a lot of attention (Bu 2013; Zhang et al. 2019; Chen et al. 2018). Alternative sources of energy have been examined using several of technologies (biomass, geothermal and solar) (Twidell and Weir 2015; Energy and Energy 2004). Solar energy is the most attractive of the many renewable technologies because of its sheer availability and accessibility (Bu 2014; Abou-Ras et al. 2016). Silicon (crystallized) (Basher et al. 2019), solar cells of thin films (Liu et al. 2018), and meso-scopic solar cells (Kumar et al. 2019) are the three main categories of solar cell technology. Crystalline silicon now governs the solar cell industry owing to its consistent performance and extended operating lifespan (Soga 2006; Kalyanasundaram 2010). On account of having easy and low-cost manufacturing techniques, mesoscopic DSSCs have been offered as a solution to these problems (Bu and Cole 2013; Grätzel 2003). A DSSCs cell is made up of a thin metal oxide-dyed sheet, an electrolyte, and a catalyst counter electrode that is commonly sandwiched between two FTO glass substrates. Counter electrodes reduce the redox coupling of the electrolyte by accepting ions from the exterior circuit. Many CEs have been proposed as potential

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Journal of Robotics and Control (JRC)
Volume 4, Issue 5, 2023
ISSN: 2715-5072, DOI: 10.18196/jrc.v4i5.19772

Optimization of Load Frequency Control Gain Parameters for Stochastic Microgrid Power System

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***Abstract*—Interconnected multi-area microgrids are vital for the future of sustainable and reliable power systems. Effective load frequency control (LFC) is indispensable for ensuring their stable operation. This paper introduces a PID-based LFC system tailored for a stochastic microgrid with diverse power sources, including solar, wind, diesel engine generators, and electrical batteries. The gain parameters of the proposed microgrid PID LFC controller are optimized using genetic algorithms (GA), teaching learning-based optimization (TLBO), and cohort intelligence algorithms. Integral time-multiplied absolute error (ITAE) and integral time-squared error (ITSE) serve as the cost functions for all optimization algorithms. The study evaluated the performance of these optimized microgrid PID LFC configurations under random step load disruptions. Our primary findings reveal that the cohort intelligence-optimized PID LFC controller excels in minimizing computation time (upto 76% and 94% lesser than GA and TLBO respectively) and exhibits superior robust response characteristics. Moreover, the cohort intelligence algorithm requires fewer iterations (upto 66% and 90% lesser than GA and TLBO respectively) and enhances power supply quality within the multi-power microgrid electrical framework, specifically in terms of effective load frequency control.**

***Keywords*—Genetic Algorithm; Load Frequency Control; Teaching Learning based Optimization; Cohort Intelligence; Integral Time Absolute Error.**

I. INTRODUCTION

Modern power networks face the challenge of managing diverse energy sources, including conventional and renewable sources such as solar, wind, electrical batteries, and diesel generators. Moreover, micorgrids comprising of unconventional power sources hold the key to the energy independence of remote areas of the planet. These networks are characterized by multiple dynamic power demands and frequent frequency disturbances caused by sudden interruptions in microgrid areas and tie lines. To ensure a stable power supply despite varying loads and power sources, interconnected multi-power microgrid frameworks require effective load frequency control (LFC) mechanisms. Minor load variations can be handled by suitable generators that act as the primary backups in the power management systems. These generators and other regulators are required in the microgrid organization to limit the variation of supply frequency in the interlinked power framework as well as the tie lines to meet the varying demands on the overall power architecture. This regulation mechanism is known as load frequency control that plays a critical role in regulating the power grid and maintaining the required power supply quality [1], [2]. Fig. 1 illustrates the dynamic nature of supply and demand in a multi-microgrid power framework.

While researchers have explored various techniques for LFC in microgrid power systems, recent efforts have focused on soft computing methods that have shown promise in enhancing load frequency control in complex energy systems. These methods include neural networks [3], fuzzy logic [4], adaptive neuro-fuzzy logic control [5], fractional order controller [6]–[9], complex order controller [10]–[13], Grey wolf optimization [14], differential evolution [15], particle swarm optimization [16], ant colony optimization [17], artificial bee colony [18], hybrid optimization [19], imperialist competitive algorithm [20], genetic algorithm [21], [22], teaching-learning based optimization [23]–[26], cohort intelligence optimization [27]–[31]. Researchers have investigated various aspects of complex and fractional order modeling and control in various systems [32]–[45]. These applications include micro and nano particle composite machining, precise control of DC motor, tool/chip interface friction while machining aluminum alloys, position control of Quanser servomotor, lean manufacturing, machined surface roughness, bolted joints, non minimum phase systems and many more [46]–[61]. The above mentioned literature review shows that there is a research gap and an ample scope to explore optimization algorithms for optimal tuning of LFC gain parameter, specifically in case of hybrid power source microgrid application.

This paper addresses the problem statement of 'investigation of selected optimization algorithms to tune PID-based load frequency controller gain parameters for interconnected diesel-solar-battery and diesel-wind-battery power systems'. We em-

Journal of the Chinese Institute of Engineers

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/tcie20

A modified hysteresis current controller with DFCEA for current harmonic mitigation using PV-SHAPF

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To cite this article: Johnnie Hepziba R & Balaji G (2024) A modified hysteresis current controller with DFCEA for current harmonic mitigation using PV-SHAPF, Journal of the Chinese Institute of Engineers, 47:1, 63-80, DOI: 10.1080/02533839.2023.2274103

To link to this article: https://doi.org/10.1080/02533839.2023.2274103

Published online: 29 Nov 2023.

Revue d'Intelligence Artificielle
Vol. 37, No. 6, December, 2023, pp. 1637-1643
Journal homepage: http://iieta.org/journals/ria

A Novel Transfer Learning with Organic Computing in Deep Learning for Stress Classification

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https://doi.org/10.18280/ria.370628

Received: 14 August 2023
Revised: 2 October 2023
Accepted: 20 October 2023
Available online: 27 December 2023

Keywords:
stress classification, deep learning, EDA, ECG, transfer learning, organic computing

ABSTRACT

Nowadays, a stress classification system is essential to classify the psychological stress that impairs a person's socioeconomic life. Several Deep Learning (DL) models have been developed in recent years to classify stress using physiological signals, including electro-dermal activity (EDA) and electrocardiography (ECG). However, those models cannot handle concept drift during the training phase, which may struggle to adapt to changing data patterns, leading to unreliable predictions. Concept drift refers to changes in the characteristics or patterns of physiological signals used for stress classification. These changes could be due to various factors, including shifts in the data distribution, environmental conditions, or the subjects' behavior. Therefore, this article develops a novel Deep Transfer Learning with Organic Computing (DTLOC) model by integrating the Deep Convolutional Neural Network (DCNN) with the TL and OC mechanisms to handle concept drift and improve the accuracy of stress classification. The TL brings prior knowledge about EDA and ECG features, which enhances the model's initial capabilities and shortens the learning curve. Additionally, the OC provides a self-management system that oversees the structure and operation of the model. It dynamically adapts the DCNN in response to changing data patterns, ensuring that the model remains accurate and effective in classifying stress, even in the presence of concept drift. The experimental results demonstrate that the DTLOC model, utilizing EDA and ECG data from the WESAD dataset, achieves an accuracy of 93.53%. This is a significant improvement compared to the LIBSVM, LSTM, DNN, and CNN models, with increases of 15.63%, 13.15%, 10.37%, and 5.03% respectively. Thus, this model can enhance individuals' quality of life and safety by detecting stress-related illnesses at an earlier stage.

1. INTRODUCTION

Stress triggers an individual's immune system to respond to external stimuli, resulting in both mental and physical reactions [1]. Psychological inflammation can impair skin defense mechanisms and reduce immune and circulatory system effectiveness. Stress symptoms are less useful for stress analysis than non-intrusive elements like respiration rate, breathing patterns, or skin temperature [2, 3]. Hormone measurements are only monitored in laboratory settings, not in the human body [4]. Psychological inflammation is associated with chronic health conditions such as diabetes, arthritis, and heart disease. The respiratory system plays a role in regulating hormone levels and maintaining defense and heart function. Techniques are utilized to predict and quantify hormone production [5], but the overall effectiveness of integration remains a challenge. Studies frequently use physiological signals to identify emotional states, as the sympathetic nervous system regulates emotions such as fear, anger, and panic [6].

Typically, changes in an individual's emotional state are a direct reflection of their psychological state. EDA is used to describe this phenomenon [7, 8]. As well, ECG has also been used for stress classification in the past decades [9]. Stress classification using machine learning schemes such as Support Vector Machine (SVM), etc., has been investigated in previous years to learn various physiological signals and classify stress levels [10, 11]. On the contrary, such algorithms need the sophisticated and random signal processing of physiological information, which is unsuitable for designing classification frameworks using large-scale databases and the emergence of deep learning models. As a result, DL models have been extensively utilized in the field of stress classification through EDA and ECG since they process actual data and recognize the relevant characteristics with no preprocessing or attribute extraction processes [12, 13]. Even though DL models can learn characteristics, those models are data-hungry. Also, they cannot handle sudden concept drift. Concept drift refers to the phenomenon where the statistical properties of a dataset change over time. In the context of stress classification, it means that the patterns and relationships between physiological signals (such as EDA and ECG) and stress levels can evolve or shift due to various factors. This poses a

Diamond & Related Materials 142 (2024) 110757

Contents lists available at ScienceDirect

Diamond & Related Materials

journal homepage: www.elsevier.com/locate/diamond

Fabrication of g-C_3N_4 decorated Au/$Zn_3(PO_4)_2$ composites for remarkable H_2 production under visible-light irradiation

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ARTICLE INFO

Keywords:
g-C_3N_4/Au/$Zn_3(PO_4)_2$
Hydrogen production
Co-catalyst free
Z-scheme
Surface plasmon resonance effect

ABSTRACT

In the present study, novel gold nanoparticles (Au NPs) loaded Zinc phosphate ($Zn_3(PO_4)_2$)/graphitic carbon nitride (g-C_3N_4) nanocomposites were fabricated via a facile hydrothermal routes followed by calcination. Surfactants and capping agents were not required for this method. After the samples had been produced, they were examined using a number of electron microscopy and spectroscopic methods. The data showed that the spherical $Zn_3(PO_4)_2$ particles that were coated on the g-C_3N_4 nanosheets had a good distribution of Au nanoparticles (NPs) on their surfaces. In comparison to $Zn_3(PO_4)_2$ (461 μmol^{-1} h^{-1} of H_2) and g-C_3N_4 (171 μmol^{-1} h^{-1} of H_2), the optimized composite, 0.5 wt% Au/$Zn_3(PO_4)_2$-gC_3N_4 (95–5), showed a remarkable production rate under visible light (1241 μmol^{-1} h^{-1} of H_2). The highest performing composite was characterized using UV–visible, X-ray photoelectron spectra (XPS), Transmission electron microscope (TEM), N_2 adsorption-desorption, time dependent photo-current study and Current-density–potential studies. Several events were identified as contributing to the photocatalyst's performance; for example, the effective heterojunction formation between g-C_3N_4 and $Zn_3(PO_4)_2$ under *Z*-scheme dynamics led to visible-light photosensitization; new electronic hybrid states of the semiconductor band energies resulted from the porosity size and shape; and the Au NPs exhibited electronic trappingsites and co-catalytic effects. These enhancements to light harvesting and charge carrier separation allowed for greater activity to be powered by visible light.

1. Introduction

Due to the rapid depletion of non-sustainable fossil fuel resources, it is promising to develop sustainable and green energy sources to satisfy the population growth and industrial development. On the other hand, the release of hazardous pollutants into the water resources and air should be treated before it damages the living organisms [1,2]. In order to persuade both these big challenges, researchers across the globe are working on the development of cost-effective sustainable methods to effectively convert solar energy into chemical fuels and to oxidize the highly toxic environmental pollutants [3–5]. Increasing global concern over emission of contaminants and depletion of natural resources is mainly due to exploitation of fossil fuels. Hence requires urgent development of alternative energy sources which are environmentally friendly and totally renewable. Hydrogen fuel is promising alternative, as it is storable, clean and efficient at generating electricity. Among the various hydrogen production technologies, such as steam reforming, electrolysis and radiolysis of water, photocatalytic water splitting is the cleanest method for its production, as the process requires only water, light irradiation and a catalyst. To date, several semiconductors such as nitrides and metal oxides [6] have been employed in photocatalytic applications. However, still a great interest remains to develop advanced photocatalytic materials with high rate of photocatalytic hydrogen production, to make the process commercially viable. Rational design and engineering of photocatalytic hybrid systems such as multi-phase heterostructures based materials has been highly active in achieving high H_2 production during the last decade. This strategy aims at overcoming the limitations of individual semiconductors (SCs) by exploiting intimate and suitable contact of electronic and chemical interfaces [7], while simultaneously enhancing charge formation/separation and light harvesting. Heterostructures-based materials such as heterojunctions, plasmonics, and multi-phase composites have achieved important milestones and provided fundamental insights into H_2 production. However, in spite of these successes, the suitable photon-conversion to

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https://doi.org/10.1016/j.diamond.2023.110757
Received 13 October 2023; Received in revised form 11 December 2023; Accepted 19 December 2023
Available online 23 December 2023

Journal of Intelligent & Fuzzy Systems 46 (2024) 3649–3657
DOI:10.3233/JIFS-231127
IOS Press

Elimination of heart sound from respiratory sound using adaptive variational mode decomposition for pulmonary diseases diagnosis

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Abstract. Lung sound (LS) signals are a vital source of information for the identification of pulmonary disorders. Heart sound (HS) is the most common contaminant of lung sounds during auscultation from the chest walls. This directly affects the efficiency of lung sound processing in diagnosing lung diseases. In this work, Adaptive Variational Mode Decomposition (AVMD) technique is proposed to remove heart sound contaminants from lung sounds. The proposed AVMD method initially breakdown the noisy lung sound signal into a collective of bandlimited modes called variational mode functions (VMF). Then, based on the frequency spectrum, the HS is filtered out from the LS. The real time lung sound data is collected from 95 participants and the performance of VMD technique is evaluated using the statistical metrics measures. Thus, the proposed topology exhibits Higher SNR (29.6587dB, lowest Root Mean Square (RMSE) of 0.0102, lowest normalized Mean Absolute Error (nMAE) of 0.0336, and highest percentage in correlation coefficient Factor (CCF) of 99.79% respectively. These experimental results are found to be superior and outperform all other recently proposed techniques.

Keywords: Variational mode decomposition (VMD), adaptive VMD, lung sound signals, heart sound signals

1. Introduction

Auscultation of lung sounds (LS) is a crucial clinical procedure for diagnosing lung disorders. It involves listening to the sounds produced by airflow within the airways during inhalation and exhalation [1]. However, heart sounds (HS) often occur concurrently during recordings and act as noise, significantly obstructing the analysis of LS [2, 3]. Even with the use of electronic stethoscopes, the frequency range of lung sounds (20–2000 Hz) overlaps with that of heart sounds, making it challenging to separate them during recording, particularly at low flow rates [4]. Previous attempts to remove HS using a high pass filter (HPF) with a frequency band of 70 to 100 Hz have been found to be ineffective [5, 6]. Researchers have explored various filtering such as linear adaptive filtering etc., to detach HS from LS [7–10]. However, these methodologies exhibit limitations when

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Soft Computing (2024) 28:5057–5070
https://doi.org/10.1007/s00500-023-09213-6

APPLICATION OF SOFT COMPUTING

Grey wolf optimization algorithm-based PID controller for frequency stabilization of interconnected power generating system

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Accepted: 5 September 2023 / Published online: 30 September 2023

Abstract
In the proposed research article, the grey wolf optimization (GWO) technique is utilized to optimize the proportional (P) integral (I) derivative (D) (PID) controller/regulator gain parameters in three-area grid-connected power networks. The interconnected power plant covers thermal plants, hydro plants, and nuclear power plants. The proposed controller is used as a secondary controller in the power system to perform load frequency control (LFC). Under unforeseen load conditions, the system frequency deviates from the norm. To control and stabilize this oscillation, the LFC system is used. During the investigation, a step load perturbation of one percent (SLP 1%) is applied for the analysis of the thermal power plant. The response of the suggested optimization technique-designed regulator performance is equated with the genetic algorithm (GA)-tuned, particle swarm optimization (PSO)-tuned, and ant colony optimization (ACO) technique-tuned PID regulator response. The performance response is evidence that the GWO-based PID regulator provides a regulated response with minimal time-domain specification parameters (settling time, peak shoots) over other tuning methods. The effectiveness and robustness of the improved response of the suggested technique-optimized controller are verified with various load values (1%, 2%, and 10% SLP) and nominal parameter (R, T_p, and T_{ij}) variations ($\pm$ 25% & $\pm$ 50%) from its nominal value.

Keywords Grey wolf optimization · System frequency stability · PID controller · Thermal power plant · Load frequency control

1 Introduction

The major and main task of any power generating unit is to generate quality power and allocate it to consumers without any interruption during emergency load-varying situations. The standard limits of power supply produced by the power system are affected due to sudden load demand. The sudden load demand crisis occurs because of enormous growth in technology and population. To eliminate this crisis in the power system, the LFC scheme has been introduced at the distribution end. On the occasion of unexpected load demand, the quality of power has been affected in the form of oscillations with a peak over, undershoot, and stability in frequency and power flow in the tie line across the interconnected plants. To rectify this crisis, two control loops are implemented in a power plant: prime and subordinate control loops. The control signal provided by the primary loop is insufficient to balance the large power demand that occurs in the system. To overawed this crisis, the subordinate control loop is employed and it creates more impact in power quality improvement in LFC/AGC. A literature review clearly related to the subordinate control loop shows that several research works have been carried out over the past decades. The function of the secondary control loop is to maintain the excellence of the generated

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Journal of Energy Storage 83 (2024) 110766

Contents lists available at ScienceDirect

Journal of Energy Storage

journal homepage: www.elsevier.com/locate/est

Research papers

Porous 3D honeycomb structures formed from interconnected Ni(OH_2) sheets on CNT-coated hybrid framework as high-performance electrodes for supercapacitors

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ARTICLE INFO

Keywords:
$Ni(OH)_2$
CNTs
Electrochemical performance
Hydrothermal
Asymmetric supercapacitor
Energy storage device

ABSTRACT

Here, we report the effective hydrothermal synthesis of nickel hydroxide [$Ni(OH)_2$] nanomaterials with a honeycomb-like structure comprising two-dimensional (2D) nanoplates formed from nanosheet arrays. According to the powder X-ray diffraction data, a composite consisting of $Ni(OH)_2$ and carbon nanotubes was effectively created. The presence of significant vibrations of CNT and $Ni(OH)_2$ was verified by FTIR and Raman spectra. Elements in the synthesized composite were validated by energy-dispersive X-ray analysis, and experimental and theoretical values agreed well. Specific capacitance of 1715 Fg^{-1} at 1 Ag^{-1} was attained with novel $Ni(OH)_2$ designs incorporated over CNT Ni foam. The effectiveness of the honeycomb $Ni(OH)_2$@CNT network device is equivalent to that of existing carbon-based and metal oxide/carbon-based solid-state supercapacitor devices, with a maximum energy density of 77.2 $Whkg^{-1}$ and a power density as high as 866 Wkg^{-1}. In particular, after 10,000 cycles, this material retains a large percentage of its original capacitance (94.4 % to be exact) while still maintaining a respectable Coulombic efficiency (84.5 %). These encouraging findings suggest these materials might be used in efficient, cheap, and safe energy storage systems.

1. Introduction

Fossil fuel utilization and CO_2 emission are major problems in maintaining an eco-friendly environment. Shifting from fossil fuel to battery-operated vehicles has been accelerated, which has succeeded on a small scale [1,2]. As an electrical energy storage device, a supercapacitor has numerous electronic applications and can serve as an alternative power source owing to higher energy density and fast discharge/charge time. Compared to its cost with fuel technologies, it is expensive. In addition, the complete fuel exemption is not achieved due to the difficulties in charging and the lifetime of the charge storage devices. It is our concern to improve the charge storage, lifetime, and power delivery [3,4]. Highly efficient and sustainable charge storage devices are the immediate and urgent need to overcome the environmental issues involved in various engineering applications [5–7]. From the materials point of view, carbon materials, conducting polymers, and transition-metal oxides/hydroxides are fundamental candidates used as supercapacitor electrode materials [6]. Pseudocapacitive materials such as hydroxides, oxides, and polymers are being explored for fabricating supercapacitors with increased specific capacitances and a high energy density. Among these pseudocapacitive materials, nickel hydroxide [($Ni(OH_2)$] is a promising candidate for supercapacitors due to its cheap, easy synthesis and its high theoretical capacity value (ca. 3750 Fg^{-1}) [7]. However, nickel hydroxide often results in compromises of rate capability and reversibility because the active materials are typically too insulating to support fast electron transport which is required by high rates. To enhance the electrochemical performance, considerable research efforts have been placed on improving the electrical conductivity of $Ni(OH)_2$-based electrodes by exploring hybrid composite in which $Ni(OH)_2$ is combined with highly conductive materials such as

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https://doi.org/10.1016/j.est.2024.110766
Received 4 November 2023; Received in revised form 2 January 2024; Accepted 30 January 2024

Diamond & Related Materials 145 (2024) 111098

Contents lists available at ScienceDirect

Diamond & Related Materials

journal homepage: www.elsevier.com/locate/diamond

Design and construction of multiwall carbon nanotube wrapped $Co(OH)_2$ nanobricks: A high-performance supercapacitor for energy storage applications

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ARTICLE INFO

Keywords:
$Co(OH)_2$
CNTs
Electrochemical performance
Hydrothermal
Asymmetric supercapacitor
Energy storage device

ABSTRACT

The issue of inadequate conductivity of electrons is consistently linked to the electrode material for pseudocapacitor, which hinders the complete utilization of the active material. In order to address this issue effectively, we have developed a composite material consisting of carbon nanotubes (CNTs) that are extremely conductive and wrapped around pseudocapacitive $Co(OH)_2$ nanobricks. The supercapacitor is created in our laboratory using a modified hydrothermal method (MHT) that allows for in situ growth. An electrochemical study confirms that the $Co(OH)_2$@MWCNT electrode is extremely reactive, resulting in a maximum specific capacitance of 1911 Fg^{-1} (at 1 Ag^{-1}). Furthermore, after 10,000 cycles of execution, it displays remarkable stability over the long term, with 96.5 % retention at a constant current density of 1 Ag^{-1}. In addition, the ASC has a significant energy density of 89.3 $Whkg^{-1}$ at 1 Ag^{-1}. Furthermore, the device maintains an excellent energy density of 55.5 $Whkg^{-1}$ while operating at a power density of 1015 Wkg^{-1}. In addition, the $Co(OH)_2$@CNT//AC ASC has remarkable long-term cycling stability, with a just 4 % decrease in capacitance after 10,000 cycles. Furthermore, the device continues to maintain a commendable Coulombic efficiency of 83.5 %. These promising results indicate that these materials have the potential to be used in economical and reliable energy storage technologies.

1. Introduction

Supercapacitors, which are highly efficient, environmentally friendly, and capable of providing sustainable energy, have garnered considerable interest [1,2]. The reason for this is the superior characteristics of supercapacitors, such as their high power density, extended cycle life, fast charging and discharging rates, and their ability to overpass the hole amid regular dielectric capacitors (which have high power density) and batteries (which have high energy density) [3]. Supercapacitors are often classified into two distinct categories based on their energy storage mechanisms: electrical double-layer supercapacitors (EDLS) and faradic supercapacitors (FS). The choice of electrode material is a critical determinant of supercapacitor performance [4]. Carbon materials, including AC, CNTs, fibers of carbon and RGO are regarded as promising electrode materials for EDLS [5–10]. This is due to their plentiful availability, cost-effectiveness, harmless nature, large specific surface area, excellent electronic conductivity, high chemical stability, and broad operating temperature range. Nevertheless, the limited specific capacitance and energy density hinder its widespread use on a broad scale [11]. Specifically, technological advancements lead to an increasing number of activities related to high energy density and power density requirements for supercapacitors. Field-effect supercapacitors (FS), which use electrode materials composed of conducting polymers or electro-active metal oxides, have been proposed as promising options for industrial applications. This is due to their ability to provide much higher specific capacitance compared to electric double-

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https://doi.org/10.1016/j.diamond.2024.111098
Received 16 February 2024; Received in revised form 3 April 2024; Accepted 10 April 2024
Available online 12 April 2024

Electric Power Systems Research 230 (2024) 110192

Contents lists available at ScienceDirect

Electric Power Systems Research

journal homepage: www.elsevier.com/locate/epsr

A case study on transformer ferroresonance for subsea cable connected 230 kV substations using PSCAD

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ARTICLE INFO

Keywords:
Ferroresonance
Overvoltage
Energisation
De-energisation
Interconnectors
PSCAD

ABSTRACT

This research paper presents a comprehensive procedure on how to perform a ferroresonance study in a system dealing with the addition of subsea cable interconnector-2 between two 230 kV substations which is previously linked by subsea cable interconnector-1. Addition of a subsea cable interconnector-2 needs to be investigated for ferroresonance in planning and designing stages itself since the interaction between cable capacitive reactance and power transformers-magnetizing core which is a non-linear inductance may cause ferroresonance. The investigation is conducted in three stages namely energisation, de-energisation and stuck pole conditions of circuit breaker. Each stage concentrates on the overvoltage patterns as ferroresonance is characterized by overvoltage. The analysis is conducted in PSCAD/EMTDC software and the modelling of entire study network is done according to the CIGRE WG C4.307. The maximum overvoltage for each stage is found by performing 200 cases of statistical simulation and it is compared with the rated withstand voltage of the equipment. Through a rigorous analysis of overvoltage characteristics under different scenarios, suggestion has been given whether the subsea cable interconnector-2 can be safely operated during the studied cases without the risk of ferroresonance.

1. Introduction

Ferroresonance is a complex phenomenon which is feared by power system operators as it occurs randomly, which results in the catastrophic damage of electrical equipment and hence it is significant to evaluate the possibility of ferroresonance in the planning and design stages to avoid inexplicable equipment failures [1]. Ferroresonance is expected to occur during system switching in power systems resulting in overvoltage [1–3],. Sustained overvoltages can lead to catastrophic failure of equipment such as transformer, breakers, surge arresters leading to the risk of explosion which pose safety hazard to substation personnel and equipment [1,4].

In linear circuit, resonance occurs at driving frequency when the capacitive reactance becomes equal to the inductive reactance [1,3]. In non-linear circuit, at a given natural frequency, multiple values of inductances are exhibited when the core is driven to saturation, therefore implying capacitances of wide range that can potentially favour ferroresonance. Ferroresonance is described as complex interaction typically in a non-linear series circuit between the ferromagnetic core, a non-linear inductor and capacitive elements in a power system as shown in Fig. 1 [1,5,6]. During system switching operations, such as energizing or de-energizing a line, power transformers or switching capacitors, the combination of inductance and capacitance in the system can create ferroresonance conditions [2]. This is due to the interaction between the saturable inductors (such as transformers with magnetic cores) and the capacitance in the system resulting in the buildup of energy in the magnetic core, leading to overvoltages and distorted waveforms [7].

At steady state and rated frequency, the critical system parameters that can impact on ferroresonance behaviour are circuit capacitance, source voltage and circuit losses. The key parameters that govern the ferroresonance are described as follows: (i) the onset of ferroresonace is favoured by low values of capacitance whereas high values of capacitance prevent it [1,8], (ii) Risk of ferroresonance is increased, if Thevenin's voltage source is increased (iii) Risk of ferroresonance is reduced when circuit losses are increased [1,9]. Ferroresonance waveforms are categorised based on their periodicity. (i) Periodic Ferroresonance Mode is characterized by distorted waveforms presenting either fundamental or sub-harmonic that can be dominant frequency (ii) Quasi-Periodic Ferroresonance Mode is characterized by non-periodic waveform having atleast two main frequencies (iii) Chaotic Ferroresonant Mode characterized by irregular and unpredictable waveform [1,7,8].

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https://doi.org/10.1016/j.epsr.2024.110192
Received 14 September 2023; Received in revised form 9 January 2024; Accepted 23 January 2024

Journal of Environmental Protection and Ecology 25, No 2, 1–1 (2024)

4842

SUSTAINABLE ENERGY AND POWER QUALITY ASSESSMENT BY INVASIVE THERMOGRAPHY AND ENERGY AUDIT IN THE TEA INDUSTRY: A SCIENTIFIC STUDY

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Abstract. Energy conservation is crucial in any process industry because it can minimise operating costs, reduce environmental effects, improve resource use, foster innovation, and promote sustainability. This work proposes energy conservation methods for various machines involved in the tea processing industry. Most drive systems employed in the process use induction motors. This case study presents real-time data from a leading tea industry. Every electrical system in the industry was analysed, and appropriate energy conservation methods were suggested for various machines. The power quality of every section is analysed, thermographed, and compared to the allowed temperature range. This eminent method of energy auditing reports on possible ways to improve energy conservation by all means. Electrical parameters are measured on various machines at different ratings. In the thermographic study, the temperatures of the motor's driving and non-driving ends were compared, and they were found to be between 38 and 53°C and 49 and 83°C, respectively. The case study improves electrical system consistency.

Keywords: tea industry, electrical network, energy audit, thermographic analysis, Total Harmonic Distortion (THD), non-contact type of testing, power quality.

AIMS AND BACKGROUND

The evaluation of energy is the key to a systematic approach to decision-making in the area of energy management[1]. The objective of the energy, power quality, and thermographic audit is to assess the viability of upgrading the energy efficiency[2]

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International Journal of Modern Physics C
(2024) 2450134 (21 pages)

DOI: 10.1142/S0129183124501341

Aerodynamic performance of semi-wing with multiple winglets operating at low- and medium-range Reynolds numbers

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Received 1 January 2024
Revised 15 January 2024
Accepted 3 March 2024
Published

Birds have traits that can induce better aerodynamic efficiency along with high manoeuvring capability during its flight, which could be shared with unmanned aerial vehicles for improving their aerodynamic performances. One such feature of the wing tip, i.e. the primary feathers of the birds could be an effective geometrical feature to reduce the wing tip vortices. This paper presents the bio-inspired wing tip devices, i.e. three-and four-tipped multiple winglets in reducing the strength of vortices emanating from the wing tip of the wing operating in the Reynolds number (Re) of 0.9794×10^5 and 0.9794×10^6. Different combinations of both three- and four-tipped multiple winglets have been designed by varying the cant angle of each tip. Numerical simulations were carried out using Ansys-Fluent by solving three-dimensional Reynolds averaged Navier–Stokes formulations coupled with k-ϵ turbulence model to resolve the features of tip vortices. The simulation clearly indicates that there is a strong correlation between the size of the vortices and the aerodynamic performance parameters such as C_L/C_D, $(C_L)_{\max}$, ${C_L}^{0.5}/C_D$, ${C_L}^{1.5}/C_D$. The three- and four-tipped multiple winglets are effective in reducing vortex drag by disintegrating large strength vortex which occurs in the tip of straight wing, into few numbers of small strength vortices. When compared to straight wing, three-tipped multiple winglet with the cant angle

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Journal of Energy Storage 73 (2023) 109266

Contents lists available at ScienceDirect

Journal of Energy Storage

journal homepage: www.elsevier.com/locate/est

Research papers

Banyan wood-derived activated carbon and binder-free Co_9S_8/NF@PPy hierarchical flower-like electrodes: Na^+ and K^+ electrolytes based solid-state asymmetric supercapacitor

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ARTICLE INFO

Keywords:
Wood-derived activated carbon
Binder-free electrode
Co_9S_8/NF@PPy composite
Solid state supercapacitor
High energy

ABSTRACT

Supercapacitors require immediate electrode materials with outstanding performance. Here, a heterostructure Co_9S_8@PPy supported on conductive Ni foam (Co_9S_8/NF@PPy) is created utilizing hydrothermal and chemical polymerization techniques. The Co_9S_8/NF@PPy electrode exhibits an exceptional specific capacitance of 1485C g^{-1} and 1936C g^{-1} at a current density of 2 A g^{-1}, respectively, using various Na_2SO_4 and KOH electrolytes. The improved electrochemical efficiency could be attributed to the superior structural properties, the numerous active sites, the abundance of redox reactions, the strong synergistic effect in the heterogeneous conducting polymer composition, and the good conductivity resulting from the NF and the Co_9S_8/NF@Ppy. An asymmetric supercapacitors (HSCs) device is made utilizing activated carbon made from banyan wood (BWAC) as the negative electrode and Co_9S_8/NF@Ppy as the positive electrode to further assess the effectiveness of the Co_9S_8/NF@Ppy electrode in practical applications. The prepared BWAC material exhibits a high surface area of 1038 m^3/g and a tiny pore size of 4 nm. The BWAC electrode exhibits high specific capacitance and volumetric capacitance of 156 Fg^{-1} and 89 Fcm^{-2} at a low current density of 2 A g^{-1}. The different electrolyte-based assembled Asymmetric Solid-State Supercapacitor (ASSN and ASSK) constructed of Co_9S_8/NF@PPy and BWAC also exhibits power densities (4284, 2053Wkg^{-1}) and energy densities (47.6, 73.5 $Whkg^{-1}$) at a low current density of 2 A g^{-1}. This study provides a framework for the optimal material preparation and logical electrode material design, including the enhancement of the characteristics of Ni foam-based materials for use in supercapacitors.

1. Introduction

The need for large-scale energy storage systems is increasing because of the rapid expansion in terms of renewable energy sources like solar and wind power, which are sporadic and dependent on environmental factors [1]. Supercapacitors (SCs), which provide a lot of power, rapid charge and discharge protocols, longer life spans, and inexpensive upkeep, have received a lot of attention recently in comparison to rechargeable lithium-ion batteries [2]. However, the limited energy density severely restricts the range of uses for SCs [3]. Thus, it is becoming increasingly important from a technology standpoint to boost SCs' energy densities without losing some of their power densities.

Hybrid supercapacitors (HSCs), which merge an electrode of the sort of an electrochemical double-layer capacitor (EDLC) with one of the kind used in batteries, have been offered as a solution to this problem. One EDLC-type electrode in a typical HSC is frequently made of activated carbon to boost power density because of its excellent chemical resistance and rapidity. The second faradaic electrode, used in batteries, is constructed from a pseudo-capacitive substance, allowing more charge storage capacity through surface redox reactions, which can boost energy storage capability [4]. Recent research has focused on the search for and the development of bio-based carbon electrode materials that are environmentally benign [5]. The utilisation of several biomass sources for use as carbon sources in electrode materials has already been studied by several researchers. Rice husk, banana peel waste, coconut shell, coffee beans, fungal cellulose, kraft pulp mill sludge biowaste,

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https://doi.org/10.1016/j.est.2023.109266
Received 5 July 2023; Received in revised form 30 September 2023; Accepted 9 October 2023
Available online 16 October 2023

Journal of Energy Storage 69 (2023) 107948

Contents lists available at ScienceDirect

Journal of Energy Storage

journal homepage: www.elsevier.com/locate/est

Research papers

Fabrication of binder-free CNT/$FeNiS_2$@PPy mixed metal sulfide loaded Ni Foam as cathode material for asymmetric supercapacitor applications

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ARTICLE INFO

Keywords:
Mixed metal sulfide
$FeNiS_2$ nanodisk
CNT/$FeNiS_2$@PPy
Asymmetric supercapacitor
Trasatti method

ABSTRACT

The Mixed Metal Sulfide of ($FeNiS_2$) has drawn a lot of interest as a potential electrode for an asymmetric supercapacitor, but challenges remain due to its poor cycle stability and low electrical conductivity. In this study, carbon nanotubes (CNTs) serve as the fundamental structural support for the tightly bound $FeNiS_2$ discs, which are further immobilised using an external elastic protective layer of polypyrrole (PPy). The creation of a CNT/$FeNiS_2$@PPy nanotube@nanodisk heterostructure that acted as a good electrode option for Ni Foam is described in this research. The heterostructure was created using a simple and affordable hydrothermal and polymerization approach. The novelty of this study, the fabrication of electrodes via a capacitive/diffusive technique, was clearly identified by using the power law and Trasatti method. As a result, asymmetric supercapacitors primarily employ the redox interaction between ferrous and ferric ions (Fe^{2+}/Fe^{3+}). These outstanding chemical properties have caught the interest of many people and led to a substantial amount of study on iron-based cathodes. The resulting binder free CNT/$FeNiS_2$@PPy electrode has a huge specific capacitance of 1541 Fg^{-1} at $2Ag^{-1}$ and a reversible high-level capacity retention of 98.1 % after 10 K extended cycles at high current density 10 Ag^{-1}. The Assembled Asymmetric supercapacitors constructed of CNT/$FeNiS_2$@PPy and activated carbon also generated a power density of 9375 Wkg^{-1} and an energy density of 28.9 $Whkg^{-1}$ at a 1.6 V potential. This study provides a framework for the optimal material preparation and logical electrode material design, including the enhancement of the characteristics of Ni Foam-based materials for use in supercapacitors.

1. Introduction

Effective energy storing and conversion techniques are essential for the society's sustainable growth. The characteristics of a potential energy storage technology known as supercapacitors are high power density, quick charge/discharge rates, and consistent cycle stability [1–4]. These features make them a feasible alternative for usage in portable electronics and electric vehicles. The improvement of energy density is currently the focus of substantial efforts [5–7]. Supercapacitors have used a variety of materials, including carbon [8–13], conducting polymers [14–16], and transition metal oxide/hydroxides [17–20]. However, proper structural design and electrode material synthesis are an essential element for the development of supercapacitors with better electrochemical performance.

It has been determined that the main variables controlling Supercapacitors (SCs) electrochemical performance are the electrode materials. Based on how they store charge, the two primary types of SCs are electrical double-layer capacitors (EDLCs), which use electrostatic charge separation at the electrolyte/electrode interface, and pseudocapacitors, which feature rapid redox reactions at/near the electroactive material on electrode surfaces [21–23]. It goes without saying that the electrode material must be developed as the primary component when designing a supercapacitor. Transition metal oxides and hydroxides with unusual chemical compositions, physical morphologies, and outstanding pseudocapacitor performance have been extensively studied as potential electrode materials [24–27]. The main obstacle to using these materials as prospective electrode materials is their poor electrical conductivity.

To solve this issue, numerous attempts have been made to deal with mixed metal oxides and take into consideration their mixed valence states in order to increase conductivity. Mixed metal sulphides have just recently been mentioned as potential electrode materials for

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https://doi.org/10.1016/j.est.2023.107948
Received 31 January 2023; Received in revised form 4 May 2023; Accepted 4 June 2023
Available online 10 June 2023

Journal of Energy Storage 93 (2024) 112210

Contents lists available at ScienceDirect

Journal of Energy Storage

journal homepage: www.elsevier.com/locate/est

Research papers

Facile synthesis of novel $MnSe_2$/Ppy based cathode material for high capacity aqueous Zn-ion batteries

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ARTICLE INFO

Keywords:
$MnSe_2$
Polypyrrole
Cathode
High capacity
Zn ion battery

ABSTRACT

Rechargeable zinc-ion batteries, or ZIBs, have garnered increasing interest recently as flexible and environmentally friendly energy storage options for grid-scale applications. This is because of the zinc metals special qualities, low cost, and high safety. However, the restricted supply of cathode materials makes it difficult to continue developing high-performance ZIBs. Herein, we develop $MnSe_2$/PPy based cathode material by using hydrothermal and polymerization process. The cathode $MnSe_2$/Ppy exhibits high specific capacity of 484.7 $mAhg^{-1}$ at 0.1 Ag^{-1}.The cyclic stability of $MnSe_2$/PPy exhibits 91.6 % after 2000 cycles at 0.1 Ag^{-1}. This tactic offers a fresh approach to enhancing the layered structure's functionality as an aqueous zinc ion battery.

1. Introduction

Building new energy infrastructure and Using renewable energy is linked to the advancement of humanity, Energy storage is the most important pressing problem that has to be resolved [1–4]. Concerns about the safety, environmental impact, and scarcity of lithium metal in relation to The industry leader in lithium-ion batteries (LIBs) has already assumed a leadership position, are becoming more and more pressing [5–7]. The element zinc is more environmentally friendly, stable and secure than LIBs. It also has a higher content. Over time, one of the greatest substitutes has emerged as aqueous zinc-ion batteries, or AZIBs. Mn-based materials [8–10], V-based materials [11], and Prussian blue analogues [12] each one was thoroughly examined as possible ZIB cathode materials. Due to its enormous Possessibility, security, and ability (308 $mAh{\cdot}g^{-1}$), MnO_2 (MNO) has attracted a lot of interest as a common chemical. Because MNO has poor conductivity and issues with when charging and discharging, volume expansion that is able to shorten the lifespan of energy storage devices quickly, it cannot be employed in expansive energy storage networks [13]. Potential Zn^{2+} storage materials in aqueous ZIBs are Mn-based oxides, which have the advantages of being inexpensive, environmentally friendly, low toxicity, and having multivalent states (Mn^x, x = 0, 2^+, 3^+, 4^+, and 7^+).Additionally, polyvalent manganese oxides have a variety of crystal forms; MnO_2 has the most structures, including a−/b−/d−/c−/k−/ and R-MnO. The basic crystal structure of manganese dioxide is an octahedral unit made up of one Mn atom and six O atoms. After that, the MnO_6 octahedral elements are linked to form a tunnel structure, the size of which is determined by the precise quantity of MnO_6 octahedral [14].

In the last five years, more academics have started to realise how important zinc anodes are to ZIB performance overall, so it's great that more attention has already been devoted to them. The main challenges facing zinc anodes at the moment are (1) zinc dendrite growth during extended cycles, which causes self-discharge difficulties, and (2) the creation of irreversible accessory chemicals (e.g., ZnO) during longer cycles. Like a lithium metal anode, all of these drawbacks are caused by higher zinc and electrolyte consumption from side reactions, which leads to low Coulombic efficiency (CE) and poor reversibility. Because of this, in order to maintain a long battery cycle life, utilising too much zinc typically results in decreased energy density and greater costs. Furthermore, it is frequently necessary to regularly refill the electrolyte with water in order to make up for the breakdown of the water. Therefore, it is critical and imperative to find solutions to these challenging issues with zinc anodes and enhance their electrochemical performance for use in real-world applications in the future [15].

Dong Zhao et al. have developed a novel low-strain $Zn_3V_4(PO_4)_6$ cathode for zinc-ion batteries. It provides outstanding cycle stability

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https://doi.org/10.1016/j.est.2024.112210
Received 1 April 2024; Received in revised form 16 May 2024; Accepted 20 May 2024

HEAT DISSIPATION EFFECTS OF DIFFERENT NANOCOATED LATERAL FINS
An Experimantal Investigation

by

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Original scientific paper
https://doi.org/10.2298/TSCI230715234M

Electrical batteries, mobile phones, central processing units of computing systems, and scientific instruments lose life due to improper heat transfer. Thermal management enables these electronics to run smoothly. This experiment measures heat sink temperature fluctuations during heating and cooling using lateral fins coated with graphene and carbon CNT. The study examined 15 W, 25 W, 35 W, and 45 W heat inputs to record the time to reach 40 °C, 50 °C, and 60 °C. Regardless of the coating material used in the heat sink, the time taken by the heat sinks to attain 60 °C was more than 3000 seconds. Heat input reduced the time to below 3000 seconds. Heat sinks dissipated heat until 32 °C during cooling. Infrared spectroscopy showed fins and heat sinks' energy retention. Convective heat transfer cooled the middle row of fins, and coated and uncoated heat sinks were evaluated for enhancement ratio. Coating the heat sink with graphene resulted in an enhancement in heat transfer by 1.15. While heating at 15 W, the CNT coated heat sink exhibited a 1.9 enhancement ratio. The graphene-coated heat sink had an enhancement ratio for 25 W, 35 W, and 45 W heat inputs. The study found that operating temperature, input energy, and nanocoatings affect heat sink performance. This work can help optimise heat transfer from the heat sink to the atmosphere by determining nanocoating thickness. Mixed-material coating studies can disclose heat sink performance.

Key words: *thermal management, heat sink, nanocoatings, graphene, CNT, enhancement ratio*

Introduction

Transferring heat efficiently is essential for the continued operation of both organic and inorganic systems, including but not limited to live organisms, industrial machinery, automobiles, electrical devices, and variable components. Heat is transferred via conduction and convection when the temperature difference between the heat source and the heat sink (the at-

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Journal of Mechanical Science and Technology 38 (4) 2024

Original Article
DOI 10.1007/s12206-024-0332-5

Keywords:
· Surface roughness
· MQL
· End milling
· Prediction
· Artificial intelligence

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Citation:
Lavanya, G., Sundaramurthy, K., Subburam, V., Makesh, M. (2024). Intelligent prediction using AI-based modeling and optimization of surface roughness in Al7049 end milling with coconut oil under minimum quantity lubrication. Journal of Mechanical Science and Technology 38 (4) (2024) 2005~2014.
http://doi.org/10.1007/s12206-024-0332-5

Received July 29th, 2023
Revised December 18th, 2023
Accepted January 18th, 2024

† Recommended by Editor
Hae-Jin Choi

Intelligent prediction using AI-based modeling and optimization of surface roughness in Al7049 end milling with coconut oil under minimum quantity lubrication

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Abstract Metal cutting researchers attempt to develop technology for metal cutting and use of cutting fluids have been continuous due to increasing demands for high productivity. This work reports on the effect of coconut oil under minimum quantity lubrication (MQL) during end milling of AL7049. Dry, wet and MQL approaches are all used to conduct the experimental studies. In contrast to dry and wet machining, it is apparent that MQL generates surfaces with less roughness. A multilayer perceptron (MLP) prediction model was developed considering the real-time dataset with three inputs, and an output that led to prediction of surface roughness. It was analyzed to determine the appropriate activation function and observed that ReLU activation function outpaces sigmoid and tanh and adapted to the proposed solution. K fold cross-validation was done for the developed MLP model with backpropagation to substantiate high accuracy in predictions than KNN and linear regression. The MQL will be good alternative to wet machining and also environmentally friendly machining solution.

1. Introduction

Modern manufacturing relies significantly on machining due to its accuracy, versatility, and capacity to create complicated parts. It makes prototype, mass production, and customization possible, making it a crucial process in all industries. Continuous innovation and the use of cutting-edge machining methods have a significant impact on the expansion of industry and the economy. The environment and human health have been seriously impacted by cutting fluids used in the metal machining sector. In the field of metal cutting, there has also been an increase in worry over the extremely high cutting heat and forces in machining. Therefore, it is essential to find an environmentally friendly cooling and lubricating systems. Vegetable oils have been shown to be effective alternative cutting fluids for machining and maintaining an eco-friendly quality. New methods and strategies are applied for prediction of various parameters in machining. For manufacturing enterprises, the incorporation of AI models into the prediction of machining parameters can result in increased productivity, lower costs, better product quality, and more competitiveness.

In view of all of this, the focus of this experimental work is to substantiate the efficacy of coconut oil as a cutting fluid and to create an AI (artificial intelligence) prediction model to predict the workpiece's (Al7049) surface roughness during end milling. To forecast the performance requirements of the end milling process on AISI1020 steel, an ANN (artificial neural network) model was created. The efficiency of the model, which had five input neurons, six hidden layers, ten neurons in each layer, and six output neurons, was demonstrated by its good agreement with experimentation results [1]. In machining experiment, cutting tools that were uncoated,

OPTIMIZATION OF END MILLING PARAMETERS FOR BETTER SURFACE FINISH USING SIX SIGMA

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ABSTRACT: *The objective of this investigation is to propose a simple methodology by combining Taguchi method and six sigma, to optimize the cutting parameters in end milling of aluminum 6063 for better surface finish under Minimum Quantity Lubrication (MQL). The most common surface characteristics surface roughness average Ra and maximum surface roughness height Rt are considered. The Taguchi experimental design and six sigma statistical tool are used with three levels of control factors and one noise factor. Experiments are conducted with respect to L9 orthogonal array. The optimum cutting conditions are determined based on the experimental values of surface roughness average, maximum surface roughness height and S/N ratios. T tests are also conducted to find the effect of noise factor. The results of confirmation runs ensure the optimum cutting conditions determined by Taguchi design of experiments and six sigma.*

KEYWORDS: *Optimization, surface roughness, Taguchi method, Six sigma, MQL*

1 INTRODUCTION

Aluminum alloys are the most prominent material in automotive, air craft, electrical, sports, building and architecture industries due to its distinctive properties of less weight, good machinability and good thermal and electrical conductivities. The applications of aluminum are intensifying due to its auspicious properties. The increasing demand has also resulted in high productivity with increased product quality and less cost. This enforces the metal cutting industries to establish the best combination cutting conditions. Choosing optimum cutting conditions is the crucial step in accomplishing greater machining efficiency. One of the most widespread metal cutting operation is end milling in variety of manufacturing industries and gives reasonably good surface quality.

A reliable manufacturing process is developed by utilising Six Sigma, to achieve precise machining while controlling the cutting temperature to minimise energy waste (Mia et al. 2020). In end milling Al6061, six sigma approach is used to identify the ideal cutting parameters to reduce process variations and to identify the machining condition that results in the fewest process variations. (Ganesh and Radhakrishnan, 2014). Six sigma is applied to improve the process capability index and surface quality of the components produced are within the expected limits (Sky Chou and Joseph, 2017). To optimising variables and enhancing material removal rates, the Six Sigma methodology is employed galvanised iron turning processes (Das et al. 2017). Six Sigma DMAIC technique is used to develop the experimentation plan and factorial plots are used to assess the contribution of key parameters. The statistical analysis that has been done to help reduce cycle time and the best values for the best cutting conditions are then proposed (Manoj et al. 2022).

New process control techniques are suggested an emphasis on lead time and energy usage to optimise the response plans after an anomaly is found and DMAIC methodology for the 6S quality management of additive manufacturing is also suggested to design, develop, and carry out (Yaug et al. 2021). A procedure incorporating the response surface approach along with finite element method and Six Sigma analysis is presented with into a multi-objective genetic algorithm (Pham et al. 2023). By using the Six Sigma technique, the amount of errors in the fine grinding process was reduced significantly and the profitability has been remarkably impacted by the DMAIC technique (Gijoa et al. 2011). Multivariate DMAIC, a domain-specific Six Sigma methodology, was introduced and demonstrated to be extremely effective throughout the phases and aspect of the quality enhancement in the hardened steel turning case (Rogerio et al. 2020).

BME Horizon Vol 1 Issue 2 2023
DOI: 10.37155/2972–449X–vol1(2)–72

ORIGINAL RESEARCH

Open Access

Ethanopharmacological Approach to Control the Replication of 2019-nCov in Host- An Insilico Study

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Received: August 21, 2023; **Accepted:** October 21, 2023; **Published Online:** October 25, 2023

How to cite: Thenmozhi M., Mohan S., Kumar M. S., ang Kumaravel, S.T. Ethanopharmacological Approach to Control the Replication of 2019-nCov in Host- An Insilico Study. *BME Horizon*, 2023; vol1(2). DOI: https://doi.org/10.37155/2972-449X-vol1(2)-72

Abstract: 2019- nCoV viral disease threatening every individual throughout the world. It is a highly challenging task to control the spread everywhere. There are certain antiviral drugs, steroids that are currently being prescribed to infected patients for faster recovery. But there is no proper cure today for this pandemic. In this present study, we have focused on controlling the replication and other possibilities of interaction of the 2019-nCoV virus inside the host cells. There are various herbs prescribed to us to improve our immunity and prepare our bodies to fight against this pathogen. In this study, herb compounds that are selected are Andrographolide (AP_1), 14-deoxy-11,12-didehydroandrographolide(AP_3), Ascorbic acid, Cinnamaldehyde, Curcumin, Diallyl sulfide, Eugenol. Gingerol, Kaempferol, Deacetylnimbin, Piperine, Quercetin, thymol, thymoquinone, Vasicine based on the literature survey. Selected ligands are most of them to treat respiratory tract infections and are also related to improving humoral immunity. Selected Ligand was allowed to dock against viral proteins which Crystal Structure of the SARS COV-2 Papain-like protease (Figure 1a) (PDB ID: 6wx4), RNA dependent RNA polymerase (Figure 1b) (PDB ID: 7c2k), Crystal structure of SARS COV-2 ORF7A encoded accessory protein (Figure 1c) (PDB ID: 6w37) Crystal structure of SARS COV-2 ADP-Ribose phosphatase NSP3 Proteins (PDB ID: 6w6y), PDB ID 6zsl Crystal structure of SARS COV-2 helicase NSP13 (PDB ID: 6ZSL), Crystal structure of NSP10-NSP16 Complex (PDB ID: 7bq7), PDB ID 6xdc Crystal structure of SARS COV-2 ORF3a Protein (PDB ID: 6xdc) to study their efficacy to control the replication and possible interactions in the human system using computational docking study. A Protein-Protein interaction study was

Proceedings of the Institution of Mechanical Engineers, Part E: Journal of Process Mechanical Engineering
Impact Factor: 2.4 / 5-Year Impact Factor: 2.3
JOURNAL HOMEPAGE | SUBMIT PAPER
Restricted access | Research article | First published online March 5, 2024

A TOPSIS-based thermal performance optimization of DHCTHX using MWCNT nanofluids

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OnlineFirst | https://doi.org/10.1177/09544089241235919

Abstract

Double-helically coiled tube heat exchangers are employed in many different heat transfer applications because of their better heat transfer capabilities and compact construction. The double helically coiled tube heat exchanger (DHCTHX) improves turbulence and maximizes heat transfer rate compared to straight tubes. A full factorial, orthogonal array of trials is used in this study (L27) to test various volume concentrations of nanofluids. The pressure drop, de, LMTDOC, re, and F have all been attempted to be optimized using the order preference similarity to the ideal solution technique. In this case, the mass flow rate and volume concentration are the variables for the input process, while the outputs are the heat transfer rate, pressure drop, de, LMTDOC, and F. The experimental results show that a nanofluids volume concentration is 0.6% and its mass flow is 120 with a range of 1460 Dean Numbers, which is the optimal configuration for maximizing the overall heat transmission and minimizing the pressure drop. The multiple-

IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

DESIGN AND DEVELOPMENT OF AN ECO SUSTAINABLE TREADMILL BICYCLE

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Abstract-The abstract delves into the technical intricacies of the design, outlining the synchronization of treadmill and bicycle components. Special attention is given to the efficiency of the DC power generator, exploring its capacity to harness and convert the energy produced during exercise. The project's innovative approach is underscored by its potential to contribute to clean energy initiatives and promote eco-friendly fitness solutions. Consideration is also given to the health benefits of this hybrid exercise device. By combining the cardiovascular advantages of cycling and walking, users can experience a comprehensive workout that targets various muscle groups. The abstract emphasizes the potential impact on personal fitness routines and the broader fitness industry.Moreover, the abstract discusses the applications of the Treadmill Bicycle beyond individual use. The generated DC power could find applications in powering small electronic devices or feeding into local energy grids. The project's interdisciplinary nature, bridging fitness and renewable energy, is highlighted as a key strength. This Treadmill Bicycle with a DC power generator represents an innovative convergence of exercise and sustainable technology. The abstract encapsulates the project's technical aspects, health benefits, and potential societal contributions, positioning it as a pioneering solution at the intersection of fitness and renewable energy.

CHAPTER 1

INTRODUCTION

The treadmill bicycle is completely a new way of moving which is designed mostly for runners. Basically, using a treadmill is similar to running, hiking or walking. Think about the last time you were riding a bike over a few obstacles such as train tracks, potholes, speed bumps etc. The possibilities are you stood up on the pedals to improve your balance when crossing the obstacle. Basically, the treadmill bicycle will provide the rider a well-balanced position the entire time. Since it uses no fuel it a very conventional option for people in their busy schedule to take care of their health completely. People with a busy schedule will also be able to take care of their health and physical fitness. Above all, it is not a conventional treadmill to make use of only in closed rooms, people using treadmill bicycles can roam around freely on roads as well. This project overcomes the drawback of the conventional treadmill which is stationary and moreover the jogger gets exposed to the natural atmosphere too. So this proposed methodology provides an ultimate solution by making use of the wheels and making the treadmill bicycle a walking cycle. The walking cycle has a simple mechanism, operated with free wheels, gear chain, bearing shaft and links arrangement. The conversion of the linear motion into rotary motion is done by the gear chain and free wheel mechanisms of the linkages, which involves very simple movements. The rotary motion is again converted into linear motion of the cycle through mechanical linkages (gear chain and free wheels) arrangement. The conveyor system is either a continuous movement or intermittent which depends on the person's usage. So a basic free wheel mechanism with bearings is designed with time delay which can be used to halt the movement when necessary. This invention relates to improvements in transport devices, and it relates particularly to devices for transferring people, small in number like that of a bike or a cycle. The Walking Bicycle is the one, which combines walking and cycling into one activity. The Walking Bicycle combines the two activities into a linear motion, allowing you to propel yourself forward at desired speed, simply by walking on the belt provided. Usually, the operation of the walking cycle machine is controlled by the user itself by simply walking on the treadmill belt and also balancing the cycle. The operating speed of the walking cycle differs on the amount of force applied by the user.

Journal of New Materials for Electrochemical Systems
Vol. 27, No. 1, January 2024, pp. 25-29
Journal homepage: http://iieta.org/journals/jnmes

Optimization of the Parameters of the Electrochemical Micromachining Process Using Artificial Neural Network (ANN) Models to established a Simple Relationship Between Machining Rate (MR), Overcut (OC) and Input Data

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https://doi.org/10.14447/jnmes.v27i1.a04

Received: October 31-2022
Accepted: September 12-2023

Keywords:
Machining rate, overcut, micromachining, Aritificial Neutral Network

ABSTRACT

Unconventional machining methods include electrochemical micromachining (EMM). EMM is suitable for hard and difficult-to-cut materials used in the manufacture of special forms of machine parts used in aeronautics and hydro pneumatic machinery. As a result of a set of electrical, mechanical and chemical parameters, the EMM process is a very complex process. The analytical modeling of the method is therefore difficult. The artificial neural network (ANN) significantly simplifies the relationship between input and output parameters due to the large number of measurements required. With a set of data containing very different machining parameter choices, the neural network was trained. This paper presents the results obtained for predicting certain output parameters. The ANN is used in this paper to determine the model for parameter optimization. To represent the relationship between machining rate (MR), overcut (OC) and input parameters, an ANN model has been established that adapts the Levenberg-Marquardt algorithm and Bayesian regularization (LMABR). The model is shown to be efficient, and optimized machining parameter improves the MR and OC.

1. INTRODUCTION

The need to develop new, multi-material, micro-components and multi-functional has increased significantly and new challenges have been posed by improving manufacturing competence due to increased competition in the manufacturing industry preferrred by Qin et al. [1]. Bhattacharyya et al. utilized micromachining for material removal in the form of micron-sized chips. EMM is considered among the different processes for its following merits, such as no heat-affected zone problem, to machine any type of material, no residual stress , no wear of the tool, lesser machining time, high precision can be achieved, cost-effective and the quality of surface finish makes this machining process more attractive for drilling holes on products [2].

By observed the current situation Tsai and Wang investigated the EMM parameter selection in the industrial sector is conservative and far from optimal and requires expensive and more time-consumption experiments to choose optimization parameters. By adjusting various optimization techniques, some of the researchers tried to increase the performance of machining. An efficient method for solving non-linear problems is the ANN. Surface finish predictions for different work materials were compared based on varoius ANN models with the change of electrode polarity [3]. By Gao et al. established the parameter optimization model for EDM, used the ANN and the genetic algorithm (GA) together [5]. Cao and Yang, presented a method of optimizing the parameters in EDM sinking process with the application of ANN [4]. The ECM process was modeled and simulated by Catalin Sorin Ungureanu using the ANN [6]. To model the experimental data, Senthil kumar et al. employed a multilayer ANN with back-propagation technique [7]. A comparison made between predicted and experimental values shows a close match with an average 6.48 percent prediction error. Sangwan et al. investigated the capability of GA-ANN for optimization and prediction of surface roughness (Ra). Good relationship between the experimental and predicted values is shown by the predicted results using ANN. In addition, to determine the optimal machining parameters that lead to minimum Ra, GA is integrated with the neural network model. The analysis of this study shows that the optimum machining parameters can be predicted by the ANN-GA approach[8]. Zou et al. used an ANN to map the input parameters to the performance indicators for the EMM process. The 3.57 percent mean absolute percentage error (MAPE) for the testing set showed that the trained ANN was able to predict outputs with a very high degree of accuracy for unseen data points [9]. Kasdekar et al. utilized the ANN model for the response parameters by using MATLAB software. The result shows the good relationship between the experimental values and predicted values [10]. Maniraj et al. investigated the impact of parameters in EMM process and also optimize the parameters by using Taguchi and TOPSIS for improving the performance of EMM process [11]. Kalaimathi et al. investigated the

International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 02 Issue: 03 March 2024
Page No: 339 - 348
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2024.0051

Underwater Visible Light Communication for Scuba Divers Health Monitoring System

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Abstract
Diving has become a common way of performing research in the underwater living world. One of the major problems with diving is the health issues faced by the divers during diving and there comes the need for monitoring diver's health. This paper mainly focuses on the health monitoring systems for divers by transferring the data using Li-Fi (Light Fidelity). This system senses different health specifications like heartbeat, body temperature and body position. The monitored health specifications are recorded as a database in a memory chip for further analysis. To reduce the power consumption, the system transfers the data to the nearby divers and ships only during the abnormal health issue. The uniqueness of this system lies in its combination of advanced technologies for diver safety, communication, and submarine surveillance. This is crucial for ensuring their safety, especially in challenging underwater environments. This is perhaps one of the most unique aspects. Li-Fi, which uses light to transmit data, is a breakthrough for underwater communication. This system provides real-time data on the diver's condition and an immediate way to request assistance in case of an emergency. By incorporating temperature and gyro monitoring, the system collects valuable data on diver conditions and movements. This data could be analyzed for research or used to improve safety protocols in the future.

Keywords: *Decentralizing, Stitching, Navigation, Panoramic images.*

1. Introduction
The undersea environment provides a unique and demanding backdrop for human activity, particularly in diving settings. Communication and health monitoring are key components of guaranteeing scuba divers' safety and well-being in such circumstances. Traditional radio-frequency (RF) communication systems are severely limited in underwater environments due to radio wave attenuation and dispersion. Underwater Li-Fi Communication has developed as a possible option in answer to these issues [1].

2. Objectives
Li-Fi, short for Light Fidelity, is a cutting-edge wireless communication technology that transmits data using visible light or near-infrared spectrum. In contrast to typical RF-based systems, Li-Fi has the ability to provide high-speed, secure, and dependable communication in situations where existing approaches struggle. The inherent benefits of light waves, which do not experience the same propagation limitations as radio waves underwater, are taken advantage of by this technique. This project's main objective is to put in place a cutting-edge underwater Li-Fi communication system made exclusively for keeping track of scuba divers' well-being. To offer thorough real-time health information fo rscuba divers, this system integrates several sensors, including an emergency button, a body

International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 02 Issue: 03 March 2024
Page No: 355 - 363
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2024.0053

Intelligent Image-Based Defense Against Incursion from The Wild Animals

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Abstract

A revolutionary development in agricultural security, Smart Crop Guardian is designed expressly to counter invasions from wild animals. This system merges cutting-edge sensors and powerful algorithms to give an all-encompassing defense mechanism for crops by utilizing cutting-edge image-based technologies. Smart Crop Guardian continuously monitors the environment to detect and track wildlife hazards in real time, enabling prompt intervention and reducing possible harm. This abstract explores the salient characteristics and advantages of Smart Crop Guardian, showcasing its potential to transform crop protection techniques. The core of Smart Crop Guardian is its intelligent image-based skills, which let it distinguish between environmental conditions that aren't a concern and real threats from wild animals. The technology achieves a high degree of accuracy in recognizing trespassing wildlife through the use of high-resolution cameras and sophisticated image processing algorithms. Furthermore, Smart Crop Guardian interacts effortlessly with current monitoring infrastructure, resulting in a cost-effective solution that maximizes the utility of pre-existing equipment. Because of its versatility, it is a viable alternative for a wide range of agricultural contexts, from small-scale farms to large commercial enterprises. The system's user-friendly interface streamlines monitoring, allowing farmers and security professionals to handle and respond to possible threats more efficiently. In addition to providing instant protection, Smart Crop Guardian promotes sustainable farming practices by eliminating the need for conventional deterrents, which can have negative environmental consequences. The approach minimizes disturbances to the natural ecosystem while protecting important crops by accurately directing interventions. Finally, Smart Crop Guardian is a game changer in agricultural security, providing sophisticated image-based protection against wild animal invasions. Its superior technology, seamless integration, and environmentally friendly approach make it a useful asset in current farming practices, offering improved crop security and less environmental effect.

Keywords: *ATMEGA328P Microcontroller, LCD, Buzzer, Power Supply Unit, Software Block Diagram.*

1. Introduction

Intelligent Image-Based Protection against Wild Animal Intrusions is a game-changing breakthrough in protecting agricultural spaces from the ongoing menace of wildlife intrusions. The presence of wild animals poses a considerable difficulty in many farming situations, potentially resulting in significant crop damage and economic losses. This unique System uses cutting-edge technology to create a comprehensive defence mechanism, integrating modern imaging sensors with complex algorithms. The system excels at distinguishing between benign environmental conditions and actual wildlife dangers by utilizing high-resolution cameras and cutting-edge image processing. This precision is critical for allocating resources efficiently, focusing on true security problems rather than false alarms. The ability

2023 14th International Conference on Computing Communication and Networking Technologies (ICCCNT) | 979-8-3503-3509-5/23/$31.00 ©2023 IEEE | DOI: 10.1109/ICCCNT56998.2023.10307822

Cybernetic Technologies in Industry 4.0

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***Abstract*—The presently ongoing industry 4.0 is by far the most rapidly transformational and widely trending revolution as compared to its previous three technological generations. The fourth generation of industry deals with cybernetics, which includes smart automation, interconnectivity, machine learning, real-time data acquisition and control. The various cybernetic technologies active in this industry 4.0 consist of 3D printing, bigdata, artificial Intelligence, cyberphysical systems and more. These technologies are the reason behind the successful implementation of the fourth industrial generation practices. Cybernetic technologies help in real time monitoring, analysing and controlling physical industrial machinery, devices and objects through data collected through smart sensors connected to the internet-network cloud. Cybernetic technologies have a lot of daily applications including smart health monitoring, smart factory, smart home appliances, and so on. This paper presents some of the important aspects of cybernetc technologies in industry 4.0, including smart sensors, asset utilisation, product development, supply chain, predictive maintenance and more.**

***Index Terms*—Fourth industrial revolution, applications, Internet of things, Cybernetic Technologies**

I. Introduction

The fourth industrial revolution was introduced in the last two decades and presents an ongoing trend that transforms machine and man dominant manufacturing into digital manufacturing [1]. This generation of industrial revolution converts the conventional factory into a smart factory that contains smart machines that support connectivity with smart sensors. These sensors are connected to various industrial machines to monitor the processing and relay this data to the cloud that helps in making more informed decisions. Industry 4.0 helps in automating and connecting the complete chain of production using cybernetic technologies in the form of 3D Printing, bigdata, cyberphysical systems, smart sensor networks and more [2].

Cybernetic technologies are the primary reasons for the success of fourth industry generation. For instance, big data plays a crucial role in predictive manufacturing management that enables detailed and multi-faceted machine learning/deep learning based analyses on the collected data [3]. Cloud computing provides a lot of useful services such as unlimited computing, data storage and other online analytical resources available through the internet. Consequently, cybersecurity assumes critical importance in industry 4.0 mainly for all cybernetic systems interacting through the internet to avoid cyberattacks. Artificial intelligence provides newer algorithms and problem solving techniques to the autonomous robots working in the place of a human workers for quicker resolution of task related challenges and to take some decisions on their own [4], [5]. These are just some of the cybernetic technologies that support industry 4.0 that are helping industries become successful in this digital world. The role of cybernetic technologies in fourth industry generation is vital from the perspective of fulfilling the market demand for products effectively with minimum wastage, rework and environmental pollution. This kind of energy efficient mass productivity can be achieved by effectively connecting and managing production digitally. Cybernetics plays one of the key roles in collecting and monitoring data from the sensors placed in the industrial machinery and by connecting all the objects to one network and processing the vast information being channeled through the network. Cybernetics is becoming the most preferred technological asset of industries because it reduces functional costs, improves energy efficiency and provides predictive maintenance and other analytics based features [6]. The following sections explain more about applications of the cybernetic technologies in the fourth industry generation.

Identification of Chronic Kidney Disease using Artificial Neural Network

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Abstract - CNN technology is now being employed in the field of health image processing for the detection of diseases such as cancer and diabetes. Another health concern gaining prominence is related to disorders arising from the substances and elements we consume. Failure to address these disorders promptly can lead to imminent and unavoidable death within a short span. Neglecting issues related to order malfunction can result in the development of habitual order complaints, eventually leading to fatal consequences. Chronic Kidney Disease (CKD) is one such disorder characterized by mild symptoms that often go unnoticed for extended periods, only becoming apparent later on. The Original Government of Yobe state in Nigeria has attracted attention from medical experts due to the high frequency of CKD cases. Unfortunately, a specialized approach to effectively address this issue is yet to be established. In our study, we collected a dataset consisting of 400 cases with 10 attributes from Bade General Hospital. The results indicated that two attributes, namely Creatinine and Bicarbonate, exert the greatest influence on the prediction of CKD. Utilizing a Deep Neural Network (DNN), Convolution Neural Network (CNN) and Recurrent Neural Network model, Additionally, we conducted an analysis to highlight the significance of each feature, providing a ranking of their influence on the CKD prediction.

Keywords
Convolution Neural Network, Machine Learning, Chronic Kidney Disease, Deep Neural Network, Recurrent neural network.

I.INTRODUCTION

Chronic Kidney Disease (CKD) stands out as a significant health challenge that demands attention due to its profound impact on both individuals and society at large. Grasping the significance of CKD involves acknowledging its widespread prevalence, potential complications, and the imperative for early detection and effective management. CKD is a pervasive condition affecting millions of individuals worldwide, characterized by a gradual decline in kidney function that results in the accumulation of waste products and disruptions in fluid balance within the body. If left unchecked, CKD can advance to end-stage renal disease (ESRD), necessitating interventions such as dialysis or kidney transplantation for survival. Recognizing the ubiquity of CKD enables healthcare systems to allocate resources strategically and devise comprehensive strategies to address this escalating public health challenge .CKD is intricately linked to a range of complications and comorbidities. Individuals grappling with CKD face an elevated risk of developing cardiovascular disease, hypertension, anemia, bone disorders, and various other health issues. These complications not only significantly diminish the quality of life for affected individuals but also contribute to escalating healthcare costs. Through a profound understanding of the importance of CKD, healthcare professionals can proactively implement preventive measures and offer appropriate management strategies to alleviate the impact of these complications.

Kidney stone disease poses a significant global health threat, often remaining undetected in its early stages, leading to detrimental effects on kidney function as it progresses. Many cases are attributed to conditions like diabetes mellitus, hypertension, glomerulonephritis, among others, resulting in a substantial number of individuals experiencing kidney failure. Given the potential severity of kidney breakdown, early identification of the issue is crucial .In recent times, deep learning algorithms have become widely utilized for processing biomedical signals, offering valuable tools for automated diagnosis. Point birth and bracketing are two essential components in machine learning operations. The extraction of optimal features from signals plays a pivotal role in achieving high classification accuracy. This study introduces a novel CNN-machine learning model designed to automatically analyze detector responses and make predictions. The CNN performs the point birth operation,

2023 14th International Conference on Computing Communication and Networking Technologies (ICCCNT) | 979-8-3503-3509-5/23/$31.00 ©2023 IEEE | DOI: 10.1109/ICCCNT56998.2023.10307700

Embedded Systems in Industrial Automation 4.0

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***Abstract*—Industrial automation 4.0 extensively relies upon cybernetics technologies to improve the efficiency of various industrial processes. Cybernetics technologies are the prime enablers of the industrial internet of things (IIoT), and are widely implemented in hardware in the form of embedded systems. Embedded systems play a vital role in the creation of new automated processes as well as in the development of new smart products. Industrial automation 4.0 and its embedded systems face several challenges such as scalability, information privacy, data integrity, trust, interoperability constraints, data/service security and more. This paper presents on overview of various aspects related to embedded systems from an industrial automation 4.0 perspective. Furthermore, it presents the implementation steps involved in developing smart/cyber physical frameworks using embedded technology in industrial context. Integration of a Raspberry Pi enabled workstation with IoT-based industrial automation and wireless network communication standards used in IIoT embedded systems, such as STM32H7, are also discussed.**

***Index Terms*—Embedded systems, industry 4.0, cyber physical systems, industrial automation 4.0, IIoT, IoT, raspberry pi**

I. Introduction

Industrial automation 4.0 primarily refers to the development of embedded smart systems that are built with artificial intelligence (AI) in mind. Industrial automation is a broad area of embedded computing that mainly pertains to various industrial applications. Most of the time, the industrial automation scenario is dominated by the programmable logic controllers, usually referred to as PLCs. The evolution of embedded technologies has led to the development of advanced automated systems that are more affordable and energy-efficient. While this field is very promising, there are still many barriers to be overcome before the smart devices can be widely used in all industries. [1] Initially, the concept of internet of things was just about identifying the different objects that were connected to a network. As the connectivity of these networks got bigger and better, the term was eventually expanded to encompass newer concepts related to monitoring and tracking objects and devices [2].

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An embedded system is a type of computing system that is designed to work seamlessly with various dedicated functions. It can be built with various hardware and software components. Cyber-physical systems are used for various remotely monitored and controlled tasks and processes that are not commonly associated with PCs or mainframes. These systems can be generally categorized as either CPUs or GPUs. Industrial trends indicate that the increasing number of sensors in various application domains is driving the development of smart or intelligent systems [3], [4]. In this new age scenario wherein more and more sensor data is becoming available, cyber-physical systems [5] [6] are considered as the main components of industry 4.0 because these systems proving more advantageous and flexible to meet the challenges faced by modern industries. The rapid evolution of embedded systems has allowed industries to enable process automation faster and more powerful in a single clock cycle. This is a major change in the way industries are trying to function nowadays. Many industries are adopting the intelligent industrial unit concept where the entire process is done by machines without any involvement of humans. This concept has become possible with the help of capable and well-connected devices uisng embedded systems. Cyber physical system is a concept that describes the connection between a physical space and a computer. It is a vital component of industry 4.0, and has to be secure, robust, and reliable [7]. Hence, the industry 4.0 technological approach is becoming popular in all industries including embedded architecture design for quicker conceptualisation as well as realisation of new systems and features for enhanced automation, convenience and safety of the modern consumers [8]–[17]. In this paper, an overview of various aspects related to embedded systems is provided, from an industrial automation 4.0 perspective. Furthermore, it presents the implementation steps involved in developing smart/cyber physical frameworks using embedded technology in industrial context. Integration of a Raspberry Pi enabled workstation with IoT-based industrial automation and wireless network communication standards used in IIoT embedded systems,

Journal of Robotics and Control (JRC)
Volume 4, Issue 5, 2023
ISSN: 2715-5072, DOI: 10.18196/jrc.v4i5.19772

Optimization of Load Frequency Control Gain Parameters for Stochastic Microgrid Power System

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***Abstract*—Interconnected multi-area microgrids are vital for the future of sustainable and reliable power systems. Effective load frequency control (LFC) is indispensable for ensuring their stable operation. This paper introduces a PID-based LFC system tailored for a stochastic microgrid with diverse power sources, including solar, wind, diesel engine generators, and electrical batteries. The gain parameters of the proposed microgrid PID LFC controller are optimized using genetic algorithms (GA), teaching learning-based optimization (TLBO), and cohort intelligence algorithms. Integral time-multiplied absolute error (ITAE) and integral time-squared error (ITSE) serve as the cost functions for all optimization algorithms. The study evaluated the performance of these optimized microgrid PID LFC configurations under random step load disruptions. Our primary findings reveal that the cohort intelligence-optimized PID LFC controller excels in minimizing computation time (upto 76% and 94% lesser than GA and TLBO respectively) and exhibits superior robust response characteristics. Moreover, the cohort intelligence algorithm requires fewer iterations (upto 66% and 90% lesser than GA and TLBO respectively) and enhances power supply quality within the multi-power microgrid electrical framework, specifically in terms of effective load frequency control.**

***Keywords*—Genetic Algorithm; Load Frequency Control; Teaching Learning based Optimization; Cohort Intelligence; Integral Time Absolute Error.**

I. INTRODUCTION

Modern power networks face the challenge of managing diverse energy sources, including conventional and renewable sources such as solar, wind, electrical batteries, and diesel generators. Moreover, micorgrids comprising of unconventional power sources hold the key to the energy independence of remote areas of the planet. These networks are characterized by multiple dynamic power demands and frequent frequency disturbances caused by sudden interruptions in microgrid areas and tie lines. To ensure a stable power supply despite varying loads and power sources, interconnected multi-power microgrid frameworks require effective load frequency control (LFC) mechanisms. Minor load variations can be handled by suitable generators that act as the primary backups in the power management systems. These generators and other regulators are required in the microgrid organization to limit the variation of supply frequency in the interlinked power framework as well as the tie lines to meet the varying demands on the overall power architecture. This regulation mechanism is known as load frequency control that plays a critical role in regulating the power grid and maintaining the required power supply quality [1], [2]. Fig. 1 illustrates the dynamic nature of supply and demand in a multi-microgrid power framework.

While researchers have explored various techniques for LFC in microgrid power systems, recent efforts have focused on soft computing methods that have shown promise in enhancing load frequency control in complex energy systems. These methods include neural networks [3], fuzzy logic [4], adaptive neuro-fuzzy logic control [5], fractional order controller [6]–[9], complex order controller [10]–[13], Grey wolf optimization [14], differential evolution [15], particle swarm optimization [16], ant colony optimization [17], artificial bee colony [18], hybrid optimization [19], imperialist competitive algorithm [20], genetic algorithm [21], [22], teaching-learning based optimization [23]–[26], cohort intelligence optimization [27]–[31]. Researchers have investigated various aspects of complex and fractional order modeling and control in various systems [32]–[45]. These applications include micro and nano particle composite machining, precise control of DC motor, tool/chip interface friction while machining aluminum alloys, position control of Quanser servomotor, lean manufacturing, machined surface roughness, bolted joints, non minimum phase systems and many more [46]–[61]. The above mentioned literature review shows that there is a research gap and an ample scope to explore optimization algorithms for optimal tuning of LFC gain parameter, specifically in case of hybrid power source microgrid application.

This paper addresses the problem statement of 'investigation of selected optimization algorithms to tune PID-based load frequency controller gain parameters for interconnected diesel-solar-battery and diesel-wind-battery power systems'. We em-

Neural Network based EEG Analysis for Seizure Prediction in Epilepsy

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Abstract.-Epilepsy is a neurological disorder characterized by recurrent and unpredictable seizures. Early prediction of seizures can significantly improve the quality of life for individuals with epilepsy by enabling timely interventions. Electroencephalography (EEG) is a valuable tool for monitoring brain activity and has shown promise in seizure prediction. In this study, we propose a neural network-based approach for EEG analysis to predict seizures in epilepsy using the back propagation algorithm. In the research involves the collection of EEG data from individuals with epilepsy, focusing on both pre-ictal (before a seizure) and non-seizure intervals. We pre-process and extract relevant features from the EEG signals, which capture the subtle changes in brain activity associated with impending seizures. These features are then used as input to a neural network, which is trained using the back propagation algorithm

Keywords: Discrete Wavelet Transform, Artificial Neural Network, K-nearest neighbours, Support Vector Machine

I.INTRODUCTION

Epilepsy is a neurological disorder characterized by recurrent and unpredictable seizures, making it a significant medical challenge. One promising approach to address this issue is the application of neural network-based EEG analysis. EEG (Electroencephalography) records electrical activity in the brain and offers valuable insights into seizure patterns. Backpropagation algorithm a widely used technique in neural networks, can be employed to develop predictive models for seizure detection. By training neural networks to analyse EEG data and identify pre-seizure patterns, we can potentially provide early warning systems for individuals with epilepsy, improving their quality of life and allowing for timely medical interventions. This stage for exploring the potential of neural network-based EEG analysis for seizure prediction in epilepsy

An electroencephalogram, commonly known as EEG, is a non-invasive technique used to monitor and record electrical activity in the human brain. It is a valuable tool in the field of neurology and neuroscience, allowing researchers and clinicians to gain insights into brain function and abnormalities. EEG involves the placement of electrodes on the scalp, which detect and measure the electrical impulses generated by the brain's neurons. These signals, referred to as brainwaves, provide a window into various brain states, such as wakefulness, sleep, and specific cognitive activities. EEG is widely used to diagnose and study neurological disorders like epilepsy, as it can reveal abnormal patterns in brainwave activity associated with seizures. Additionally, it is an essential tool for cognitive and psychological research, as it can help investigate brain responses to stimuli, emotions, and cognitive tasks. EEG's non-invasive nature, high temporal resolution, and versatility make it an indispensable tool for understanding the brain's dynamic activity and its role in various cognitive and clinical contexts.

II.SYSTEM DESIGN AND DEVELOPMENT

Flow Behaviour of Wastewater Contaminants in Compost with Manufactured Sand (M-SAND) Under Layered Conditions

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Source: The Journal of Solid Waste Technology and Management, Volume 49, Number 3, September 2023, pp. 231-239(9)
Publisher: International Society of Waste Management, Air and Water (ISWMAW)
DOI: https://doi.org/10.5276/jswtm/iswmaw/492/2023.231

In order to improve the suitability of recycled water for managing the supply and demand with a sustainable technique, a laboratory-scale column experiment was conducted to comprehend the flow behaviour coming out from varied layers with respect to time and depth. This study deals with transfer of wastewater collected from sewage treatment plant through the multiple layers of river sand, Manufactured sand and compost filled under saturation and breakthrough behaviour was monitored. The purpose of the current study was to evaluate experimentally the ammonia-nitrogen and nitrate-nitrogen transport phenomena of the wastewater effluent collected from a sewage treatment plant with respect to time. The samples taken at regular time intervals were tested for the critical parameters pH, electrical conductivity, ammonia-nitrogen, nitrate-nitrogen and chemical oxygen demand assessed with respect to time. The pH ranges observed were almost consistent with contact time in different beds of column whereas the electrical conductivity reaches a maximum at a specific time up to 5 times greater than the minimum value. The ionic transition in relation to dilution, filtration, oxidation, etc. may be the cause of this. The compost-filled column has the capacity to nitrify the ammonia-nitrogen in wastewater, according to the flow behaviour of the ammonia-nitrogen through the wastewater through the M-sand-filled column. The column containing compost showed lower outlet concentration of wastewater ammonia-nitrogen and higher nitrate-nitrogen compared to the other one. The study is useful in the agricultural sector for predicting interactions between sand, waste water, and compost.

Waste to Wealth: A Futuristic Outlook for Waste Utilization in India

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Abstract. India, having one of the largest agro-basedeconomies in the world, produces a significant amount of wastes, both from farming activities and agro-based industries. These wastestreams pose critical environmental and public health challenges that necessitate efficient management strategies.The present review examines the current status and future perspectives of waste utilization in India. We have attempted to criticallyidentify the most prominent features of effective waste management and the constraints in resource recovery for achieving the sustainable development goals. This review provides an overview of the prevailing practices in waste utilization, highlighting various methods employed and the types of industries that can benefit from this approach. In particular, techniques such as co-processing, recycling, waste-to-energy conversion, and industrial symbiosis to be extensivley made accessible to maximize the value derived from wastes. Some of the major challenges we identified include limited awareness, inadequate infrastructure, and regulatory gaps, which can significantly hinder the optimal utilization plans. To address these challenges, the review proposes potential strategies such as awareness campaigns, infrastructure development, technology transfer, and policy strengthening both at community and organizational levels. The findings of this review canshed light on the current landscape of waste utilization in India and present pathways for a more sustainable and efficient approach in the near future.

1. Introduction

India, with its growing population and evolving consumption patterns, produces a significant volume of organic wastes from households, agricultural activities, green spaces, local markets, and the food industry. While mismanaged organic wastes can pose severe environmental challenges including greenhouse gas emissions and groundwater contamination, they also offer substantial opportunities for resource recovery and circular economy principles [1-5]. On the other hand, industrial waste management and utilization play a vital role in achieving sustainable development goals, particularly

International Journal of Scientific Research in Science, Engineering and Technology

Print ISSN - 2395-1990
Online ISSN : 2394-4099

OPEN ACCESS

Available Online at : www.ijsrset.com
doi : https://doi.org/10.32628/IJSRSET24113129

Person Authentication System Using Multimodal Biometrics

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ARTICLEINFO

Article History:

Accepted: 15 May 2024
Published: 31 May 2024

Publication Issue :
Volume 11, Issue 3
May-June-2024
Page Number :
276-280

ABSTRACT

Biometrics is the automated process used to recognize human by measuring their behavioural and physiological characteristics. Biometrics are generally used either for verification The use of biometric for identification purposes requires that a particular biometric factor be unique for each individual that it can be calculated, and that it is invariant over time. Biometrics such as signatures, photographs, fingerprints, voiceprints and retinal blood vessel patterns all have noteworthy drawbacks. Although signatures and photographs are cheap and easy to obtain and store, they are impossible to identify automatically with assurance, and are easily forget. Human iris on the other hand as an internal organ of the eye and as well protected from the external environment, yet it is easily visible from within one meter of distance makes it a perfect biometric for an identification system with the ease of speed, reliability and automation Iris recognition is an automated method of biometric identification that uses mathematical pattern-recognition techniques on images of the irises of an individual's eyes, whose complex random patterns are unique. Proposed system provides a comprehensive implementation of periocular biometrics and a deep insight of various aspects such as utility of peri-ocular region In this project face and eye points are captured using Grassmann algorithm and Gabor filter for eye features extraction. Each trait is analysed separately and given its own score. The results are combined using deep leaning algorithm to provide a single decision in real time environments.

Keywords : Biometrics, Periocular Regions, Grassmann Algorithm, Gabor Filter, Deep Leaning Algorithm

International Journal of Scientific Research in Science, Engineering and Technology

Print ISSN - 2395-1990
Online ISSN : 2394-4099

OPEN ACCESS

Available Online at : www.ijsrset.com
doi : https://doi.org/10.32628/IJSRSET24113131

Conserving Certainty of Crypto Transactions with Machine Learning Methodologies

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ARTICLEINFO

Article History:

Accepted: 15 May 2024
Published: 31 May 2024

Publication Issue :
Volume 11, Issue 3
May-June-2024

Page Number :
291-293

ABSTRACT

Nowadays there are increase in fraudulent activities within cryptocurrencies transactions. To combat this, we propose a novel framework that integrates machine learning methodologies with the SHA-256 algorithm to enhance security and predict price fluctuations. This framework aims to provide a comprehensive solution for preventing fraudulent activities in cryptocurrencies transactions contributing to a more secure.

Keywords : Cryptocurrencies Transactions, Preventing Fradulent Activities, Future Prediction.

I. INTRODUCTION

This paper proposes a novel framework that integrates machine learning methodologies, the SHA-256 algorithm, and blockchain technology. The framework aims to enhance security by predicting cryptocurrency prices and detecting fraudulent activities such as money laundering and somewhere payments. Through comprehensive data processing and validation, the proposed system seeks to provide a secure and reliable platform for cryptocurrency transactions in smart city environments.

II. METHODOLOGY

The blockchain is secure and transparent, so each block is irreversible and viewable by everyone. Bitcoin, Ethereum, and other wide-scale cryptocurrency coins use blockchain to process and record transactions securely. This remains the primary use of the technology. It records the data and keeps track of the transactions sent via the network

BLOCKCHAIN INTEGRATION MODULE

This module integrates blockchain technology into the system, enabling secure and transparent recording of cryptocurrency transactions. It involves setting up nodes, establishing consensus mechanisms, and deploying smart contracts if necessary.

International Journal of Scientific Research in Science, Engineering and Technology

Print ISSN - 2395-1990
Online ISSN : 2394-4099

OPEN ACCESS

Available Online at : www.ijsrset.com
doi : https://doi.org/10.32628/IJSRSET24113129

Efficient Authentication Steps for Vehicle Transmission in Ad-Hoc Networks

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ARTICLEINFO

Article History:

Accepted: 15 May 2024
Published: 31 May 2024

Publication Issue :
Volume 11, Issue 3
May-June-2024
Page Number :
294-301

ABSTRACT

Vehicular ad-hoc networks (VANETs) are underactive development, thanks in part to recent advances in wireless communication and networking technologies. The most fundamental part of VANET is to enable message authentications between vehicles and roadside units. Message authentication using proxy vehicles has been proposed to reduce the computational overhead of roadside units significantly. In this message authentication scheme, a proxy vehicle that verifies multiple messages at the same time improves roadside units' efficiency. In this paper first, we show that the only proxy-based authentication scheme (PBAS) presented for this goal by Liu et al. cannot guarantee message authenticity and also it is not resistant to impersonation and modification attacks and false acceptance of batched invalid signatures. Next, we propose a new identity-based message authentication scheme using proxy vehicles (ID-MAP). Then guarantee that it can satisfy the message authentication requirements, existential unforgeability of underlying signatures against adaptability chosen message, and identity attack is proved under the Elliptic Curve discrete logarithm problem (ECDLP) in the random oracle model. It should be highlighted that ID MAP not only is more efficient than PBAS since it is pairing-free and identity based and also it does not use map-to-point hash functions, also, it satisfies the security and privacy requirements of VANETs. Furthermore, analysis shows that the required time to verify 3000 messages in ID-MAP is reduced by 76% compared to that PBAS.

Keywords : Vehicle infrastructure Analysis, VANET, PBAS , Modification, OBUS, RSUS, V2V

International Journal of Scientific Research in Science and Technology
Available online at : www.ijsrst.com
Print ISSN: 2395-6011 | Online ISSN: 2395-602X
doi : https://doi.org/10.32628/IJSRST24113115

Multiple Retinal Diseases Prediction for Enhancing the Identification of Diabetic Retinopathy

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ARTICLEINFO

Article History:
Accepted: 10 May 2024
Published: 25 May 2024

Publication Issue :
Volume 11, Issue 3
May-June-2024

Page Number :
420-431

ABSTRACT

The primary causes of vision impairment and blindness are retinal diseases, which include diabetic retinopathy, age-related macular degeneration, glaucoma, and retinal detachment. Correct and timely diagnosis of these illnesses is essential for efficient treatment and patient care. This abstract describes a novel use of convolutional neural networks (CNNs) for the diagnosis and prediction of various retinal diseases. A large dataset of retinal images covering a variety of retinal diseases is gathered and labelled with disease names in this study. To guarantee consistency and improve the model's capacity to pick up pertinent features, these photos go through a thorough preprocessing process. Techniques for data augmentation are used to diversify datasets more. The architecture of a CNN is intended for the categorization of retinal disorders. Convolutional layers are used in this architecture to extract features, and pooling layers are used to reduce dimensionality. Fully connected layers are then used to classify diseases. Using supervised learning methods, the model is trained on the annotated dataset, optimizing the loss function and keeping an eye on validation performance to avoid overfitting. On a different test dataset, the CNN model's performance is evaluated using a number of evaluation metrics, such as accuracy, precision, recall, F1-score, and the AUC-ROC score. Additionally, post-processing steps are used to eliminate predictions with low confidence, increasing the model's clinical usefulness.

Keywords : Fundus Images, Machine Learning, Deep Learning, Convolutional Neural Network Algorithm, Retinal Diseases

International Journal of Scientific Research in Science and Technology
Available online at : www.ijsrst.com
Print ISSN: 2395-6011 | Online ISSN: 2395-602X
doi : https://doi.org/10.32628/IJSRST24113112

Handwritten Based Alzheimer Disease Prediction from One Dimensional Datasets Using Deep Learning

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ARTICLEINFO

Article History:

Accepted: 10 May 2024

Published: 25 May 2024

Publication Issue :

Volume 11, Issue 3

May-June-2024

Page Number :

394-403

ABSTRACT

Because to their high cost, sensitivity, and difficulty in completing surgeries, brain-related disorders are among the most challenging conditions. On the other hand, since the procedure's outcomes could be negative, the operation itself does not have to succeed. Alzheimer's disease, which affects adults and causes varied degrees of memory loss and knowledge forgetfulness, is one of the most prevalent brain diseases. based on the state of each patient. For these reasons, using user-handwritten datasets to categorise memory loss and determine the patient's evaluation of Alzheimer's disease at every given level is crucial. This work offers a novel method for predicting Alzheimer's disease by using advanced deep learning techniques on handwritten data. Alzheimer's is a degenerative. Alzheimer's disease, a neurological condition that progresses and necessitates prompt diagnosis and appropriate treatment. Traditional diagnostic techniques are mostly based on clinical evaluations and imaging, which are frequently inaccessible and expensive. This study investigates the unrealized potential of handwritten data as a special kind of Alzheimer's disease prediction. The dataset provides a broad picture of cognitive impairments by containing handwritten samples collected from individuals in varying states of cognition. Using deep learning architectures, such as the multi-layer perceptron method, the suggested model takes use of the temporal dependencies found in sequential handwritten patterns. These designs show promise for ensuring the temporal characteristics of handwritten data are captured with subtle features. The handwritten input is converted into a format suitable for deep learning using feature extraction techniques, which helps with efficient model training. A thorough assessment of the model's performance is conducted using common metrics including specificity, sensitivity, and accuracy. The goal is to determine whether the model can

International Journal of Scientific Research in Science and Technology
Available online at : www.ijsrst.com
Print ISSN: 2395-6011 | Online ISSN: 2395-602X
doi : https://doi.org/10.32628/IJSRST24113114

Multiple Road Fissures Detection Using Deep Learning Algorithm

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ARTICLEINFO

Article History:

Accepted: 10 May 2024
Published: 25 May 2024

Publication Issue :
Volume 11, Issue 3
May-June-2024

Page Number :
412-419

ABSTRACT

Road infrastructure is critical in transportation systems because it ensures the safe and efficient movement of people and goods. However, the deterioration of roads over time as a result of various factors such as weather and heavy traffic poses significant maintenance and safety challenges. Early and accurate detection of road damage is critical for timely repairs and accident prevention. This paper proposes a novel approach to detecting road damage using Convolutional Neural Networks (CNNs). CNNs have demonstrated remarkable success in a variety of computer vision tasks, making them an appealing option for automated road damage detection. The goal of this research is to use deep learning and computer vision techniques to create an efficient and accurate system for detecting road damage from images. Our methodology entails gathering a diverse dataset of road images with various types of damage, such as potholes, cracks, and road surface degradation. The dataset is pre-processed to improve image quality and annotated for training and evaluation. Using this dataset, a custom CNN architecture is designed and trained to recognize and classify various types of road damage. A separate validation dataset is used to evaluate the trained model's performance in terms of accuracy, precision, recall, and F1 score. Furthermore, we investigate the model's ability to generalize to previously unseen road damage scenarios by testing it on real-world images captured under varying conditions. Our CNN-based road damage detection system achieves high accuracy in identifying and classifying road damage types, according to the results. This system can be integrated into existing infrastructure management systems, allowing for cost-effective and timely road maintenance. Furthermore, it helps to improve road safety by identifying potential hazards before they cause accidents.

Keywords : Road Crack Detection, Deep Learning, Convolutional Neural Network, Notification, Neural Networks

https://doi.org/ 10.33472/AFJBS.6.9.2024.325-338

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

EEG-BASED SCHIZOPHRENIA DETECTION USING ADEEP LEARNING WITH CNN-TCN MODEL

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Article History

Volume 6,Issue 9, 2024

Received:14Mar 2024

Accepted : 09 Apr 2024

doi: 10.33472/AFJBS.6.9.2024.325-338

Abstract

Schizophrenia is a complex, chronic mental health disorder characterized by an array of symptoms, including delusions, hallucinations, disorganized speech or behavior, and impaired cognitive ability. Schizophrenia is a debilitating mental illness which involves three groups of symptoms, i.e., positive, negative and cognitive, and has major public health implications. According to various sources, it affects up to 1% of the population. The Patho mechanism of schizophrenia is not fully understood and current antipsychotics are characterized by severe limitations. Firstly, these treatments are efficient for about half of patients only. Secondly, they ameliorate mainly positive symptoms (e.g., hallucinations and thought disorders which are the core of the disease) but negative (e.g., flat affect and social withdrawal) and cognitive (e.g., learning and attention disorders) symptoms remain untreated. Thirdly, they involve severe neurological and metabolic side effects and may lead to sexual dysfunction or agranulocytosis (clozapine). The purpose of the study is to identify a common person who are affected by Schizophrenia. Our presentation will also cover the role of psychotherapy, specifically cognitive- behavioral therapy for psychosis, and the benefits of family therapy and support groups. It will create impact on social skills training, focusing on communication, social interaction, problem-solving, and decision-making skills. This application is very user-friendly, efficient and it has got many unique features. Tenants can register using their phone number, store information about their identity and upload the dataset of EEG data it will train the dataset and produce the accurate result of whether the person is affected the disease. Proposed system aims to shed light on the comprehensive and multi-faceted approach required to manage schizophrenia effectively and improve the quality of life for those affected by this complex disorder.

Keywords: Schizophrenia, Web Application, Early Intervention and Prevention, CNNs for Schizophrenia Detection, TCNs for Schizophrenia Analysis, Deep learning.

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | Monthly Peer Reviewed & Refereed Journal |

|| Volume 12, Issue 2, April 2024 ||

International Conference on Recent Development in Engineering and Technology – ICRDET 24

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Dhaanish Ahmed Institute of Technology, KG Chavadi, Coimbatore, Tamilnadu, India

Smart Locket for Blind Peoples

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ABSTRACT: The 2017 WHO Global Demographic Report reveals that 285 million people, constituting 4.25% of the world's population, experienced visual impairment by the end of 2016. Of these, 39 million are blind and 246 million have varying degrees of visual impairment. This impairment, whether from pregnancy, illness, or injury, significantly impacts daily tasks, especially independent navigation. While early diagnosis and treatment can prevent many cases of blindness, innovative solutions like guide dogs, navigation devices, and smart canes assist those unable to undergo treatment. This paper introduces a novel approach utilizing an Arduino ESP32 and a dedicated camera to provide smart vision aid for the visually impaired.

I. INTRODUCTION

Recently, the World Health Organization (WHO) published its 2017 Global Demographic Report. The report states that approximately 285 million of the world's population of approximately 7.338 billion have suffered from visual impairment since the end of 2016. Figure 1 shows this example. Percentage of visually impaired people in the world's total population. Among them, 39 million are blind and 246 million are visually impaired, accounting for 4.25% of theworld's total population.

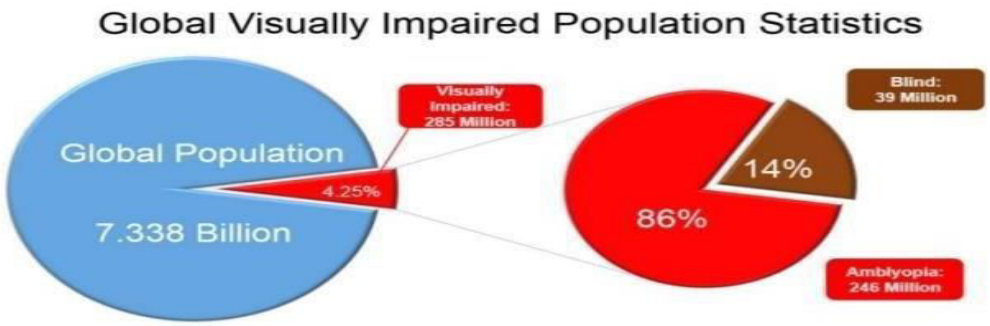

Fig. 1 Proportion of visually impaired people in the total worldpopulation

Whether caused by pregnancy, illness, injury or other causes, blindness can affect people's lives. For example, it is very difficult for visually impaired people to walk independently in unfamiliar and difficult places. Research shows that many people have poor eyesight but perform well in good lighting, and thisdamage can be repaired to some extent. Most cases of blindness can be prevented with early diagnosis and appropriate treatment. Therefore, guide dogs, navigation devices, smart canes, remote sensors (sonar or lasers), ultrasound, etc. are used to help people who cannot receive treatment. Many innovations have been developed using some recently It has been learned that systems use mobile phones as a bridge between users and remote online sites, but these resulted fromseveral irregularities. This paper depicts a technique to provide smart vision for visually challenged using a Aurdino ESP32 and its dedicated camera.

International Journal of
INTELLIGENT SYSTEMS AND APPLICATIONS IN ENGINEERING
ISSN:2147-6799 www.ijisae.org Original Research Paper

Online Fraudulence Detection Based on Decision Support System in Digital Banking

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Submitted: 15/12/2023 **Revised:** 27/01/2024 **Accepted:** 06/02/2024

Abstract: The widespread use of online banking operations is anticipated to climb additionally as applications for digital banking progress. An unforeseen impact of this pattern is a surge in fraud attempts. On the other hand, the scientific research on spotting online banking scams is astonishingly thin. Our proposed solution is an attention-based structure that can be utilized to differentiate between truthful and bogus online banking transactions. In this article, a Decision Support System based on Machine Learning is proposed that automatically allocates a risk factor to each payment produced via a mobile device or online financial system. Since there is an enormous rise in the total amount of people using the internet, this suggested approach will be more effective in hindering unidentified hazards and malicious activity. The framework of the claimed method is structured: In advance of supplying a risk factor for activities that were not flagged as irregularities in the preceding phase, a controlled machine learning section is executed to recognize unusual behaviors or purchases that were mistakenly labeled. The final results of the simulation reveal that the concept of intelligent decision-making demonstrated in this paper has some real-world applications.

Keywords: *DSS, online fraud detection, safe transactions, Banksealer architecture*

1. Introduction

Over 60 percent of citizens in various nations engage with the internet or mobile phones to purchase financial items, making digital banking a common outlet for transactions in money and items bought. However phone banking scam arises when an attacker receives fake credentials to the victim's mobile banking account, online banking scam arises when an intruder gains access to a person's online bank account and transactions money from it. Every year, financial crime produces immense damage worldwide. In the UK, for instance, the total loss from fraudulent checks, payment cards, and electronic banking was 768.8 million. It was practical to halt fraud for an entire amount of 1.38 billion at the same time. Nevertheless, recognizing that unwarranted hindering of financial services is highly irritating to consumers and could potentially increase the rate of turnover challenges the safeguarding of fraudulent transactions. As a result, before determining to stop an electronic transaction, safeguarding mechanisms necessarily require human assistance [1].

A notion of the part of computers in reaching choices is illustrated by Decision Support Systems (DSS). Investigators, professionals and administrators who express concern that the disciplines of management science and management information systems have irrationally restricted their focus have dedicated themselves to promoting around this term. Identical to several encouraging calls, the expression lacks a clear description. Some writers comprehend DSS as simply interactive systems envisioned for leadership use. For certain people, it's primarily about their assistance than the system. They emphasize recognizing and improving the decision-making process; any suitable and easily accessible innovations in technology are then utilized to design a DSS. While some researchers see DSS as a branch of management science techniques other individuals see it as a related branch of MIS [2].

As demonstrated in Figure 1.1, a DSS's primary components are organizing data, model supervisors, user interface, knowledge administration, and users. A DSS is a flexible instrument that makes it effortless for decision-makers to evaluate and interpret reasoning models and oversee data in a manner to solve complicated non-repetitive and informal decision-making duties. Decision-makers utilize the interface and management segments for using the system, and they draw numerous types of data and information concerning the framework of databases under their demands [3].

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https://doi.org/10.33472/AFJBS.6.2.2024.1142-1157

African Journal of Biological Sciences

Research Paper Open Access

IoT-Based Monitoring Systems for Tracking Wildlife Health and Migration Patterns

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Article History

Volume 6, Issue 2, 2024

Received:28 Dec 2023

Accepted: 15 Jan 2024

doi:10.33472/AFJBS.6.2.2024.1142-1157

Abstract

This research paper explores the development and implementation of IoT-based monitoring systems for tracking wildlife health and migration patterns. By leveraging advanced IoT technologies, including GPS, health monitoring sensors, and environmental sensors, this study aims to enhance our understanding of wildlife behaviors and improve conservation efforts. The IoT system was deployed in a designated study area, monitoring selected wildlife species to collect real-time data on health metrics and migration patterns. Data analysis revealed significant insights into the movement and health status of the wildlife, demonstrating the efficacy of IoT technology in wildlife conservation. The findings highlight the potential for immediate interventions, policy recommendations, and future research directions to further integrate IoT in environmental monitoring.

Keywords: IoT-based monitoring, Wildlife tracking, Health metrics, Migration patterns, Conservation technology, Real-time data, Environmental monitoring, GPS tracking, Sensor networks, Wildlife conservation.

SN Computer Science (2024) 5:353
https://doi.org/10.1007/s42979-024-02665-z

ORIGINAL RESEARCH

A Model for Predicting Chronic Kidney Diseases Based on Medical Data Using Reinforcement Learning

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Received: 26 October 2023 / Accepted: 27 January 2024

Abstract

Kidney diseases (KD) are a global public health concern affecting millions. Early detection and prediction are crucial for effective treatment. Artificial intelligence (AI) techniques have been used in KDP to analyze past medical records, applying patients' Electronic Medical Record (EHR) data. However, conventional statistical analysis methods conflict with fully comprehending the complexity of EHR data. AI algorithms have helped early KDP learn and identify complex data patterns. However, challenges include training heterogeneous historical data, protecting privacy and security, and developing monitoring system regulations. This study addresses the primary challenge of training heterogeneous datasets for real-world evaluation. Early detection and diagnosis of chronic kidney disease (CKD) is crucial for improved outcomes, reduced healthcare costs, and reliable treatment. Early treatments are crucial for CKD, as it often develops without apparent symptoms. Predictive models, particularly those using reinforcement learning (RL), can identify significant trends in complex healthcare information, which standard techniques may struggle with. The study makes KDP more accurate and reliable using RL methods on clinical data. This lets doctors find diseases earlier and treat them better by looking at static and changing health measurements. Machine learning (ML) algorithms can enhance the accuracy of AI systems over time, enhancing their effectiveness in detecting and diagnosing diseases. In the current investigation, the RL-ANN model is implemented for performing enforceable CKD by assessing the outcomes of multiple neural networks, which include FNN, RNN, and CNN, according to parameters such as accuracy, sensitivity, specificity, prediction error, prediction rate, and kidney failure rate (KFR). The recommended RL-ANN method has a lower failure rate of 70% based on the KFR data. Further, the proposed approach earned 95% in PR and 70% in analysis of errors. However, the RL-ANN approach obtained superior results of 97% accuracy, 95% sensitivity, and 90% specificity.

Keywords Chronic kidney disease · Medical history · Machine learning · RL-ANN · Alerting systems and diagnostic assistance

Introduction

The kidneys are two bean-shaped organs positioned in the posterior part of the abdomen [1]. Their main job is to filter waste materials and extra blood fluids, which the body excretes as urine. Kidney disease (KD) occurs when the kidneys are damaged and can no longer perform their filtering function (FF) accurately. There are many types of KD, but some of the most common are included in Fig. 1. The importance of early identification and chronic kidney disease prediction (CKD) rests in its ability to optimize patient outcomes, lower healthcare expenses, and improve the overall treatment of this standard and severe ailment. CKD frequently advances without noticeable symptoms and only becomes evident in the latter stages when therapies may have reduced effectiveness. Timely identification using predictive models can provide prompt therapies, impeding or ceasing the advancement of the disease and diminishing the likelihood of consequences such as cardiovascular disease and kidney failure.

Depending on the sort and degree of the condition, KD symptoms might vary; however, they may include swelling

This article is part of the topical collection "Machine Learning for Pandemic Prediction and Control" guest edited by Anand J Kulkarni, Akash Tayal, Patrick Siarry, Arun Solanki and Ali Husseinzadeh Kashan.

Extended author information available on the last page of the article

Published online: 27 March 2024

Materials Today: Proceedings xxx (xxxx) xxx

Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: www.elsevier.com/locate/matpr

Cytotoxic effects of endophyte origin nanosilver and its computational studies

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ARTICLE INFO

Keywords:
Cm-AgNPs
Pa-AgNPs
Anticancer activity
In silico analysis
Molecular docking

ABSTRACT

The present study aimed in the investigation of anticancer potential of silver nanoparticles (AgNPs) from endophytic bacterium *Cupriavidus metallidurans* (*Cm*-AgNPs) and *Pantoea anthophila* (*Pa*-AgNPs) of *W. indica* reported in our earlier studies, against human oral epidermoid carcinoma (KB 3–1) and COLON 26 cell lines. The cytotoxicity response was assessed by 3-(4, 5-dimethylthiazol-2-yl)-2, 5-diphenyltetrazolium bromide (MTT). Measurement of intracellular reactive oxygen species (ROS), mitochondrial membrane potential ($\Delta\Psi m$) and apoptotic morphological changes were studied in KB 3–1 cell line. Both the endophytes were found to produce periplasmic nitrate reductase (PNR) that converts the ionic silver into stable nano silver. Hence the structure and function of PNR was determined by computationl tools and evolutionary relationships were constructed using Clustal Omega. The inhibitive properties of AgNP against selected cancer targets were analyzed by molecular docking tool Autodock 4.0. KB 3–1 cell line showed good anticancer response than COLON 26 cell lines. On comparison of AgNPs, *Cm*-AgNPs exhibited higher cytotoxicity with increased intracellular ROS levels, altered $\Delta\Psi m$ and apoptotic cell death than *Pa*-AgNPs. The three-dimensional structure of the PNR was modeled by Swiss model and validated using PROCHECK and PROVES. Docking study showed that the AgNP bound exactly in the inhibition site or in their close proximity that may enable the modulation of proteins. Thus the study provides an insight on the anticancer activity of AgNPs fabricated from endophytic extract.

1. Introduction

Cancer is a life threatening second leading cause of human deaths around the world. Annually 18 million new cases of cancer occur that causes 8.8 million deaths. The risk of cancer increases significantly with age, and many cancers occur more frequently in developed countries. The overall incidence rates of cancers are rising comparatively in women and children as of 2021 [1]. Oral cancer leads as a 6th to 9th most common cancer accounting for 2–4% of cancer cases globally. Annually, about 77,000 new cases and 52,000 deaths are reported in India, which is approximately one-fourth of global incidences. The incidence and mortality rates of colon cancer also known as colorectal cancer (CRC) vary distinctly around the world. According to the World Health Organization GLOBOCAN database, in males CRC is diagnosed as the third most commonly occurring cancer and in females the second most diagnosed cancer [2]. With the advancement in the molecular analysis, expression profile of different proteins such as Annexins (II and V), keratin-1, squamous cell carcinoma antigen (SCC-Ag), heat-shock proteins (HSP) 27, actin and their association in signaling pathways in cancers are revealed. The expression levels are found to have important roles in intracellular and mitochondrial signal transduction pathways of tumor cells that varied apparently in normal cells [3]. Mutation in certain genes and dysregulation of some proteins also leads to the higher risk of cancers [4]. Hence with the proteogenomics approach, the new features of the disease that are supposed to be the potential target in treatment strategies were identified. Among the various approaches, the exploitation of natural products and synthetic variations of their novel structures is one of the most successful methods to identify new drug entity. Depending on the significance of disease, natural products can be structurally and functionally optimized to serve particular biological functions. The development of potent and effective antineoplastic drugs is one of the most persuaded goals in the recent time in which nano particulate technology has gained more attention due to its targeted function.

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https://doi.org/10.1016/j.matpr.2023.07.324
Received 10 February 2023; Received in revised form 9 May 2023; Accepted 28 July 2023

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:10/October-2023 Impact Factor- 7.868 www.irjmets.com

BLOCKCHAIN CYBER SECURITY VULNERABILITIES AND POTENTIAL COUNTER MEASURES

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DOI : https://www.doi.org/10.56726/IRJMETS45781

ABSTRACT

Blockchain technology has garnered significant attention due to its wide array of potential applications, initially emerging as the foundation for the cryptocurrency Bitcoin. However, it has since found utility across various industries and non-commercial domains. Unlike most prevailing systems based on centralized architectures, this innovative approach employs peer-to-peer networks and a distributed system utilizing a blockchain ledger to establish connections. Its framework functions as a digital log, organized into a series of interconnected units known as blocks. Each block is cryptographically secured to its preceding block, rendering it immutable once added. Many experts believe that the inherent cryptographic nature of blockchain systems makes them resilient against constant hacking attempts and security threats. Nonetheless, prior research on the security and confidentiality of blockchain technology has revealed instances where applications have succumbed to sophisticated cyber-attacks. With the increasing demand for cryptocurrencies and the existing security challenges, earlier studies did not extensively focus on the cybersecurity vulnerabilities of blockchain technology. Consequently, our research endeavors to shed light on potential attacks targeting the weaknesses in blockchain technology's cybersecurity.

Keywords: Block Chain, Cloud Computing, Cyber Security, Ledger, Smart Contracts, Cryptocurrency, Attacks, Consensus Algorithms, Distributed Ledger Technologies, Security.

I. INTRODUCTION

The cybersecurity framework encompasses various elements involved in safeguarding networked computers and data from digital threats. Its objective is to prevent, detect, recover from, and respond to internet-based threats, which come in diverse forms such as unauthorized access or use of information resources and network attacks that disrupt, deny, degrade, or destroy information and network resources. These threats encompass information theft, computer viruses, website tampering, denial-of-service attacks, network intrusions, and data manipulation or creation. The security infrastructure is designed to protect against these risks, ensuring the confidentiality, authenticity, integrity, and availability of data.

Blockchain serves as a transaction database containing records of all previously executed transactions, operating on the Bitcoin protocol. It creates a digital ledger of transactions, allowing all network participants to modify the record securely, shared across a distributed network of computers. To modify existing data blocks, all nodes in the network execute algorithms to evaluate, verify, and match transaction information with the Blockchain history. If the majority of nodes agree on the transaction, it is confirmed, and a new block is added to the existing chain.

The Blockchain metadata is stored in Google's Level DB by the Bitcoin Core client. Conceptually, Blockchain can be visualized as a vertical stack of blocks placed on top of each other, with the bottommost block acting as the foundation. Each block is linked to the previous one and refers to the preceding block in the chain. Blocks are identified by a hash generated using the secure hash algorithm (SHA-256) cryptographic hash function on the block header. A block has one parent but can have multiple children, each referring to the same parent block, thus containing the same hash in the previous block hash field. Each block contains the hash of the parent block in its own header, and the series of hashes linking individual blocks with their parent blocks form a significant

Tokenized Economy The Rise of Blockchain Tokens

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Abstract-
The emergence of blockchain technology has catalyzed a paradigm shift in how assets are represented, exchanged, and managed. At the forefront of this revolution is the concept of blockchain tokens, digital representations of assets or rights that are stored and transferred on a blockchain network. This paper explores the evolution of tokenized economies, examining the underlying technology, the diverse types of tokens, their applications across various industries, and the implications for businesses and society at large. Additionally, it discusses the challenges and opportunities presented by tokenization, along with potential future developments in this rapidly evolving landscape.

1. INTRODUCTION

Blockchain tokens are digital representations of assets or rights that are created, stored and exchanged on the blockchain network. These tokens use the underlying technology of blockchain, a distributed and immutable database that facilitates security and transparency without the need for intermediaries. Initially, blockchain tokens benefited from the rise of cryptocurrencies such as Bitcoin and Ethereum, serving as centers of exchange and stored value in their networks. However, as the technology has matured, the concept of tokenization has expanded beyond cryptocurrencies to include a variety of assets and transactions. Tokenization change is marked by the conversion of common currency tokens into different token types. Various asset-backed tokens, utility tokens and security tokens. While cryptocurrencies are generally a medium of exchange or store of value, real assets represent real-world assets such as real estate, commodities, and even art. Utility tokens, on the other hand, allow access to certain products or services within an autonomous region, while security tokens represent ownership of assets and are managed in the same way as normal security systems.

Evolution from Cryptocurrencies to Cryptocurrencies Different asset classes reflect the growing awareness of blockchain technology's potential to transform many industries by enabling the tokenization of tangible and intangible assets. By leveraging blockchain tokens, individuals and organizations can unlock new opportunities for business, ownership and efficiency in asset management and exchange. Additionally, tokenization has the potential to liberalize investment and simplify processes such as fundraising and supply chain management.

Blockchain tokens represent a fundamental shift in the field of digital assets, changing the way assets are created, managed and exchanged. From the humble beginnings of cryptocurrencies to their current role in supporting the tokenization of different assets, blockchain tokens have revolutionized finance, business, and more. As this technology continues to advance, businesses around the world are recognizing its ability to drive innovation and empower people and businesses.

II. UNDERSTANDING BLOCKCHAIN TOKENS

Basic Fundamentals of Blockchain Tokenization:

Blockchain technology enables distributed recording and exchange assurance by providing immutable and flexible tags where digital assets provide the infrastructure for tokenization to get under. Blockchain ensures the integrity and security of transactions through cryptography, making it ideal for tokenization. Each token represents a unique digital asset or right whose ownership can be easily audited and transferred on the blockchain.

Token Type:

1. Utility Tokens: These tokens provide access to goods or services on the blockchain network. They are often used to access or facilitate certain functions in business applications (DApps).
2. Security Tokens: Security Tokens represent ownership of assets such as company capital, equity rights or debt. They comply with securities regulations and generally provide some form of return to investors.
3. Asset-Backed Tokens: These tokens are backed by real-world assets such as real estate, commodities, or fiat currencies. Each token represents an ownership share of an asset and provides investors with income and majority ownership.

Online Transaction Fraud Detection Using Backlogging on E-Commerce Websites

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Abstract- **The proliferation of e-commerce platforms has brought about numerous conveniences for consumers and businesses alike. However, it has also opened the door to various forms of online transaction fraud. This paper presents an innovative approach to detecting online transaction fraud by employing the backlogging technique on e-commerce websites. Utilizing machine learning algorithms and data analytics, this system aims to enhance the security infrastructure of online shopping platforms, safeguarding consumers and businesses from fraudulent activities.**

Keywords: **Online Transaction Fraud, E-commerce, Backlogging, Fraud Detection, Machine Learning, Data Analytics.**

1. INTRODUCTION

The digital transformation of the retail sector has led to the widespread adoption of e-commerce platforms. While these platforms offer unparalleled convenience and accessibility, they also present new challenges related to fraud in online transactions. This paper presents a novel approach to mitigate this problem by using a backlogging technique to detect fraud in online transactions on e-commerce websites.

2. BACKGROUND AND MOTIVATION

2.1 Rise of E-commerce Fraud

With the growing popularity of online shopping, cybercriminals have devised sophisticated methods to exploit vulnerabilities in e-commerce platforms. Types of online transaction fraud include credit card fraud, identity theft, and account takeover, among others. Traditional fraud detection systems have struggled to keep up with these evolving fraud schemes, necessitating the development of more advanced and robust detection mechanisms.

2.2 Backlogging in Fraud Detection

Backlogging is a sophisticated technique used in fraud detection systems to increase the accuracy and reliability of identifying fraudulent activities. It involves carefully monitoring and analyzing user transaction history over a period of time to detect patterns, trends, and anomalies that may indicate fraudulent behavior. The primary goal of backlogging is to create a comprehensive and detailed transaction history for each user, allowing the system to identify unusual or suspicious activity that deviates from established patterns.

2.3 Principles Of Backlogging

Historical Transaction Analysis: Backlogging focuses on analyzing users' historical transaction data to identify their typical purchasing behavior, transaction frequency, spending patterns, and geographic locations. By understanding common user transaction patterns, the system can more effectively identify abnormal or suspicious activity that may indicate fraudulent behavior.

Pattern Recognition: Backlogging uses advanced data analytics and machine learning algorithms to identify recurring patterns, trends and anomalies in user transaction history. The system uses pattern recognition techniques to distinguish between legitimate and fraudulent transactions based on established patterns and deviations from those patterns.

Anomaly detection: Backlogging emphasizes the detection of anomalies or outliers in user transaction history that do not conform to established patterns. The system uses statistical analysis and anomaly detection algorithms to identify unusual transaction activity, such as unusually large transactions, multiple rapid transactions, or transactions from unknown geographic locations that may indicate fraudulent behavior.

INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)

e-ISSN : 2583-1062

Impact Factor: 5.725

www.ijprems.com
editor@ijprems.com

Vol. 04, Issue 05, May 2024, pp: 1025-1028

"A STUDY ON EMPLOYEE JOB SATISFACTION IN HMT MTL, COIMBATORE"

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ABSTRACT

The watch making division, HMT Watches, opened in 1961. During the 1970s and 1980s HMT was the largest supplier of wrist watches in India, with popular styles including Janata and Pilot. The division closed in 2016, largely due to mismanagement leading to heavy losses. In the same year, the Government of India also shut down HMT Chinar Watches Ltd., HMT Bearings, and HMT Tractors.

period.

1. INTRODUCTION

1.1Background of the Study :

The research is conducted at HMT MTL which is a leading machine tool manufacturer in India. This study examines the different factors which influence the satisfaction level of the employees of the organization. The Appropriateness of study is based on the employee's views and their work atmosphere. The project was undertaken to study the level of Employee Satisfaction in order to improve the whole working atmosphere in the industry. The project was also done through direct personnel interviews and also through the structured questionnaires. Data gathered was analyzed using a structured technique in order to draft recommendation, suggestions and implications.

1.3 Relevance & Scope of the Study

"Employee satisfaction leads to customer satisfaction. When internal customers (employees) are happy, they treat external customers well. Customers will keep coming back for more. This grows the relationship and leads to customer loyalty." by - Richard Federico Vice President and National Work-Life Practice Leader at The Segal Company inn Survey Links Work -Life Programs to Employee Performance".

1.4 The objectives of the study

1) To measure the satisfaction level of employees in HMT MTL

2) To know the employee satisfaction towards the facilities available at HMT MTL.

3) To identify the factors influencing employee satisfaction

4) To identify the factors improving the satisfaction level of employees.

5) To identify the employees expectations on their job

2. INDUSTRY PROFILE

2.1 Business Process of the Industry

constituting the top 28 machine tools manufacturing countries), had a turnover of US$ 51.85 billion in 2005, reprThe global machine tools industry (primarily esenting a 14.5 percent growth by value over the previous year. The machine tools industry in Japan and China witnessed a growth of 14per cent in 2005.

- ❖ Indian Machine Tools Industry
- ❖ The industry has been growing in both volume and value terms
- ❖ Category-wise growth
- ❖ Industry Exports
- ❖ Industry Consumption & Imports

2.2 Market Demand & Supply – Contribution to GDP – Revenue Generation

The global machine tools market size was USD 112.78 billion in 2019 and is projected to reach USD 151.90 billion by 2027, exhibiting of 4.5% during the forecast period.

INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)

e-ISSN : 2583-1062

Impact Factor: 5.725

www.ijprems.com
editor@ijprems.com

Vol. 04, Issue 04, April 2024, pp: 918-920

A STUDY ON CUSTOMER RELATIONSHIP MANAGEMENT IN BSNL, SALEM

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ABSTRACT

The Project work entitled" is to study the of various factors that are concerned with attitude of the employees.

The Study focused on analyzing job satisfaction in level in the organization . The analysis is mainly based on the primary data, through the survey method. For the study has taken a sample size 110 respondents at convenience sampling method from the total population.

The Study gives Employees opinion about job satisfaction, opportunity, attitude, stress, leadership, working environment, nature of work, incentive policy, bonus system, promotional opportunities, and increments.

The Study has used simple percentage analysis, chi-square And ANOVA used. The study has given suggestions to improve the motivational factors. To increase productivity. Through this organizational objective can be easily achieved. Overall company is satisfactory in job.

1. INTRODUCTION

Customer relationship management (CRM) is a number of strategies and technologies that are used to build stronger relationships between companies and their customers.

A company will store information that is related to their customers, and they will spend time analyzing it so that it can be used for this purpose.

Some of the methods connected with CRM are automated, and the purpose of this is to create marketing strategies which are targeted towards specific customers.The strategies used will be dependent on the information that is contained within the system. Customer relationship management is commonly used by corporations, and they will focus on maintaining a strong relationship with their clients.

1.1 Objectives of the study:

- To find out the relationship by knowing the satisfaction level of subscribers about the telecom industry.
- To know the customer opinion about tariff rates of BSNL.
- Creating awareness to BSNL subscribers about the facilities in prepaid and postpaid connections.
- Analyzing the problem faced by BSNL subscribers.

1.2 Scope of the study

The study is conducted on BSNL prepaid and postpaid users at 'BSNL CUSTOMER SERVICE CENTER'. The study is confined to the area of RAJAHMUNDRY. The size of the sample was 50.

2. RESEARCH METHODOLOGY

2.1 Procedure

To Procedures by which Researchers go about their work of describing explaining and prediction phenomena are called methodology. Methods comprise the procedures used for generating, collecting and evaluation data. Methods are ways of obtaining information useful for assessing explanations.

2.2 Research Design

- A Research design is the arrangements of condition for collection and analysis of data. This speaks about the decision recording what, where, when, how much by what means concerning on inquiry or a research studies. In constitutes the blue print for the collection measurements and analysis of data.
- The type of research used in this project is descriptive in nature. Descriptive studies aim at portraying accurately the characteristics of a particular group or situation.

3. DATA COLLECTION

- Primary Data
- Secondary Data

A STUDY ON EMPLOYEE WELFARE AND SAFETY MEASURES AT HYUNDAI PRIVATE LIMITED, CHENNAI

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ABSTRACT : Representative wellbeing is a basic part of keeping a solid and useful workplace. This theoretical investigates the significance and advantages of carrying out representative wellbeing estimates in associations. It features how these actions add to diminishing mishaps, expanding efficiency, upgrading organization notoriety, accomplishing cost reserve funds, guaranteeing administrative consistence, and further developing worker fulfilment and maintenance. By focusing on worker wellbeing, associations show their obligation to the prosperity of their labour force and make a positive and secure work environment.

INTRODUCTION

Employee Welfare includes anything that is done for the comfort and improvement of employees and is provided over and above the wages. Welfare helps in keeping the morale and motivation of the employees high so as to retain the employees for longer duration. The welfare measures need not be in monetary terms only but in any kind/forms. Employee welfare includes monitoring of working conditions, creation of industrial harmony through infrastructure for health.

Labor welfare entails all those activities of employer which are directed towards providing the employees with certain facilities and services in addition to wages or salaries

Wellness includes activities carried out for the betterment and comfort of employees and provided in addition to wages. Happiness is a broad concept that refers to an individual's state of life in which accretion is the desired relationship with the global environment - ecological, economic and social.

Employee welfare includes both the social and economic content of well-being. According to Todd." "Employee welfare means anything done for the comfort and betterment, intellectual or social, of an employee other than wages paid which is not an essential need of the industry".

Benefits include all that is done for the comfort and betterment of the employee and provided in addition to wages. Wellbeing helps to keep employees' morale and motivation high to retain them longer.

Welfare measures need not only be in money, but in all forms. Employee benefits include controlling working conditions, creating social harmony through health infrastructure, industrial relations, and workers' sickness, accident and unemployment insurance.

FEATURES OF LABOUR WELFARE MEASURES

1. Labor welfare includes various facilities, services and amenities provided to workers for improving their health, efficiency, economic betterment and social status.
2. Welfare measures are in addition to regular wages and other economic benefits available to workers due to legal provisions and collective bargaining

A STUDY ON THE PERFORMANCE OF HR POLICIES AND ITS IMPLEMENTATION OF CREATION INFRA INDIA PRIVATE LIMITED

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ABSTRACT - Human resource management is concerned with people element in management. Since every organization is made up of people, acquiring their services, developing their skills/ motivating to high level of performances and ensuring that they continue to maintain their commitments to the organization which are essential to achieve organizational objectives. This project is meant to know the Human Resource Policies in the organization. The HR Policies are a tool to achieve employee satisfaction and thus highly motivated employees. The main objective of various HR Policies is to increase efficiency by increasing motivation and thus fulfill organizational goals and objectives. The objective is to provide the reader with a framework of the HR Policy Manual and the various objectives that the different policies aim to achieve. The main focus was on the managerial levels of employees in CREATIONS INFRA INDIA PRIVATE LIMITED.

1. INTRODUCTION

This study is conducted to measure the effect of human resource policies (planning, recruitment & selection, training & development, job analysis & design, motivation, performance appraisal, and employee participation in decision making) on organizational performance, to verify if there is a positive and significant relationship between human resource policies and organizational performance, and to measure the scope of application of human resource policies. These guidelines identify the organizations intention in matters of recruitment, selection, promotion, development, compensation, motivation, and otherwise leading and directing employees in the working organization. HR policies serve as a road map for the manager. HR policies are also defined as that body of principles and rules of conduct which govern the enterprise in its relationship with employees. Such a policy statement provides guidelines for a wide variety of employment relationships in the organization. The purpose and significance of the HR policies hardly need any elaboration. Every organization needs policies to ensure consistency in action and equity in its relation with employees. Policies serve the purpose of achieving organizational goals in an effective manner. HR policies constitute the basis for sound HRM practices. Moreover, policies are the yardstick by which accomplishment of programs can be measured.

2. NEED OF THESTUDY

- HR policies are important for employees to work for an Organization.
- It helps to maintain motivation and willing work forces.
- It is an interesting and significant area for conducting research.
- They also ensure compliance with employment legislation and inform employees of their responsibilities and the Company's expectations
- HR policies provide guidelines on employer-employee relationships, which impart information on acceptable norms of behaviour, work schedules, health and safety measures, employment laws, conflict resolution and disciplinary measures.
- HR planning, hiring (recruitment and selection), training and development, payroll management, rewards and recognitions, Industrial relations, grievance handling, legal procedures.
- To have a formal Statement on corporate thinking

APPLYING DEEP LEARNING FOR DETECTING AND INTERVENING IN HATEFUL DISCOURSE ON SOCIAL MEDIA, AIMING TO MITIGATE ITS HARMFUL EFFECTS.

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Abstract: Currently, the global impact of social media is expanding rapidly, with a significant increase in users and a vast amount of new content generated daily. Identifying harmful content, particularly hate speech, has become a crucial issue in managing online environments. Deep learning is being utilized to enhance the efficiency of identifying hate speech. While progress has been made in this area, there is a lack of comprehensive reviews on recent advancements, hindering researchers interested in this field. To address this gap, we provide an overview of deep learning applications in detecting hate speech, presenting new approaches developed in recent years and highlighting potential challenges in this task.

Keywords: Habertor, Deep Learning, Social Media, language analysis

1.Introduction

Social media has made it possible for people to voice their thoughts at any time and from any location. However, these days, hate speech, acts of violence, threats, and even a trend of flooding are being disseminated through social media platforms. This is not a baseless claim. An EU poll found that 40% of social media users reported they had been attacked and intimidated online, while 80% of users reported having encountered hate speech online [1]. Many social media platforms, including Facebook, Twitter, and others, have attempted to manually screen these speeches, but their effectiveness has not been very great.

In the past, scholars have attempted to categorize content using conventional machine learning techniques, such as building models with a Bayesian network or employing the SVM-based kernel method, in order to automatically handle hate speech [4]. However, feature engineering is the foundation of classical machine learning, which depends on In order to extract features from the data for machine learning models or algorithms to classify or regress tasks, Itis utilized to manually generate data features. Feature engineering, the foundation of traditional machine learning, is the process of creating artificial features in data and then extracting those features for use by machine learning algorithms or models in tasks like classification or regression.

There are two issues with this kind of approach: First, because task features are constructed mostly using human background knowledge, their quality is inconsistent; second, because these features are shallow and primarily rely on statistical approaches, they are not capable of being very excellent. It also implies that hate speech with nuanced substance and purpose cannot be recognized by models created with these techniques. Data (text, photos, etc.) are directly processed as real-valued vectors for learning, in contrast to the old technique of collecting data characteristics [2]. The idea of end-to-end training, which preserves the data feature annotation prior to the execution of each independent learning assignment, is supported by deep learning and completely demonstrates the representability of the deep learning model.

Additionally, deep learning models have the ability to autonomously learn semantic information relevant to a task through several

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue II Feb 2024- Available at www.ijraset.com

Online Network Protection Firmware for Malware Identification Utilizing Transformer Learning

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Abstract: ***Malware ID expects a critical part in network security with the expansion in malware improvement. What more, kinds of progress in cutting edge assaults. Noxious programming applications, or malware, are the principal wellspring of different security issues. For different reasons, including the taking of state of the art developments and insightful properties, regulative exhibitions of retaliation, and the modification of sensitive information, to give some examples, these pernicious applications plan to perform unapproved exercises on the host machines to assist their makers. More valuable assistance systems are required because of the quick expansion of noxious programming on the web and their self changing skills, as in polymorphic and remarkable malware. This task proposes to support the MalFree Sandbox with stacked bidirectional long transient memory (Stacked BiLSTM) and generative prepared transformer based (GPT2) critical learning language models for recognizing pernicious code isolated. The proposed computations, specifically the bidirectional long transient memory (BiLSTM) model and the generative prepared transformer 2 (GPT-2) method, employ gathering rules derived from Minimal Executable (PE) Records static examination results to identify harmful code pieces. To comprehend malwares through MalFree Sandbox, care should be taken to sandbox the malwares in a climate that considers an encapsulation and exhaustive evaluation while in addition keeping on propelling spread from being gifted.***
Keywords: Network wellbeing, Malware, BiLSTM, GPT-2.

I. INTRODUCTION

Malware (destructive composing PC programs) is a massive gamble to PC designs, cells, and affiliations all around the planet. Malware can incur harm, including taking delicate information, holding onto structures, and upsetting essential associations. There is a growing demand for improved methods because traditional mark-based malware discovery frameworks are unable to distinguish between new and advanced malware variants. Malware code pieces, as a rule, to overlook a framework then again contraption's security strategies by executing themselves on the design. Aggressors could exploit blemishes in PC structures to take delicate information, spy on the compromised system, or assume command over the structure. Malware is often referred to as malicious "documents," but malicious code typically only affects a small portion of a document rather than the entire document. Model development for malware affirmation, as a rule, with consolidate, not completely firmly established by one or the other static or dynamic evaluations, and every so often crossbreed assessment. The solid evaluation adopts a gander at the strategy to acting of PE (Supportive Executable) reports upon execution, while the static assessment processes the substance of the PE records without execution. The DL alludes to setting up a potentially complicated learning system tended to by a solitary model, a Profound Cerebrum Association (DNN), and is the finished learning approach. The organization tends to the whole objective structure via mechanizing feature extraction totally without preprocessing. Utilizing the open-source disassembler objdump, we separate gathering codes in this task. This contraption makes movements as documents or sentences. Those information are then utilized for model turn of events, considering that the get-together code gives accurate data to acquiring fundamental coding plans. For this, we utilize the disassembler yield as information Worldwide Journal of Investigation Dispersion and Studies, Vol 4, no 6, pp 2686-2692 June 2023 2687 information to foster a language model helped with word implanting in this way to dealing with conventional language. Then, by using this language model, we plan to see whether an executable record is harmful or harmless. Basically, we endeavor outrageous area on bunch directions' executable archives. Computer-based intelligence, a subset of man-made intellectual prowess, includes significant learning. It connects with us to kill data from the layers present in its planning. It is utilized in Picture Attestation, Intimidation Disclosure, News Appraisal, Stock Evaluation, Self-driving vehicles, and Clinical advantages like unsafe advancement picture appraisal, and so on. By offering more information into the affiliation, the layers get organized well as a rule.

Chemical Papers
https://doi.org/10.1007/s11696-023-02985-z

ORIGINAL PAPER

Effect of conducting polymer-decorated Ppy@rGO hybrid electrodes with high specific capacitance and long-term stability for energy storage devices

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Received: 16 February 2023 / Accepted: 16 July 2023

Abstract
In this work, we synthesized hybrid nanocomposite comprising of polypyrrole (Ppy) and reduced graphene oxide (rGO) by using in situ polymerization and hydrothermal technique for supercapacitor application. The prepared electrode materials have been characterized by various analytical tools to assess their phase confirmation, morphology, porous structure, surface area and chemical composition. Powder XRD analysis revealed the presence of both rGO and Ppy phase in hybrid composite. UV–vis analysis demonstrates that heterojunction development decreases the band gap of bare materials from 2.21 to 1.65 eV. SEM and TEM analysis shows the layered and bending morphological formation of hybrid electrode. The textural analysis demonstrated that Ppy, rGO, Ppy/rGO show a BET surface area of 45.2, 59.4, 95.2 $m^2\ g^{-1}$, respectively. The designed hybrid composite material was successfully utilized as an electrode material in a supercapacitor, and the resulting device achieved notable performance metrics a power density, energy density and specific capacitance of 400.85 W kg^{-1}, 72.23 Wh kg^{-1} and 675 F g^{-1} , respectively. In comparison with pristine rGO and Ppy terminals, the enhanced efficiency of the Ppy@rGO hybrid electrodes towards supercapacitor application is raised as results of interaction between pristine materials. The addition of Ppy creates porous structures and improves conductivity across the rGO sheets, resulting in enhanced electrochemical performance. Furthermore, Ppy@rGO hybrid electrode retains approximately 85% of the primary capacitance value upon completion of 1000 runs. The present work significantly advances Ppy@rGO hybrid composites for use as electrode materials in supercapacitor devices.

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Published online: 14 August 2023

American Romantic Elements in Emily Dickinson's Selected Poems

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https://doi.org/10.5281/zenodo.10795627

Article History: Submitted-15/12/2023, Revised-14/02/2024, Accepted-15/02/2024, Published-29/02/2024.

Abstract:

This paper works on the intricate world of Emily Dickinson's poetry, aiming to unveil the unmistakable presence of American Romantic elements her literary contribution to American literature. Though Dickinson is frequently associated with the 19th- century American Romantic movement, her unique voice and unconventional style have urged scholars to assay the extent to which she coheres to or diverges from traditional Romantic ideals. This paper scrutinizes her works based on themes, language, and stylistic features that align with the broader American Romantic tradition.

Keywords: Individualism, Nature, Emotional Intensity, Transcendentalism, Inner World, Sublime, lyrical Style.

Introduction:

Emily Dickinson, an enigmatic figure in American literature, is notorious for her inventive and unconventional poetry that challenges the morals of her time. The American Romantic movement, starting from the early to mid-19th century, emphasized primarily on individualism, nature, imagination, and the supernatural. This paper is to explore how Dickinson's poetry reflects and reinterprets these themes within the environment of American

Research Journal of English Language and Literature (RJELAL)
A Peer Reviewed (Refereed) International Journal
Impact Factor 6.8992 (ICI) http://www.rjelal.com;
Email:editorrjelal@gmail.com; ISSN:2395-2636 (P); 2321-3108(O)

Vol.11.Issue 4. 2023 (Oct-Dec)

RESEARCH ARTICLE

INTERNATIONAL STANDARD SERIAL NUMBER INDIA
2395-2636 (Print):2321-3108 (online)

SPATIAL THEORY IN MARK TWAIN'S LITERARY LANDSCAPE: NAVIGATING PHYSICAL AND SOCIAL SPACES

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Article info

Article Received:30/11/2023
Article Accepted: 26/12/2023
Published online:31/12/2023
DOI: 10.33329/rjelal.11.4.281

Abstract

This research paper probes into the employment of spatial theory in the works of Mark Twain, an eminent American author celebrated for his astute commentary on society. Spatial theory, rooted in geography and cultural studies, provides a lens through which one can analyse the ways in which Twain's literary landscapes echo and assess societal constructs. By examining the spatial scopes within Twain's works, this paper aims to shed light on how the author circumnavigates and challenges prevailing norms, ideologies, and power structures. Henri Lefebvre, a French Marxist philosopher, made significant contributions to spatial theory, emphasized the social production of space and insisted that the space was a social product and also a set of relations that are lived, that also live in us. The major Objectives of this paper mainly focus on the core points such as the spatial dimensions within the selected works of Mark Twain and find out the narratives that connect the application of spatial theory to interpret the social commentary. The masterpieces Tom Sawyer, Huckleberry Finn, life on the Mississippi and The Man That Corrupted Hadley burg have been taken to explore the spatial ideas imbibed within the characteristic of realism. These works include the landscapes as the major part and the Mississippi river interlacing the portrayal of power dynamics, identity, and cultural norms.

Keywords: Spatial Theory, Societal Constructs, Identity, Freedom, Morality, Literary Landscape, Geographical Representation.

Introduction

Mark Twain, born Samuel Langhorne Clemens, is celebrated for his literary contributions that provide profound insights into the socio-political landscape of 19th-century America. Twain's narratives often unfold in diverse geographical settings, presenting a unique opportunity to explore the intersection of space and societal constructs. The discussion in this paper includes an overview of spatial theory in literature and explores how authors employ space as a narrative device to convey deeper meanings and reflect societal realities. Twain is a realist with the digression from American romanticism and his writing style was different from his contemporaries. His works majority based on the Mississippi river belt and the people lived in there during his times. He found solace in the river and spent some time as a steam pilot that has influenced most of his writings. The fictional town St.

International Journal of English Literature and Social Sciences
Vol-8, Issue-6; Nov-Dec, 2023

Peer-Reviewed Journal
Journal Home Page Available: https://ijels.com/
Journal DOI: 10.22161/ijels

American Romantic Elements in Mark Twain's The tragedy of Puddn'head Wilson

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Received: 12 Nov 2023; Received in revised form: 15 Dec 2023; Accepted: 22 Dec 2023; Available online: 29 Dec 2023

Abstract— *This Paper mainly focuses on the romantic elements used by Twain in the novel "The tragedy of Puddn'head Wilson". The major American romantic elements like a life with nature, civilization is corrupt and, social differences due to slavery. All the points are found plenty in the characters in the novel. The protagonists in the novel are suffering one way or the other because of the social structure that breeds slavery. Slavery is the major theme of the novel and its consequences over the people who walk in and around of it. The novel circumambulates slavery and its effect on people. Slavery is supposed to be the outcome of racial supremacy and "society". This paper is to prove that society breeds slavery and inequality, and corrupts people with its whims and fancies.*

Keywords— ***romanticism, American romanticism, slavery, society, nature, greed, racial discrimination, belongingness***

I. INTRODUCTION

Romanticism is a movement in the field of arts and literature and originated in the late 18th century European world particular in England. The salient themes of American romanticism are such as, a tendency towards nature, a life by living close to nature, elf realization and intensions to regard civilization as corrupt. The American romantics concentrated on transcendentalism which came from the German romantic thought, is defined as: "Any philosophy based upon the doctrine That the principles of reality are to be Discovered by a study of the process of thought, not from experience… (The TYE of GK). Individualism which is the central and prevalent thought of all romantic, is defined as: "They will say that you are on the Wrong Road if it is your own" -(Antonio Porchio in 1968). And to quote individualism strongly as:" A social theory that encourages men to act freely and singly; Opposed to socialism." (The growth of IKTI.P.336). Most of the American romantics believed that man can achieve his divine qualities by living close to nature and should be guided by his emotions and feelings rather than his intellect. The individualists like Thoreau, Emerson and Whitman strengthened these ideas in their living as an example to others.

Samuel longhorn Clemens (1835- 1910), universally known as mark twain, grew up in the slave state of Missouri. His novel "Pudd'nhead Wilson" narrates the story of slavery condition in Dawson's Landing in Missouri town. The major characters are Roxana, a female slave; Puddn'head Wilson, a black lawyer by profession but he remarked as a town's fool because of his illogical ideas; Tom and Chamber, the identical people switched over by Roxy so as to save her child from being sold; Judge Driscoll (Tom's uncle), a good-hearted white man and a close friend of Wilson; Percy Northumberland Driscoll (a father of tom), a rich white master and considers himself a god to his slaves. This novel is filled with humor and thrills. This project is to prove that the romantic elements are found by doing the detailed character analysis on the two major characters Tom and Chambers.

JOURNAL OF MECHANICS OF CONTINUA AND MATHEMATICAL SCIENCES
www.journalimcms.org

ISSN (Online) : 2454 -7190 Vol.-19, No.-4, April (2024) pp 60-82 ISSN (Print) 0973-8975

QUALITATIVE BEHAVIOR OF THIRD-ORDER DAMPED NONLINEAR DIFFERENTIAL EQUATIONS WITH SEVERAL DELAYS

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https://doi.org/10.26782/jmcms.2024.04.00005

(Received: February 14, 2024; Revised: March 19, 2024; Accepted: April 02, 2024)

Abstract

In this article, we examine the oscillation of a class of third-order damped nonlinear differential equations with multiple delays. Using the integral average and generalized Riccati techniques, new necessary criteria for the oscillation of equation solutions are established. The major effect is exemplified by an example.

Keywords: Oscillation; nonlinear differential equations; third-order; delay arguments; damping.

I. Introduction

Differential equations are a modeling technique used in many different domains, and most of them have general solutions that are difficult to come up with. As a result, researchers have been very interested in the qualitative components of differential equations. Asymptotic characteristics and oscillation are two important elements of qualitative research that are still in trend. It is not difficult to discover during problem-solving that the past and present states have an impact on the future state as well. As a result, the problem description should incorporate some time delay in the equation. Readers who are interested in learning more about the theoretical and practical significance of qualitative research on neutral equations should read O. Arino et al. [XIII], G. S. Ladde et al. [III], and J. K. Hale [IV]. Real-world applications cover a range of models that involve oscillation phenomena. In the context of mathematical biology, certain models can describe oscillation and/or delay

ScienceDirect

Materials Today: Proceedings

Available online 8 June 2023

In Press, Corrected Proof What's this?

Influences of MWCNT bonding strength on Microstructure, mechanical performance of Alsi10mg alloy composite

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https://doi.org/10.1016/j.matpr.2023.05.621

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Abstract

The high strength-to-weight ratio material is becoming essential in various engineering sectors like automotive, structural, aviation, and marine. This investigation is to produce the high strength to lightweight AlSi10Mg alloy composite with 0, 5, 10, and 15 wt% of multi-walled carbon nanotube (MWCNT) as reinforcement through vacuum-assisted liquid state processing. Characteristics-wise, the metal matrix composites are synthesized by using organic, inorganic, and fiber as reinforcement. The developed composites are subjected to physical, microstructural, and mechanical behaviour. The outcome results of the SEM micrograph show good interfacial bonding between AlSi10Mg and MWCNT. The composite contained higher content of MWCNT (15 wt%) and observed maximum tensile strength (192 ± 1.2 MPa) with reduced weight (2.316 g/cc). Tensile strength was increased by 23.87 %, and its weight reduction was 35.89 % compared to unreinforced AlSi10Mg alloy composite. The energy absorption capability was increased significantly (53.84 %) compared to the unreinforced AlSi10Mg composite.

Mathematical Modelling and Control

http://www.aimspress.com/journal/mmc

MMC, 3(2): 127–138
DOI:10.3934/mmc.2023012
Received: 18 November 2022
Revised: 14 March 2023
Accepted: 19 March 2023
Published: 08 June 2023

Research article

Existence theory of fractional order three-dimensional differential system at resonance

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Abstract: This paper deals with three-dimensional differential system of nonlinear fractional order problem

$$\begin{aligned} D^{\alpha}_{0^+}\upsilon(\varrho) &= f(\varrho,\omega(\varrho),\omega'(\varrho),\omega''(\varrho),...,\omega^{(n-1)}(\varrho)),\ \varrho\in(0,1),\\ D^{\beta}_{0^+}\nu(\varrho) &= g(\varrho,\upsilon(\varrho),\upsilon'(\varrho),\upsilon''(\varrho),...,\upsilon^{(n-1)}(\varrho)),\ \varrho\in(0,1),\\ D^{\gamma}_{0^+}\omega(\varrho) &= h(\varrho,\nu(\varrho),\nu'(\varrho),\nu''(\varrho),...,\nu^{(n-1)}(\varrho)),\ \varrho\in(0,1), \end{aligned}$$

with the boundary conditions,

$$\begin{aligned} \upsilon(0)=\upsilon'(0)=...=\upsilon^{(n-2)}(0)=0,\ \upsilon^{(n-1)}(0)=\upsilon^{(n-1)}(1),\\ \nu(0)=\nu'(0)=...=\nu^{(n-2)}(0)=0,\ \nu^{(n-1)}(0)=\nu^{(n-1)}(1),\\ \omega(0)=\omega'(0)=...=\omega^{(n-2)}(0)=0,\ \omega^{(n-1)}(0)=\omega^{(n-1)}(1), \end{aligned}$$

where $D^{\alpha}_{0^+}, D^{\beta}_{0^+}, D^{\gamma}_{0^+}$ are the standard Caputo fractional derivative, $n-1<\alpha,\beta,\gamma\le n$, $n\ge 2$ and we derive sufficient conditions for the existence of solutions to the fraction order three-dimensional differential system with boundary value problems via Mawhin's coincidence degree theory, and some new existence results are obtained. Finally, an illustrative example is presented.

Keywords: fractional differential equation; coincidence degree theory; resonance

1. Introduction

In the recent years, the glorious developments have been envisaged in the field of fractional differential equations due to their applications being used in various fields such as blood flow phenomena, electro Chemistry of corrosion, industrial robotics, probability and Statistics and so on, refer [1–7]. In particular, the fractional derivative has been used in lot of physical applications such as propagation of fractional diffusive waves in viscoelastic solids [8], charge transmit-time dispersion amorphous semi-conductor [9] and a non-Markovian diffusion process with memory [10].

Although fixed point theorems like the Banach contraction principle and the Schauder fixed point theorem are used to establish the existence of solutions, stronger conditions on the nonlinear functions involved limit their application to a limited number of problems. We employ Mawhin's topological degree theory method to include

Journal of Magnetism and Magnetic Materials 594 (2024) 171910

Contents lists available at ScienceDirect

Journal of Magnetism and Magnetic Materials

journal homepage: www.elsevier.com/locate/jmmm

Research article

Monte Carlo exploration of magnetic properties: Graphene and borophene comparison

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ARTICLE INFO

Keywords:
Graphene
Borophene
Magnetic features
Monte Carlo simulations
Blocking temperature

ABSTRACT

This study employs Monte Carlo simulations to investigate the magnetic characteristics of graphene and Borophene lattices, emphasizing various physical parameters. Temperature-dependent variations in magnetization and susceptibility reveal a transition from ferromagnetic to superparamagnetic states, characterized by the blocking temperature (T_B). Borophene exhibits a higher T_B than graphene, suggesting an easier phase transition in Graphene due to its distinct geometry. These findings provide valuable perspectives into the unique magnetic features of Graphene and Borophene lattices, guiding future advancements in materials and spintronics.

1. Introduction

2D materials have revolutionized the field of materials science and generate interest for outstanding features and promising uses [1–5]. Among these 2D materials, graphene and Borophene have emerged as prominent contenders. Graphene, has won noteworthy attentiveness owing by its outstanding features and powerful applications [6]. Graphene possesses exceptional mechanical strength, elevated thermal and electrical conduction, and excellent optical properties [7–11]. For instance, its high electrical conductivity makes it suitable for use in electronic devices [12,13]. Moreover, its excellent mechanical strength allows for the fabrication of ultra-light and strong materials, potentially revolutionizing industries like aerospace and automotive [14–16]. Moreover, the excellent thermal conductivity of Graphene also makes it an indispensable choice for use in thermal management applications such as heat sinks [17]. Furthermore, its optical properties, including high transparency and conductivity, enable its functional utilization in optical devices and solar cells [18–23]. The Graphene was a testament to its versatility and potential to revolutionize various industries. Besides, Borophene, is a two-dimensional material composed entirely of boron atoms, has emerged as a rising star in the field of materials research due to its unique properties and promising applications [24–26]. Borophene possesses remarkable physical features that rendering it appealing for a diverse array of applications [27–31]. In terms of mechanical properties, Borophene exhibits exceptional strength and flexibility, surpassing other 2D materials like graphene [32]. Its conductivity also renders it a suitable candidate for applications in electronic storage [33,34]. Borophene demonstrates a tunable band gap, which enables its utilization in optoelectronic devices [35,36]. Furthermore, its chemical and thermal stability enhance its potential for applications in catalysis and as a protective coating [28,37]. The diverse range of applications for Borophene is proof to its versatility and potential impact in various industries. As research in this field progresses, it is expected that Borophene will continue to shine as a remarkable 2D material with numerous applications on the horizon. In this extensive exploration of various phenomena in Borophene and graphene structures, researchers have utilized Monte Carlo simulations to unravel a multitude of intriguing properties. Investigating the magnetic features of a Borophene system provides valuable insights into the interplay between magnetic ordering and thermal fluctuations [38]. Extending this inquiry to Borophene nanoribbons with core–shell structures, the dynamic magnetic properties were elucidated, paving the way for tailored

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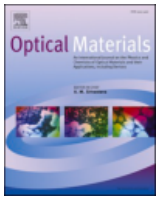
https://doi.org/10.1016/j.jmmm.2024.171910
Received 10 January 2024; Received in revised form 15 February 2024; Accepted 27 February 2024
Available online 1 March 2024

Optical Materials 151 (2024) 115349

Contents lists available at ScienceDirect

Optical Materials

journal homepage: www.elsevier.com/locate/optmat



Research Article

Enhanced DSSC efficiency through integration of red-emitting $MgAl_2O_4$: Eu^{3+} phosphor within TiO_2 layer

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ARTICLE INFO

Keywords:
$MgAl_2O_4$: Eu^{3+}
Red emitting phosphor
Photovoltaic performance
DSSCs

ABSTRACT

The main objective of this paper was to enhance the absorption and charge carrier generation rates of DSSC. The functional property of the Eu^{3+} ion (red light) when infused with the $MgAl_2O_4$ host was combined with TiO_2 nanoparticles and the results obtained through various studies are elaborated. The host and the nanoparticles were prepared through solid-state and sol-gel routes, respectively, with their crystalline structure and surface morphology identified by X-ray diffraction and field emission scanning electron microscope. The optical characteristics of the sample were studied through photoluminescence (PL) excitation (394 nm) and PL emission spectral analysis. The $MgAl_2O_4$: Eu^{3+} phosphor utilized in DSSC for the light down-conversion process converts high-energy incident light into low-radiation light, which further excites the N719 dye to emit charge carriers, thus increasing the conversion efficiency of the dye-sensitized solar cells. The overall conversion efficiency was observed a 4.80 % when 0.9 MW % Eu^{3+}: $MgAl_2O_4$ was added to the TiO_2 nanoparticle with an enhanced DSSC performance.

1. Introduction

In recent days, the application of dye-sensitized solar cells (DSSCs) has attracted many research groups as it helps towards the progress of renewable energy utilization as stated by O'Regan and Gratzel in 1991 [1]. Although there had been consistent development in DSSCs, power conversion efficiency (PCE) is found to be considerably lower than that of the conventional technique of silicon cells [2–4]. Thus, this topic holds good for research in enhancing the parameters of photocurrent, photovoltage, and PCE to a considerable range to increase the performance of the system. One such technique to substantiate the previous characteristics was achieved through the introduction of artificial dyes such as N719 and N749, into the conventional DSSC structure that absorbs visible light over a wide wavelength range so as to increase the maximum solar light tapping capacity [1,5]. Alternatively, downshift luminescence materials were introduced to transfer the ultraviolet irradiation to visible light, and the excess light emitted was reused by DSSC dyes for the regeneration of charge carriers whenever required, thereby increasing the maximum solar energy utilization rate. This increases the photocurrent density to a considerable value in turn promoting the PCE of the system. However, this methodology was adopted to progress the performance of silicon-based solar cells [6], and gradually implemented in DSSCs. Initially, $SrAl_2O_4$: (Eu^{3+}, Dy^{3+}) phosphor was added to DSSCs as well as to quantum dot-sensitized solar cells (QDSSCs) [7,8], but in recent research works the rare-earth (RE) doped luminescent materials are used in LEDs, displays, and energy applications [9–13]. On the other hand, based on extensive research activities aluminates are used as host materials owing to their high mechanical strength and definite optical features. The synthesis and characterization process was explained for various aluminates such as $SrAl_2O_4$,

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https://doi.org/10.1016/j.optmat.2024.115349
Received 23 January 2024; Received in revised form 27 March 2024; Accepted 7 April 2024
Available online 15 April 2024

Energy Technology
Generation, Conversion, Storage, Distribution
www.entechnol.de

Nanoflowers of Ternary Cobalt–Copper–Manganese Oxide as an Efficient Electrocatalyst for Oxygen Evolution Reaction

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Oxygen evolution reaction (OER) is an integral step in the water-splitting process. Hence, to promote OER, efficient catalysts are required to lower the energy barriers at the electrode/electrolyte interface. Low-cost and highly active catalysts are in great demand. Herein, a ternary metal oxide, $CoCuMnO_x$, synthesized by a facile hydrothermal method is reported, which possesses excellent catalytic ability for OER in alkaline electrolytes. The nanoscale morphology of the catalyst with flower-like nanostructures is instrumental in increasing the electrochemical surface area of the electrode. The presence of multivalent ions and the incorporation of copper greatly enhance the electrochemical properties of the catalysts. The catalysts typically demonstrate an overpotential value of 220 mV for achieving 10 mA cm^{-2} current density and a Tafel slope of 73 mV dec^{-1}. The catalysts demonstrate good stability with minimal degradation in OER activity even after 20 h of chronopotentiometry test. For practical applications, this low-cost material holds great potential.

1. Introduction

For a long time, hydrogen has been proposed as a significant green energy source.[1–3] However, green energy infrastructure has not been realized yet due to the high cost of materials and the low efficiency of the water electrolysis process. This low efficiency is generally caused by the sluggish kinetic behavior at the anode, where the oxygen evolution reaction (OER) occurs. OER is an integral part of any electricity-driven water-splitting process.[4–6] New findings in the cost-effective, eco-friendly catalyst for OER processes will help in minimizing the dependency on fossil fuels to fulfill energy demands. There are mainly two processes involved in the water-splitting process: 1) OER; and 2) the hydrogen evolution reaction (HER). The reactions are OER: $2H_2O \rightarrow O_2 \uparrow + 4H^+ + 4e^-$ and HER: $2H^+ + 2e^- \rightarrow H_2 \uparrow$. OER is the primary bottleneck in the electrolysis of water because of its sluggish nature and multiproton and multielectron transfer processes.[7,8] As OER involves four electrons, it requires a large overpotential to reach appreciable reaction rates. So far, iridium (Ir)[9,10] and ruthenium (Ru)[11] oxides have been found to be the most active electrocatalyst for OER and Pt-based[12,13] materials for HER. However, due to low availability and high cost, large-scale adoption of these materials is not practically viable. Hence, it is a current scientific challenge to develop an eco-friendly, low-cost, efficient catalyst for OER. Transition metal oxides have emerged as an alternative choice,[14] as they are earth-abundant and have tunable electronic and chemical properties. In particular, spinel oxides of cobaltites (ACo_2O_4) (typically, A^{2+} occupies tetrahedral sites and Co^{3+} occupies octahedral sites; A = Ni, Cu, Mn, Zn, Cd, etc.) have been investigated as a promising candidate for the OER process because of their multivalent states and flexible structure.[15,16] Among them, copper-doped[17] and manganese-doped[18] cobaltites demonstrate relatively high stability and activity due to available bimetallic sites with low cost and availability. Q. Zhang et al. fabricated copper-doped cobalt oxide prepared by magnetron sputtering.[19] X. Pheng et al. fabricated a p-doped defect-rich manganese–cobalt oxide, demonstrating an overpotential of 220 mV.[15] W. Menezens et al. reported an overpotential of 350 mV for cobalt–manganese-based spinel oxides.[4] K. Lankauf et al. synthesized $Mn_xCo_{3-x}O_4$ spinel oxide by soft chemistry methods and reported an overpotential of 327 mV.[20]

To further enhance the catalytic activity of these cobaltites, we made the ternary compound of cobalt–copper–manganese oxide (CCM). The binary spinel oxides had low electrical conductivity during the study. The properties of spinel oxides can be changed by adding extra cations to their tetrahedral and octahedral sites.[18] The availability of three metal cations helps in lowering the adsorption energies for the formation of intermediates by changing the chemical nature of the oxides.[21] OER performance is mainly dependent on the reactivity of the active sites.[22,23]

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The ORCID identification number(s) for the author(s) of this article can be found under https://doi.org/10.1002/ente.202301355.

DOI: 10.1002/ente.202301355

Carbon Letters (2024) 34:215–225
https://doi.org/10.1007/s42823-023-00604-1

Online ISSN 2233-4998
Print ISSN 1976-4251

ORIGINAL ARTICLE

Carbon based manganese oxide (MnO_2, MnO_2/MWCNT and MnO_2/rGO) composite electrodes for high-stability Li-ion batteries

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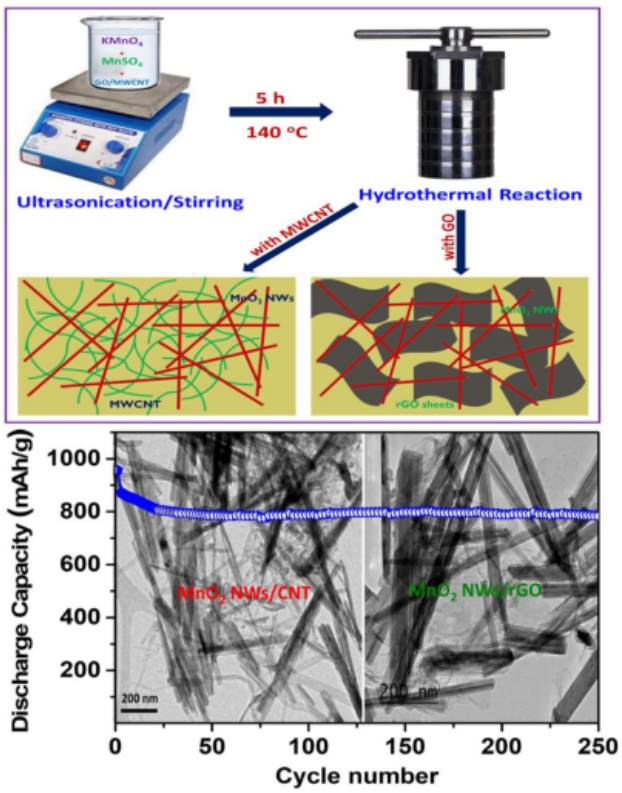
Received: 10 July 2023 / Revised: 11 August 2023 / Accepted: 13 August 2023 / Published online: 23 September 2023

Abstract

Synthesis of extremely competent materials is of great interest in addressing the energy storage concerns. Manganese oxide nanowires (MnO_2 NWs) are prepared in situ with multiwall carbon nanotubes (MWCNT) and graphene oxide (GO) using a simple and effective hydrothermal method. Powder XRD, Raman and XPS analysis are utilized to examine the structural characteristics and chemical state of composites. The initial specific discharge capacity of pure MnO_2 NWs, MnO_2 NWs/MWCNT and MnO_2 NWs/rGO composites are 1225, 1589 and 1685 mAh/g, respectively. The MnO_2 NWs/MWCNT and MnO_2 NWs/rGO composites showed stable behavior with a specific capacity of 957 and 1108 mAh/g, respectively, after 60 cycles. Moreover, MnO_2 NWs/rGO composite sustained a specific capacity of 784 mAh/g, even after 250 cycles at a current density of 1 A/g showing outstanding cycling stability.

Graphical abstract



Extended author information available on the last page of the article

Indian J Phys
https://doi.org/10.1007/s12648-024-03231-2

ORIGINAL PAPER

Preparation and characterization of TiO_2 nanostructures by changing the parameters of trichloroaniline concentration, pH and annealing for dye-sensitized solar cell application

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Received: 14 July 2023 / Accepted: 29 April 2024

Abstract: Mesoporous Titanium dioxide (TiO_2) sphere, nanosheet and nanoparticle were synthesized by a simple wet chemical method using Trichloroaniline (TCA) as a capping agent. The presence of a lone pair of electrons in the TCA is used to modify the TiO_2 structure when it is added with different amounts of ratios. The as-synthesized TiO_2 nanostructures were characterized by powder X-ray diffraction, Raman spectroscopy (FT-Raman), ultraviolet–visible spectroscopy, Fourier transform infrared spectroscopy (FTIR), field emission scanning electron microscopy and transmission electron microscopy. The anatase phase of TiO_2 was confirmed by Powder X-ray diffraction and Raman spectroscopy. The particle size of TCA-capped TiO_2 was reduced when compared with the sample without TCA capping. FTIR results demonstrated the TiO_2 nanoparticles were capped by the TCA molecule. The impact of different TiO_2 nanostructure morphology for DSSCs was investigated. The photoanode cells were fabricated with mesoporous spheres and mixed morphology of TiO_2 nanoparticle and nanosheet. Their optimal efficiencies were found to be 5.537 and 1.539%, respectively. Mesoporous spheres coated photoanode cells reached the maximum efficiency when compared to that of the mixed morphology of nanosheet with nanoparticle-coated photoanode. The enhanced performance of mesoporous spheres coated photoanode cells is due to the anatase phase of TiO_2 with high crystallinity and interconnected mesoporous network.

Keywords: Semiconductor; Nanostructures; Nanoparticles; DSSC; Amines; TiO_2

1. Introduction

Dye-sensitized solar cells can be the low-cost alternative device for commercially available solar cells. In recent years, to improve the performance of DSSC new nanostructures were synthesized, such as mesoporous spheres, nanotubes, nanowires, nanofibres, nanorods, nanodisks, cauliflower-like structures [1–13], etc. To enhance the DSSC efficiency a new kind of approach and directions are needed [14, 15]. The photoanode fabricated with mesoporous spheres is a suitable alternative to get better improvement for DSSC. The interparticle connections and mesoporous network of TiO_2 nanoparticles adsorbed more dye molecules when assembled on a photoanode as well and it acts as a good light scatter when used for DSSC.

The photoanode prepared with TiO_2 one-dimensional nanostructures: such as nanowires, nanorods, nanofibers, nanotubes and nanosheets improved the electron mobility and transport rate in DSSC. It shows that one-dimensional nanostructure can collect more photo-generated electrons and it could reduce the charge recombination rate as well.

The efficiency of the DSSCs depends on the many components like photo-anode, cathode, electrolytes and dyes. Many research works were carried out to optimize the cell performance of DSSCs. The photo-anode surface modification using different nanostructures is also one of the alternate ways to improve the performance of DSSCs. To synthesize the different nanostructures many research processes have been adopted to obtain it. The usage of

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Published online: 15 May 2024