National Conference on

Contemporary Research in Science, Engineering and Technology (NCCRSET 2024)

25 March 2024

Book of Abstracts

Edited by

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Organized by

Department of Science and Humanities (Physics)

SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY

Kuniamuthur, Coimbatore, Tamil Nadu 641008

(An Autonomous Institution Affiliated to Anna University, Chennai)

ISBN: 978-93-93518-71-2

Published by

IOR PRESS
5/11, Perumal Kovil Street,
Naickenpalayam, Coimbatore-641020,
Tamil Nadu, India
Email: support@iorpress.org

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DESIGN AND DEVELOPMENT OF AUTONOMOUS MORPHOBOT FOR ENVIRONMENTAL SUSTAINABILITY

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Abstract

The rapid advancements in robotics and autonomous systems have revolutionized aerial and ground-based applications. One such ground breaking innovation is the Morphobot - an integrated system that combines the capabilities of a drone (Unmanned Aerial Vehicle - UAV) and an Unmanned Ground Vehicle (UGV) to achieve unparalleled levels of adaptability and performance in dynamic environments. Depending on the need, it may be transformed into an Unmanned Aerial Vehicle or an Unmanned Ground Vehicle. The Morphobot's design is inspired by morphological adaptability found in nature, allowing it to seamlessly transition between aerial and ground modes, which addresses the limitations of traditional drones and unmanned ground vehicles. Inspired by the abilities of birds and other organisms that can both fly and walk, the Morphobot is equipped with advanced mechanisms that enable it to adjust its configuration based on the requirements of the task. The Morphobot's innovative design enables it to navigate through challenging terrains and agility through complex obstacles with ease. While navigating through rough terrain, the Morphobot can dynamically modify its formto optimize its efficiency and effectiveness. In its ground mode, the Morphobot can adjust its ground clearance to overcome obstacles and traverse different types of terrain. This feature enhances its mobility and ensures efficient navigation even in challenging conditions. It can be deployed for military operations, disaster response, or industrial applications. Its innovative design and advanced capabilities make it a powerful asset in the evolving landscape of robotics and autonomous systems.

Key words: *Autonomous, Morphobot, Unmanned Aerial Vehicle, Unmanned Ground Vehicle, Traditional drones, Terrains, Agility.*

COMPARATIVE STUDY OF CORONAL MASS EJECTIONS ON 07 NOVEMBER 2004 (SC23) AND 15 MARCH 2015 (SC24)

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Abstract

The coronal mass ejections (CME) on 07 November 2004 at 16:54 UT and 15 March 2015 at 01:48 UT are studied using multi-wavelength data. These events produce the moderate geomagnetic storms in the Disturbance Storm Time index (DST) of -289nT and -222 nT. The eruption of trans-equatorial loop was initiated the first CME and prominence eruption was initiated the second CME. The drag force and magnetic energy plays the role as it propagate in the interplanetary medium. The comparative study of two CMEs from different cycles helps to understand the initiation mechanism and propagation nature of the CMEs with respect to solar cycle.

Keywords: CME, DST, trans-equatorial, prominence

EXPLORING VERSATILE CONTROL OPERATIONS FOR MOTORIZED WHEELCHAIR

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Abstract

The smart multifunctional wheelchair aims to revolutionize mobility assistance for individuals with disabilities by integrating cutting-edge control and safety features. Central to its design is the utilization of the ATmega328P microcontroller, renowned for its reliability, versatility, and extensive community support.

The ATmega328P microcontroller serves as the backbone for various modes of operation, including joystick control, path remembering, and gesture control. In the gesture control mode, the microcontroller interprets simple and natural gestures to enable hands-free operation, enhancing accessibility for users with limited hand mobility.

Additionally, the ATmega328P power's location tracking, leveraging its capabilities to enable continuous GPS monitoring of the wheelchair's position. This feature enhances user safety and caregiver peace of mind by facilitating prompt responses to emergencies and ensuring overall situational awareness.

Specialized microcontrollers further enhance specific functionalities. The ESP12F microcontroller facilitates IoT connectivity, enabling seamless remote control and data exchange, while the ESO32H-WROOM-32E microcontroller is dedicated to geofencing, defining virtual boundaries and triggering alerts when the wheelchair deviates from predefined areas.

Through rigorous testing and evaluation, the project has demonstrated the successful implementation and functionality of these advanced features, made possible by the collaborative integration of microcontrollers. By leveraging the unique advantages of each microcontroller, the project sets a new standard for mobility aids, promising to significantly enhance the quality of life for users with disabilities.

By adopting a user-centred approach to assistive technology and harnessing the capabilities of specialized microcontrollers, the smart multifunctional wheelchair promotes independence, inclusivity, and empowerment for individuals with mobility impairments. With its innovative design and comprehensive features, this wheelchair represents a significant leap forward in the field of mobility solutions, ushering in a new era of accessibility and mobility for users worldwide.

Rise and Fall of Sunspot area with Umbral flares by the Investigation of Rotational bands of Silicon Nitride Molecule

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Abstract

The sunspots are not permanent features on the sun. Rather they start off as a small blemish on the photosphere called a pore (dark area with an average diameter of 1000 miles), grow to maximum size that is tens of thousands of miles across, and then fade away. In this study we analyze several sunspots areal changes with the rotational lines of Silicon Nitride molecule.

A high-resolution sunspot umbra spectrum recorded in National Solar Observatory, Kitt Peak in the visible and infrared wave number range was used to search the rotational lines of D $^2\Pi$ – A $^2\Pi$ (2,2), (4,3) and (2,2) and $^2S \rightarrow {}^2S$ (0,0), (1,1), (2,2), (3,3), (4,4), (5,5), (3,2), (4,3), (5,4) and (6,5) bands of SiN molecule. The spectral wave number range used in the present study was from 24,239 cm^{-1} to 27,378.33 cm^{-1} (3651.5 Å to 4277.1 Å). By using a reliable line identification method, the chance coincidence was evaluated for the selected bands of D $^2\Pi$ – A $^2\Pi$ and $^2S \rightarrow {}^2S$ systems of SiN molecule. With the help of the identification method, the results of number of chance of coincidences were compared with I-parameter values for the selected bands of D $^2\Pi$ – A $^2\Pi$ and $^2S \rightarrow {}^2S$ systems of SiN molecule. By using triangle approximation method, the equivalent widths were estimated for the well resolved rotational lines of band system of D $^2\Pi$ – A $^2\Pi$ and $^2S \rightarrow {}^2S$ of SiN molecule. The effective rotational temperatures were then calculated for the certain band system of D $^2\Pi$ – A $^2\Pi$ and $^2S \rightarrow {}^2S$ of SiN molecule. The rotational temperature values calculated for these bands were found to be in the range of 1130 - 3500 K. This range of temperature agrees well with the effective rotational temperatures stated for other diatomic molecules in sunspot umbrae. This change in temperature causes the changes in the structure of umbra and its magnetic field. The convection current inside the photosphere surface make the sudden flash of umbral flares. So, one can make a clear confirmation that there is a more chance for the finding of SiN molecule with the rise and fall of sunspot areal changes with umbral flares.

Keywords: Growth and Decay - Umbral Flares - Sunspot atlas – Photosphere - SiN diatomic molecule - Equivalent width - Rotational temperature – Magnetic field

INVESTIGATION ON STRUCTURAL BEHAVIOUR OF BEAMS WITH VARIABLE ORIENTATION OF SHEAR REINFORCEMENT.

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Abstract

This project explores the impact of various stirrup configurations on the efficacy of shear resistance in reinforced concrete beams, expressed as a ratio of the nominal shear stirrup strength. Shear effects in reinforced concrete beams stem from multiple mechanisms, with the most common contributors being shear resistance of concrete, aggregate interlocking nature, dowel force in tension reinforcement, and shear reinforcement. Managing shear typically involves adjustments to or variations in shear reinforcement.

In our study, we aimed to alter the orientation of shear reinforcement to investigate its influence on shear resistance and assess the potential reduction in the quantity of bars required in concrete beams. The primary focus was on understanding how changes in shear reinforcement orientation affect the behaviour of reinforced concrete beams under shear forces. While the prevailing trend suggests a decrease in the efficiency of shear force resistance with reduced transverse spacing of stirrups, conflicting results indicate instances where the transverse spacing of stirrups across the beam width has negligible effects. In our project, we specifically explored the impact of altering stirrup orientation and analysed its effects on shear in reinforced concrete beams.

Keywords: Differential stirrup configuration, Inclined stirrups, Shear study

NCCRSET - 006

HAPTIC VISION-ULTRASONIC GLOVE FOR BLIND NAVIGATION

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Abstract

There are many object detection systems for blind people using various technologies. A lot of countries around the world provide people with disability some extra benefits and tools to help them. One such idea to help the blind to prevent fatal accidents and frequent clashes with objects around them is to provide a Ultra Sonic Glove to help them to prevent these accidents with a low cost module.

When ultrasonic sensor detects anything in front of it gives a message to the controller and we process this data and calculate the obstacle's position. If the obstacle is not to close the circuit, it does nothing. When the barrier is closed the person it sends a signal to sound a buzzer. The sound changes depending on the distance of the obstacle. If the obstacle is too close then the buzzer will always be open to alert the person.

We have designed the project in such a way that it produces different vibration depending on the distance of the obstacle. In the present paper we report a the construction of an equipment with Arduino nano which helps blind people to move faster and more confidently by finding nearby obstacles using the ultrasonic sensors by alerting the blind person with a buzzer sound and vibrator also with Esp 32 cam for object identification.

Keywords: ultrasonic sensor, Arduino nano, vibrator, buzzer.

NCCRSET - 007

MICROWAVE-ASSISTED SYNTHESIS OF DIHYDROPYRIMIDINONE DERIVATIVES FROM m-NITROBENZALDEHYDE AND CINNAMALDEHYDE

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Abstract

Green synthesis methodologies have gained significant traction in organic chemistry due to their environmentally friendly nature and high efficiency[1]. Microwave-assisted organic synthesis represents a promising approach within this paradigm, offering rapid and sustainable routes to diverse organic compounds. Microwave-assisted organic synthesis[2] has emerged as a powerful tool for the rapid and efficient generation of diverse molecular scaffolds. In this study, we report a microwave-assisted synthesis of dihydropyrimidinones from m-nitrobenzaldehyde / cinnamaldehyde as a key starting material. The reaction proceeded smoothly under microwave irradiation, employing a one-pot multicomponent reaction involving m-nitrobenzaldehyde / cinnamaldehyde, ethyl cyanoacetate, and urea in the presence of a catalyst. The use of microwave irradiation significantly accelerated the reaction rate and improved the overall yield of the dihydropyrimidinone products. Various reaction parameters, including reaction time, temperature, and catalyst loading, were systematically optimized to enhance the efficiency of the synthesis. The synthesized dihydropyrimidinone derivatives such as

- 5-(3-oxopropanenitrile)-6-methyl-4-(3-nitrophenyl)-3,4- dihydropyrimidin-2(1H)-one
- 5-(3-oxopropanenitrile)- 6-methyl-4-styryl-3,4- dihydropyrimidin-2(1H)-one

were characterized using spectroscopic techniques, like FT-IR spectrum and 1H-NMR spectra. The synthesized compounds both (1 & 2) show better antibacterial activity against Enterobactero-aerogens. This approach shows that MWI-assisted one-pot multicomponent synthesis of substituted 3,4- dihydropyrimidine-2(1H)-ones with EtOH as a solvent, is a convenient and green method. This method provides many benefits like operational simplicity, clean, green solvent, easy workup, excellent yields, short reaction time, no need for a column for separation, and eco-friendly method. Further, this technique offers a widespread application in the area of drug discovery, combinatorial and medicinal chemistry preparations

This microwave-assisted synthesis of dihydropyrimidinones from m-nitrobenzaldehyde / cinnamaldehyde holds promise for applications in medicinal chemistry and drug discovery efforts.

Keywords: *Microwave Assisted Synthesis, Dihydropyrimidinones, m-nitrobenzaldehyde / cinnamaldehyde*

NCCRSET - 008

IoT BASED DRIVER FATIGUE DETECTION AND VEHICLE CONTROLSYSTEM

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Abstract

Every year lot of fatalities is happening in roads due to accidents globally. Breaking rules while driving is one of the reasons behind accidents and also due to fatigue. Due to laxity of other driver/occupant most of the vehicle accident occurs. Drowsiness or a fatigue is also a factor behind major accidents. This paper provides a novel way for safety as well as security. A nonintrusive system is developed to detect the above factors and also will give an immediate lead about accident. The warning signal will be issued with the help of an alarm and also to detect alcohol content present in the body and send message to family or friends. This lead to many number of crashes or accidents in the road. In this paper we will find a solution by using eye blink sensor. So the drowsiness is detected with the help of sensor and alarm will be sensitized. If the eyes of the driver are closed for more certain interval of time, then this will result in the form of sound.

Keywords: IoT, Eye blink sensor, Alcohol detection system, Driver assistance.

Strontium titanate ($SrTiO_3$) thin films: Preparation, Characterization and Rectification properties

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Abstract

In spite of the limited sources with expensive nature and high toxicity of organic materials used in optoelectronic devices, research perseverance has shifted towards novel inorganic materials and technologies. The novelty behind optoelectronics lies in its ability to harness the unique properties of the light for a wide range of application leading to the development of innovative and efficient electronic devices. These shortcomings may be rectified through the optimal utilization of inorganic materials particularly in the form of ABO_3 type perovskites. ABO_3 type perovskite thin film are a class of materials with a perovskite crystal structure named after the general formula ABO_3, in this formula, A is cation typically a large alkaline earth or rare earth metal ion, and B is smaller ion. These films are of significant interest in various application including solar cell, memristors, sensors and catalyst due to their unique properties. Perovskite thin film have gained attention for their excellent light absorption properties, long carrier lifetimes, and high charge carrier mobilities. ABO_3 type perovskite thin films represent a versatile class of materials with a wide range of potential application, driven by their intriguing electronics, optical, and structural properties. Among ABO_3 type perovskites, strontium titanate ($SrTiO_3$) has a broad band gap value of 3.2 eV and also having multifaceted polymorphic structures like cubes, spheres, rods, flakes, flowers, fibers and stars because of the influences of synthesis methods and parameters. Consistent and well-dispersed STO (Strontium Titanate) thin films are deposited on FTO substrates by Nebulizer Spray Pyrolysis (NSP) technique influenced by various substrate temperature. The optimum deposition parameter is influenced by a solution's concentration, time, and spray gun nozzle, as well as structural characteristics such as crystallite size, texture coefficient, lattice constant, and dislocation density. The cubic crystal structure is discovered using an X-ray diffraction pattern with a favored orientation along (1 0 0). The STO film deposited at 475°C designated notably strong intensity peaks with optimum crystallite size. Generally, the substrate temperature proliferate the size of the crystallites because of the atoms or molecules in the thin film have higher kinetic energy at higher temperature, which promotes diffusion and rearrangement of atoms on the substrate surface. UV spectra indicated three consistent strong and wide peaks at 342(2.9 eV), 338 (3.17 eV), and 336 nm (3.29 eV), which correspond to the UV area and deep level emission at blue the visible range. some large, non-uniforms grains are coming out to the front figure. As the temperature increases, gradually the grain size also increases at particular temperature 475°C (263 nm). In general, the surface morphology of the samples depends on synthesis method. XPS spectra aside from the oxidation state of $SrTiO_3$ and the survey spectra of $SrTiO_3$, the availability of elements such as Sr, Ti, and O were discovered. The $SrTiO_3$ thin films exhibits strong spin orbit coupling in its 3d state, which is separated into Sr3d (135.92 eV) and Sr3d (135.82eV). These data validate the Sr2+ oxidation state and cubic perovskite structure. From the results, concluded that the substrate temperature strongly influence the diverse properties like structural, optical, emission, compositional, electrical and rectification properties.

NCCRSET -010

SYNTHESIS, ANTI-MICROBIAL, ANTIOXIDANT AND CYTOTOXIC ACTIVITY OF METHOXYDIBENZONAPHTHYRIDINES

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Abstract

Synthetic organic and pharmaceutical chemistry heavily relies on heterocyclic compounds due to their widespread presence in nature and diverse applications across various fields. Extensive literature surveys highlight the importance of chloroquinolines in synthesizing substituted quinolines with significant biological activities. Among these, amination reactions utilizing aromatic amines have been extensively investigated to yield anilinoquinolines. Recent years have witnessed a significant expansion in research focused on naphthyridines, driven by the discovery of biologically active compounds within their derivatives.

After viewing the above facts, the entity of the present investigation was to study the reaction of chloroquinolines. In this concern 2,4-dichlorobenzo and 2,4-dichloroquinolines was taken as a starting precursor to prepare various substituted angular and linear isomeric methoxydinaphthonaphthyridines via aminoquinoline intermediate using CuI as catalyst . The synthesized compounds were characterized using spectral studies. All the synthesized were screened for microbial, anti-oxidant abd cytotoxic studies. The synthetic outcome and their mechanism and spectral differentiation of isomer and their biological evaluation will be discussed in detail during the presentation.

Keywords: Methoxynaphthyridines, CuI catalyst and Anticancer.

NCCRSET - 011

THE TRAFFIC WHISPERER USING RFID AND IOT

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Abstract

Traffic Whisperer is an established method to detect the traffic signs and analyze the traffic in the area and controlling the speed of the vehicle in order to reduce the accidents. In the last 5-10 years, the number of active vehicles has reached a tremendous growth, the growth has also resulted in more traffic and increased no of accidents. It is hard to control the vehicle traffic. It is crucially important to control the traffic and reduce the occurrence of accidents. In this paper, we use technologies like RFID, ESPNOW which is developed in Arduino UNO environment. Primarily, the first step is to read the traffic sign board signals like speed limit(40kmph), No horn region, Left turn and take diversion etc., using RFID reader. Excluding speed limit signal other signal are only displayed in lcd display. Generally, the system is used to reduce the speed of the vehicle if it is a speed limit signal. So, the speed of the vehicle is reduced by controlling the speed of the motor. The speed of the motor is controlled by modulating its PWM (Pulse Width Modulation). For the purpose of PWM we will be using the concept of duty cycle to effectively reduce the speed.

Key Words: Traffic signs, Analyze traffic, Vehicle speed control, RFID, ESPNOW, Arduino UNO, Traffic sign board signals, Speed limit, LCD display, Speed reduction, Motor control, PWM (Pulse Width Modulation), Duty cycle.

NCCRSET - 012

DESIGN AND FABRICATION OF SMART OVERHEAD VACUUM CLEANER

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Abstract

The textile industry, particularly cotton manufacturing, faces challenges in maintaining clean and safe working environments due to the accumulation of lint and dust particles. Traditional cleaning methods are often inefficient, time-consuming, and prone to human error. To address these challenges, this paper presents the design and fabrication of a novel Smart Overhead Vacuum Cleaner (SOVC) tailored for cotton textile industries.The SOVC integrates advanced sensing technologies, automation, and smart control mechanisms to efficiently collect and remove lint and dust particles from overhead spaces within textile manufacturing facilities. Leveraging state-of-the-art sensors such as LiDAR and infrared, the SOVC navigates through complex overhead environments autonomously, identifying and targeting areas with high dust accumulation. Furthermore, the SOVC incorporates intelligent algorithms for real-time monitoring and adjustment of cleaning parameters based on environmental conditions and operational requirements. Through machine learning techniques, the system continuously improves its cleaning efficiency and adapts to dynamic changes in the manufacturing environment.

In conclusion, the design and fabrication of the Smart Overhead Vacuum Cleaner offer a promising solution to enhance cleanliness, safety, and productivity in cotton textile industries. The integration of smart technologies and automation not only improves cleaning efficiency but also reduces operational costs and enhances overall workplace hygiene. This research contributes to the advancement of cleaner and safer working environments in textile manufacturing, paving the way for future developments in smart cleaning systems tailored for specific industrial applications

Keywords: Textile Manufacturing Optimization, Occupational Health Standards Industrial Hygiene Protocols, Advanced Cleaning Technology, Workplace Safety Measures Automation Integration, Efficiency Enhancement Strategies, Sensor-driven Cleaning Systems, Precision Cleaning Solutions, Operational Efficiency Initiatives, Sustainable Production Practices, Regulatory Compliance Frameworks, Quality Assurance Protocols, Continuous Improvement Methodologies

NCCRSET - 013

DESIGN AND FABRICATION OF SHADOW ROBOTIC ARM

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Abstract

With its telepresence features, the Shadow Robotic Arm is a ground-breaking invention meant to improve worker safety in the chemical industry. With the use of this cutting-edge technology, handling dangerous materials remotely is made possible, reducing the possibility of chemical explosions and safeguarding worker safety. By using potentiometer-based kinematics and precision-driven hand motions, the technology makes safe industrial operations possible, enabling human operators to do complex tasks without being exposed to dangerous situations.

This project tackles the pressing need for safer handling of hazardous chemicals, which is common in the chemical industry and presents serious hazards due to the constant possibility of explosions and accidents. Operators may supervise the robotic arm's actions from a safe distance by incorporating telepresence capabilities, which lowers the danger of harmful exposure and decreases workplace accidents.

The creation of the telepresence-capable Shadow Robotic Arm represents a substantial advancement in teleoperation and robotics and provides a workable way to improve worker safety in the chemical industry. Furthermore, this technology's adaptability points to possible uses in a variety of hazardous settings, such as oil refineries, nuclear power plants, and pharmaceutical labs.

Keywords: Robotic Arm, Telepresence features, Worker safety, Chemical industry, Potentiometer-based kinematics, Precision-driven hand motions, Teleoperation, Operational effectiveness, Industrial environments

NCCRSET - 014

BLOCKCHAIN-BASED POMS FOR ANTI-COUNTERFEITS

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Abstract

In recent years, blockchain has received increasing attention and numerous applications have emerged from this technology. A renowned blockchain application is the cryptocurrency bitcoin, that has not only been effectively solving the double-spending problem but also it can confirm the legitimacy of transactional records without relying on a centralized system to do so. Therefore, any application using blockchain technology as the base architecture ensures that the contents of its data are tamper-proof.

This project is going to uses the Decentralized Blockchain Technology approach to ensure that consumers do not fully rely on the merchants to determine if products are genuine.

Project describe a decentralized blockchain system with products anti-counterfeiting, in that way manufacturers can use this system to provide genuine products without having to manage direct-operated stores, which can significantly reduce the cost of product quality assurance.

NCCRSET – 015

ENHANCING PATIENT PRIVACY THROUGH INTEGRATION OF CLOUD-BASED RECORDS STORAGE AND BLOCKCHAIN TECHNOLOGY

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Abstract

Block chain technology has the potential to completely transform healthcare management systems by enhancing data security, interoperability, and integrity because to its decentralized and unchangeable structure. Sensitive patient information is more difficult for bad actors to breach thanks to the SHA-256 algorithm, which improves data security. Interoperability between diverse healthcare systems is facilitated by smart contracts and standardized data formats. However, issues with user adoption, scalability, and regulatory compliance also face block chain implementation in the healthcare industry. This study offers important insights into the changing environment of healthcare data management by highlighting the possible advantages and challenges of integrating block chain technology in healthcare management systems.

Keywords: patient monitoring, health, security, EHRs, Block Chain

NCCRSET – 016

PLANT LEAF DISEASE DETECTION USING CNN AND PESTICIDE SUGGESTION

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Abstract

Crop plants such as corn, apple, and grape are susceptible to various diseases that can significantly impact yield and quality. Timely detection and appropriate management of these diseases are crucial for sustainable agriculture. In this system, we propose a comprehensive solution utilizing Convolutional Neural Network (CNN) algorithms, specifically DenseNet-121, for the automated detection of diseases in corn, apple, and grape plants. The proposed system provides a user-friendly interface where farmers or users can upload images of plant leaves exhibiting symptoms of disease. The CNN model analyses these images and accurately identifies the type of disease present, aiding farmers in early detection and intervention. Furthermore, the system incorporates a recommendation engine to suggest suitable pesticides for disease management. Users have the option to choose between natural and artificial pesticides based on their preferences for organic farming or conventional practices. The recommendation engine considers factors such as the type of disease detected, plant species, environmental conditions, and user preferences to provide personalised suggestions for pesticide application.

Keywords: CNN, Detection of disease, Timely detection, DenseNet-121, Pesticides recommendation

NCCSRET – 017

Synthesis, Structural, Thermal and Photoluminescent Properties of Copper Thiophene-2,5-dicarboxylate hydrates

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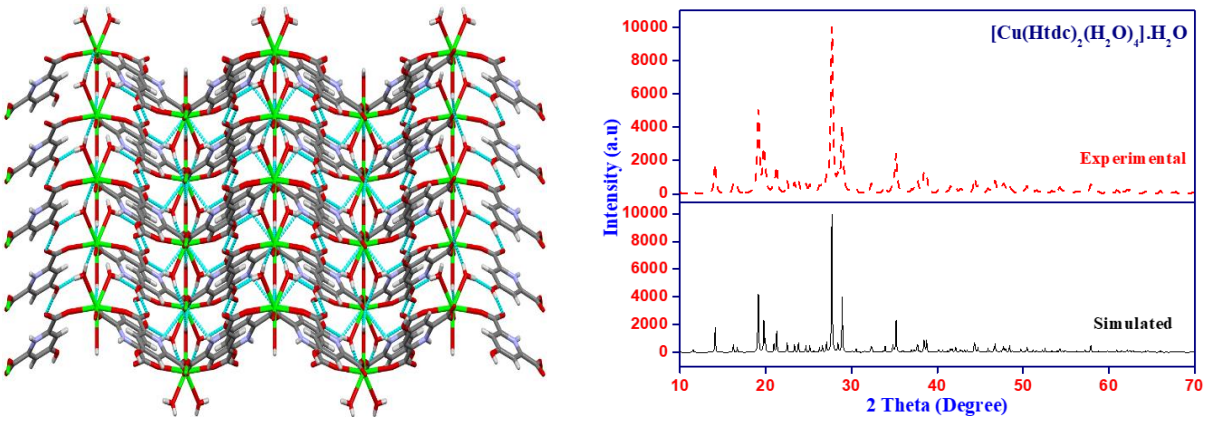
Water assisted Copper complex was successfully prepared by aqueous medium. The prepared complex has been characterized by analytical, spectral, thermal and photoluminescent techniques. Although there have been numerous characterized structures originating from thiophene-2,5-dicarboxylic acid (H_2tdc), however, predictable unusual structures still can be assembled when appropriate experimental conditions are modified. The single crystal X-ray study reveals that the Cu complex crystallizes in the triclinic crystal system with **P-I** space group. There has been six coordination around the Cu metal ion to form the octahedral geometry, which is further assembled to a 2-D Zigzag layer through intermolecular hydrogen bonds and π-π interactions.

The IR spectrum of the complex shows O-H stretching frequency in the region 3450 cm^{-1} revealing the presence of water molecules. The asymmetric and symmetric stretching frequencies of the carboxylate groups appears around 1650 cm^{-1} and 1344cm^{-1} respectively, which shows the presence of deprotonated carboxylate groups. Simultaneous TG-DTA curve of the Cu complex in air resulted in the formation of metal oxide as final residue *via* the [Cu(Htdc)$_2$] as an intermediate. The emission spectrum of the parent acid and its complex have been recorded and the emission spectral results shows that the Cu complex is having better luminescent behaviour as compared to free acid.



3-D packing view of [Cu(Htdc)$_2$(H_2O)$_4$].H_2O & Experimental and simulated PXRD patterns of Cu complex

NCCRSET - 018

FABRICATION, CHARACTERIZATION OF SURFACTANT ENHANCED Mn/Co/Ni TERNARY OXIDES FOR CATALYTIC REDUCTION OF 4-NITROPHENOL

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Abstract

A novel surfactant enhanced Mn/Co/Ni ternary metal oxides have been synthesized by simple and economic co-precipitation method to investigate the efficiency of catalytic reduction of 4-nitrophenol. The optical, structural and chemical structures were analyzed by X-ray diffraction, X-ray photoelectron microscopy, UV-Vis, Fourier Transform Infrared spectroscopy, and Brunauer-Emmett-Teller studies. XRD study revealed that urea supported Mn/Co/Ni ternary oxides (MCNU) have cubic structure with average crystallite size of 19 nm. FESEM images confirmed that MCNU have the agglomerated spherical, needle like morphologies. The specific surface area was found to be 55.66 m^2/g. The band gap value was calculated to be 3.4 eV using Tauc plot. The XPS analysis confirmed the presence of Mn, Co, Ni as major parts with a 2p core level region. The formation of bond between metals and oxygen were confirmed by the peak appeared in the range of 500 – 600 cm^{-1} in FT-IR. The reduction efficiency was found to be >99% against 4-Nitrophenol at natural pH, 10 mg of catalyst weight, 0.25 mM of pollutant and 0.0011 mM of sodium borohydride. Hence, the surfactant enhanced Mn/Co/Ni ternary metal oxides were found to be efficient catalyst for catalytic and environmental applications.

Keywords: Catalyst; Morphology; 4-Nitrophenol; Surfactant; Ternary Metal Oxides;

SYNTHESIS, CHARACTERSIATION AND ANTIMICROBIAL EVALUATION OF PYRAZOLINO AND 1-HYDROXYLAMINO-3,8-DIHYDROCYCLOPENT[*b*] INDOLE DERIVATIVES

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Abstract

The indole moiety is probably the most widely spread nitrogen heterocyclic in nature. Indole and its derivatives are shown to exhibit antitumour, antiinflammatory, antibacterial and antifungal activities. The biology of molecules derived from the skeleton of cyclopent[*b*]indoles, as well as cyclohexa[*b*]- and cyclohepta[*b*]indoles has attracted considerable interest from the pharmaceutical industry as potential therapeutics in recent years. Due to these interesting properties, a number of synthetic approaches to the Cyclopent[*b*]indoles framework have been described. This work describes a strategic approach for the synthesis of efficient precursor 2-(4-methoxy)benzylidine-1-oxo-3,8-dihydrocyclopent[*b*]indole which can obtained by aldol condensation of the appropriate cyclopent[*b*]indole with anisaldehyde under basic conditions. Pyrazolino and Hydroxylamino carbazoles were derived by the treatment of 2-(4-methoxy)benzylidine-1-oxo-3,8-dihydrocyclopent[*b*]indole with hydrazinehydrate and hydroxylaminehydrochloride in sodium methoxide under proper condition respectively.

Keywords: Pyrazolino, aldol condensation, Antifungal, Antibacterial.

NCCRSET – 020

Preparation and Thermal Decomposition Of 2-Methylimidazole Picolinato Copper (II) Hydrate

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Abstract

The nitrogen containing hetero aromatic monocarboxylic acid particularly picolinic acid (Hpic), are capable of forming stable complexes as well as simple salts. It can act as a mono- and bi- dentate ligand. In this connection, our aim is to prepare 2-methylimidazole picolinato copper (II) mono hydrate with appropriate experimental condition. The isolated complex was characterized by various physico-chemical techniques. Physico-chemical studies reveal that the composition of the complex has $[Cu(pic)_2(2\text{-}MIm)_2]H_2O$.

The IR spectra of the complex show the O-H stretching frequency in the region 3420 cm^{-1} reveals the presence of water molecule. The asymmetric and symmetric stretching frequencies of the carboxylate groups appear 1620cm^{-1} and 1350 cm^{-1} respectively, which indicates that deprotanation occur in the complexation. The C=N stretching frequencies of 2-methyl imidazole has been observed around the region of 1590 cm^{-1}. The low temperature dehydration in TG shows that the complex has lattice water molecules. The anhydrous complex further decomposed to give metal oxide as the end residue. The SEM image of CuO nanoparticles are agglomerates to large extent. The nano particle size is confirmed by PXRD. The various physico-chemical techniques are assigned the proposed formula of the prepared complex has six-coordinated distorted octahedral geometry.

Key words: picolinic acid, 2-methylimidazole, thermal studies

Zinc Oxide Prepared by Monomeric Complex of Zinc Picolinates Bearing Hydrazine derivatives

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Abstract

The new aminoguanidinium zinc(II)trispicolinatopicolinicacid trihydrate have been prepared in aqueous medium with appropriate experimental condition. The isolated compound was characterized by IR spectra and the simultaneous TG-DTA technique. Physico-chemical studies reveals the compositions of the new compound as (AgunH) $[Zn(pic)_3](Hpic).3H_2O$.

The IR spectrum of the complex shows O-H stretching frequency in the region 3450cm^{-1} revealing the presence of water molecules. The asymmetric and symmetric stretching frequency of the carboxylate groups appear in the range of 1654-1615 and 1411-1353 cm^{-1} respectively. The N-H and C=N stretching frequencies of guanidine has been observed around the region of 3000 and 1580 cm^{-1} confirming the presence of aminoguanidinium cation. The low temperature dehydration in TG shows that the complex has lattice water molecules. The anhydrous complex further decomposed to give Zinc oxide as the end residue. The various physico-chemical techniques are assigned the proposed formula of the title complex has six-coordinated distorted octahedral geometry.

From the IR spectrums, hydroxyl group in acid shifted to lower region as well the disappearance of carbonyl peak confirms the deprotonation occur in the acid group. IR spectrum of the compound shows O-H stretching around 3490 cm^{-1}. IR spectra shows that the peaks around 3240 and 1520 cm^{-1} are assigned N-H and C=N stretching vibrations. The asymmetric and symmetric stretching frequencies of the carboxylate groups are seen in the range 1680-1430cm^{-1} . The low temperature dehydration in TG shows that the complex has lattice water molecules.. The anhydrous complex further decomposed to give zinc oxide as the end residue. In all these observation the proposed structure of the complexes shows six coordinated distorted octahedral prism geometry.

A Study on Improved Photocatalytic Decomposition of Organic Colorants Utilizing Ternary Nanohybrid Structures of $SnO_2/Fe_2O_3/g\text{-}C_3N_4$

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Abstract: A novel ternary nanohybrid structure was constructed with reduced cuprous oxide/zinc oxide/graphene-oxide ($SnO_2/Fe_2O_3/g\text{-}C_3N_4$) via a facile hydrothermal method. The crystalline phase, surface morphology and size of the prepared nanomaterials were characterized by XRD, FESEM & TEM analysis. The prepared nanomaterials were used for photocatalytic degradation of methylene orange in aqueous media under solar light irradiation. The photocatalytic performance of the as-prepared ternary nanocomposite materials was higher than pure and binary photocatalysts ($SnO_2/g\text{-}C_3N_4$ and $Fe_2O_3/g\text{-}C_3N_4$). This improvement is attributed to the $g\text{-}C_3N_4$ which effectively improves the ability to transfer the photoexcited electrons and the specific surface area of material, the SnO_2 which increases the absorption of light and adsorption of dyes, and the synergistic effect among SnO_2, Fe_2O_3 and $g\text{-}C_3N_4$. The effective separation of photogenerated electrons and holes was proposed to be responsible for the enhancement of visible light photoactivity.

Keywords: reduced graphene oxide, zinc oxide, cuprous oxide, photocatalysis, methylene orange

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Hydrothermal synthesis of NiS/rGO for energy storage applications

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Abstract

Incorporation of transition metal sulfides with reduced graphene oxide has gained attention due to its high specific capacitance, surface area, conductivity, large active sites, excellent rate capability, and outstanding stability making it a desirable electrode material for electrochemical energy storage devices. Herein NiS/rGO composite and pristine NiS were synthesized via a solvothermal method. NiS/rGO composite were characterized by various analytical methods namely XRD, FE-SEM, TEM, XPS, EDS, BET, and Raman spectra. The electrochemical performance of NiS/rGO anode electrode material demonstrated an exceptional specific capacitance of 1669 F g -1 at 2 Ag -1 with 65.71 % capacitance retention after 1000 cycles at 10 Ag -1 making it excellent electrode material for supercapacitor applications.

Keywords: Transition metal sulfides; NiS/r-GO composite; Hydrothermal method; Energy Storage; Supercapacitor.

A novel synthesis of High performance Nickel Bisumth Oxide for supercapattery application

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Abstract

This work used a two-step method to produce nickel bismuth oxide ($NiBi_2O_3$) nanoparticles: chemical precipitation and annealing. $NiBi_2O_3$ nanoparticles were first created using a chemical precipitation process. The resultant nanocomposite was studied using a variety of methods, including UV–vis spectroscopy, X-ray diffraction (XRD) shown in figure (1), Fourier-transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM). The produced nanoparticles underwent a controlled annealing process to improve their characteristics and increase their crystallinity. By proving the high-quality potential characteristics like power density and energy density for supercapattery applications, this approach paves the way for understanding the properties of those nanoparticles and their potential examinations, such as cyclic voltammetry, GCD, and EIS. Because of its exceptional electrochemical behavior, nickel bismuth oxide electrodes show great promise as a negative electrode material for supercapattery application.

Keywords: supercapattery, electrode, power density, energy density, Nickel bismuth oxide

NCCRSET - 025

Advancing Road Safety: The Implementation of Dynamic Speed Limiters in India

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Abstract

India currently holds the unenviable top position in road accidents globally, highlighting the critical need for enhanced road safety measures. As urbanization and population growth continue to surge, the risk of accidents escalates proportionally, emphasizing the urgency for effective solutions.Overspeeding emerges as a predominant factor contributing to road accidents, necessitating innovative interventions to curb this hazardous behavior. Introducing a Dynamic Speed Limiter represents a progressive approach to address this issue comprehensively.The proposed Dynamic Speed Limiter functions as an advanced iteration of the conventional speed governor, dynamically adjusting a vehicle's maximum speed based on real-time data of the local speed limit. This adaptive system ensures strict adherence to speed regulations, significantly mitigating the risk of accidents.Implementation of this technology involves the development of sophisticated software capable of creating virtual barriers on digital maps. These barriers delineate specific zones with varying speed limits, seamlessly adjusting the vehicle's speed limit as it traverses different areas.By storing and updating speed limit data for diverse geographical locations, authorities can tailor enforcement strategies to specific road conditions, enhancing overall road safety outcomes. Additionally, integrating this system with existing traffic management infrastructure can facilitate efficient monitoring and enforcement of speed limits.Furthermore, public awareness campaigns and educational initiatives can complement technological interventions, fostering a culture of responsible driving and promoting adherence to speed regulations.

Keywords: Road safety; Road accidents; Population growth; Overspeeding

NCCRSET - 026

Driving Sustainable Transportation: Leveraging Dynamo Motors for Affordable and Clean Energy in Electric Vehicles

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Abstract

The United Nations Organization has set forth 17 ambitious goals to be achieved by 2030, encompassing various aspects of sustainable development. One of these critical goals focuses on "Affordable and Clean Energy," emphasizing the urgent need to transition towards renewable and environmentally friendly energy sources. Our project is dedicated to addressing this goal and falls under the umbrella of "Affordable and Clean Energy." Specifically, our focus lies on leveraging dynamo motors, also known as electric generators, to drive advancements in the realm of electric vehicles (EVs) and sustainable energy production. Dynamo motors serve as integral components in the operation of electric vehicles, functioning as generators to produce energy without detrimental impacts on the environment. By harnessing the principles of electromagnetic induction and Faraday's law, our project aims to delve deeply into the underlying physics behind dynamo motor operation. Through a comprehensive analysis of case studies and examination of technological trends, our project underscores the pivotal role of dynamo motors in advancing the adoption of electric vehicles and fostering a greener transportation ecosystem. These motors not only contribute to reducing greenhouse gas emissions but also pave the way for greater energy efficiency and sustainability in the automotive industry. Moreover, our project endeavors to provide valuable insights into various aspects of dynamo motor technology, including operational mechanisms, design considerations, and potential future advancements. By doing so, we aim to facilitate informed decision-making and innovation in the field, ultimately accelerating the transition towards affordable and clean energy solutions in line with the UN's Sustainable Development Goals.

Methoxycarbony- hydrazano- butanoic acid and ethoxycarbonyl-hydrazano-butanoic acid preparation, Thermal behaviour, Structural characterization and Cytotoxic properties

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Abstract

α- keto acids, i.e., Methyl pyruvic acid and the alkyl carbazates (methyl or ethyl) are reacted in the aqueous medium under appropriate mole ratio and experimental conditions yields water soluble Methoxycarbony-hydrazano-butanoic acid (**1**) and ethoxycarbonyl-hydrazano-butanoic acid (**2**) respectively. IR spectroscopy exhibit a strong bond for C=N moiety and confirms the formation of schiff base. The NMR study reveals a clear downfield shift for the alkyl protons attached to the azomethine group further ensures the presence of hydrozone moiety. Thermal decomposition pattern and stability of the compounds have been studied by TG/DTA and TG/DTG analysis at N_2 atmosphere. Compound 1undergoes direct single step decomposition (150º-350 ºC in TG), without melting to give gaseous products. Whereas the latter ethyl carbazate ligands show clear melting at 135 ºC before undergoing complete decomposition. Crystal studies of compound **1** explicate the structural determination and the hydrogen network stabilizing the 3D network. The hydrated molecule crystallizes in *$P2_1/C$*, monoclinic space group with Z=4. Asymmetric unit of **1** consists of hydrazone ligand exhibiting E-configuration with a torsion angle of 178º and involves in strong intra-molecular hydrogen bonding creating various ring motiffs. The molecule is found to be nearly planar and exist in E configuration. In-vitro cytotoxicity of the compounds **1** and **2** were investigated using MTT assay for Hela and MCF-7 cells.

Keywords: Hydrazone, NMR, Thermal studies, crystal structure, cytotoxicity

NCCRSET - 028

Piperidinium 3-chlorobenzoate – A phase matchable organic nonlinear optical material for optoelectronics device applications

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Abstract

A noncentrosymmetric, organic single crystal, Piperidinium 3-chlorobenzoate was synthesized and grown by slow evaporation solution technique at room temperature using methanol as a solvent. The cell parameters of the grown crystal were determined by single crystal X- ray diffraction method. The various functional groups present in the crystal and the different types of protons and carbons were identified by the FTIR and NMR spectral analyses. Optical properties were determined by UV-vis–NIR spectroscopic and photoluminescence studies. The second harmonic generation of the grown crystal was observed by Kurtz Perry powder technique. Photoconductivity studies were carried out for various voltages applied on the grown crystal. The thermal and mechanical stabilities of the Piperidinium 3-chlorobenzoate single crystal were investigated by TGA-DTA and Vickers microhardness measurements respectively. The second harmonic generation (SHG) efficiency of the crystal was obtained using ND-YAG laser, which is found to be 2.39 and 6.8 times that of Urea and KDP.

Keywords: Organic compounds; Crystal growth; FTIR analysis; optical properties; Thermal Analysis

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NCCRSET - 029

DESIGN AND FABRICATION OF SMART OVERHEAD VACUUM CLEANER

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Abstract

The textile industry, particularly cotton manufacturing, faces challenges in maintaining clean and safe working environments due to the accumulation of lint and dust particles. Traditional cleaning methods are often inefficient, time-consuming, and prone to human error. To address these challenges, this paper presents the design and fabrication of a novel Smart Overhead Vacuum Cleaner (SOVC) tailored for cotton textile industries.The SOVC integrates advanced sensing technologies, automation, and smart control mechanisms to efficiently collect and remove lint and dust particles from overhead spaces within textile manufacturing facilities. Leveraging state-of-the-art sensors such as LiDAR and infrared, the SOVC navigates through complex overhead environments autonomously, identifying and targeting areas with high dust accumulation. Furthermore, the SOVC incorporates intelligent algorithms for real-time monitoring and adjustment of cleaning parameters based on environmental conditions and operational requirements. Through machine learning techniques, the system continuously improves its cleaning efficiency and adapts to dynamic changes in the manufacturing environment.

In conclusion, the design and fabrication of the Smart Overhead Vacuum Cleaner offer a promising solution to enhance cleanliness, safety, and productivity in cotton textile industries. The integration of smart technologies and automation not only improves cleaning efficiency but also reduces operational costs and enhances overall workplace hygiene.This research contributes to the advancement of cleaner and safer working environments in textile manufacturing, paving the way for future developments in smart cleaning systems tailored for specific industrial applications

NCCRSET - 030

DESIGN AND IMPLEMENTATION OF EFFECTIVE MANAGEMANT OF CONSTRUCTION AND DEMOLITION WASTE SYSTEM

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Abstract

The abstract highlights the pressing need for an integrated approach to managing the considerable waste output of the construction and demolition (C&D) sector, which poses significant environmental and economic challenges worldwide. The proposed management system is designed to tackle these issues comprehensively by incorporating a range of strategies.

These include initiatives to reduce waste generation at its source, enhance the efficiency of waste sorting and segregation processes, promote recycling and reuse practices, and ensure the proper disposal of residual waste. Central to the system's effectiveness are advanced technological solutions for tracking and monitoring waste flows, along with robust stakeholder engagement programs and supportive policy frameworks. By fostering collaboration among diverse stakeholders such as contractors, waste management firms, regulatory bodies, and local communities, the system aims to cultivate a holistic approach to C&D waste management.

Moreover, the system seeks to drive positive change by incentivizing sustainable practices across the construction industry. This entails not only reducing the sector's environmental footprint but also creating economic opportunities through the development of a circular economy model. Through measures such as regulatory reforms, capacity-building initiatives, and public awareness campaigns, the system aims to align with broader sustainable development goals.

By mitigating environmental impacts and promoting resource efficiency, it represents a pivotal step towards achieving a more sustainable future in construction waste management. In essence, the proposed management system offers a multifaceted approach that addresses the complex challenges posed by C&D waste, with the potential to yield significant environmental, social, and economic benefits.

Keywords: *Environmental challenges, Waste reduction , Stakeholder engagement, Sustainable practices , Resource efficiency , Technological solutions.*

NCCRSET - 031

Design and Fabrication of innovative SCARA robot for industrial applications integrating image processing and advanced features

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Abstract

This project focuses on the progressive development of an advanced SCARA (Selective Compliance Assembly Robot Arm) robot tailored for industrial applications. The core objective is to enhance the robot's adaptability, precision, and efficiency in diverse industrial tasks through the incorporation of cutting-edge image processing techniques and advanced features. The integration of image processing capabilities allows the robot to dynamically interpret and respond to visual information, contributing to its versatility in navigating complex work environments. Additionally, advanced features such as enhanced dexterity, real-time feedback mechanisms, and intuitive human-machine interaction further elevate the robot's overall performance. The study adopts a holistic approach, covering design methodology, hardware implementation, and software architecture. The seamless integration of these elements aims to create a comprehensive robotic system that redefines industrial automation standards. The proposed SCARA robot, a culmination of extensive research and development, promises to optimize productivity, reliability, and adaptability across a broad spectrum of industrial scenarios.

In essence, this project represents a significant stride towards reshaping the landscape of industrial robotics by offering a sophisticated solution that addresses the evolving needs of dynamic work environments.

NCCRSET - 032

DESIGN AND FABRICATION OF MANIPULATOR FOR WELDING PROCESS

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Abstract

This project centres on the design, development, and validation of a portable manipulator tailored specifically for welding processes. The manipulator is engineered to deliver heightened flexibility and precision, thereby optimizing welding operations in diverse industrial contexts. It is used to replace human for continuous welding process thereby preventing human error. The development process entails meticulous conceptualization and requirement analysis to delineate precise objectives and operational parameters. Advanced mechanical and control system designs are formulated to ensure seamless integration of portability, accuracy, and safety features, crucial for welding applications. Testing and validation protocols encompass rigorous assessments to evaluate the manipulator's performance under various welding scenarios. Real-world deployment in welding environments further underscores its reliability, efficiency, and safety compliance. Continuous refinement is driven by user insights and ongoing optimization of design elements.

Prototyping efforts involve the construction of a robust robotic arm prototype, accompanied by thorough testing and validation procedures. Real-world testing in welding environments serves to evaluate the arm's performance under simulated operating conditions, assessing factors such as accuracy, repeatability, speed, and reliability.

In summary, this project represents a significant advancement in welding automation by introducing a state-of-the-art robotic arm engineered to deliver unparalleled precision, efficiency, and versatility in welding processes.

KEY WORDS:

Portable manipulator, Welding automation, Precision welding, Continuous welding processes, Human error prevention, Conceptualization, Requirement analysis, Mechanical design, Control system design, Portability, Accuracy, Safety features, Testing and validation, Real-world deployment, Efficiency, Versatility, Robotic arm, Prototyping, Testing procedures, Optimization efforts

NCCRSET - 033

Machine Learning and AI Applications in Mechanical Engineering: Driving Innovation and Efficiency

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Abstract

Machine learning (ML) and artificial intelligence (AI) have emerged as transformative tools in the field of mechanical engineering, offering innovative solutions to complex problems across various domains. This paper explores the diverse applications of ML and AI in mechanical engineering, elucidating their roles in design optimization, manufacturing process improvement, predictive maintenance, and control system optimization. In mechanical design, ML algorithms facilitate the generation of optimized designs by analyzing vast datasets and identifying optimal configurations based on specified objectives and constraints. AI-powered generative design tools enable engineers to explore novel design spaces and accelerate the innovation process. Within manufacturing, ML and AI techniques are leveraged for quality control, predictive maintenance, and process optimization. By analyzing sensor data and historical maintenance records, predictive maintenance models can anticipate equipment failures and schedule maintenance activities proactively, minimizing downtime and maximizing productivity. Furthermore, ML algorithms optimize manufacturing processes such as additive manufacturing, machining, and assembly by identifying optimal process parameters to enhance product quality and efficiency. In the realm of maintenance and asset management, ML and AI enable condition monitoring, fault diagnosis, and prognosis of mechanical systems. Real-time analysis of sensor data allows for early detection of anomalies and prediction of potential failures, facilitating timely interventions to prevent costly downtime and repairs. Moreover, ML-driven optimization algorithms enhance the performance and efficiency of mechanical systems by iteratively refining control strategies and parameters based on real-time data and environmental conditions. Through these applications, ML and AI revolutionize traditional practices in mechanical engineering, driving efficiency, reliability, and innovation across various industries.

Keywords: AI, ML, Algorithms, Industries

NCCRSET - 034

Exploring the Growth and Implications of Artificial Intelligence: From AGI to ASI

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Abstract:

The evolution of Artificial Intelligence (AI) has been a remarkable journey, revolutionizing various aspects of human life. This paper presentation delves into the trajectory of AI growth, with a particular focus on the development of Artificial General Intelligence (AGI) and the hypothetical concept of Artificial Superintelligence (ASI). AGI, often portrayed as the Holy Grail of AI research, represents the ability of machines to understand, learn, and apply knowledge across diverse domains, mirroring human intelligence. However, the prospect of ASI, an AI system surpassing human intelligence across all domains, raises profound ethical, societal, and existential concerns. This presentation navigates through the technological advancements, challenges, and ethical considerations associated with the pursuit of AGI and the potential emergence of ASI. It examines the current state of AI research, highlighting milestones, breakthroughs, and limitations in achieving AGI. Furthermore, it elucidates the theoretical frameworks and speculative scenarios surrounding ASI, addressing concerns regarding control, autonomy, and the impact on human society. Moreover, the presentation underscores the dual nature of AI, elucidating its transformative potential to enhance human capabilities while acknowledging the inherent risks and vulnerabilities it poses. It explores ethical frameworks, regulatory measures, and collaborative efforts necessary to navigate the complex landscape of AI development responsibly. In conclusion, this paper presentation provides a comprehensive overview of the growth of AI, from AGI to the hypothetical realm of ASI, elucidating the opportunities and challenges that lie ahead. By fostering interdisciplinary dialogue and ethical reflection, it aims to inform and empower stakeholders in shaping a future where AI augments human flourishing while safeguarding against potential risks.

Keywords: Artificial superintelligence; Ethical; Frameworks; Interdisciplinary

DESIGN AND FABRICATION OF PIEZOELECTRIC TILE INTEGRATED WITH SOLAR PANEL

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Abstract

The integration of piezoelectric tiles with solar panels presents a novel approach to enhance the efficiency and sustainability of renewable energy systems. This project explores the synergistic benefits of combining piezoelectric technology with solar photovoltaics to harness both solar radiation and mechanical vibrations for electricity generation. Through experimental implementation and analysis, the feasibility and effectiveness of this hybrid system are demonstrated. Piezoelectric tiles, strategically placed in areas with high foot traffic or vehicular movement, are utilized to convert mechanical stress into electrical energy, complementing the energy output from solar panels. The project investigates the technical, environmental, and practical implications of integrating these two renewable energy technologies. Furthermore, the scalability, versatility, and potential applications of the hybrid system are discussed, highlighting its relevance for urban infrastructure development, off-grid electrification, and sustainable energy initiatives. The findings contribute to the advancement of renewable energy research and offer insights into the integration of diverse energy harvesting technologies for enhanced energy efficiency and resilience. The integration of piezoelectric tiles with solar panels presents a groundbreaking approach to amplify the efficiency and sustainability of renewable energy systems. This project delves into the intricate interplay between piezoelectric technology and solar photovoltaics, aiming to harness the dual potential of solar radiation and mechanical vibrations for electricity generation. Through meticulous experimentation and comprehensive analysis, the project meticulously examines the feasibility and efficacy of this innovative hybrid system. Moreover, the project scrutinizes the scalability, adaptability, and manifold applications of the hybrid system, underscoring its pertinence to urban infrastructure development, off-grid electrification endeavors, and broader sustainability initiatives.

KEY WORDS:

Piezoelectric tiles, Solar panels, Renewable energy systems, Synergistic benefits, Electricity generation, Mechanical vibrations, Feasibility analysis, Environmental implications, Scalability, Urban infrastructure, Off-grid electrification, Sustainability initiatives, Energy efficiency, Resilience, Integration of energy harvesting technologies.

NCCRSET - 036

Study of Al Surface Functionalized ZnO Nanoparticles for Visible Light Photodetector Applications

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Abstract

ZnO nanoparticles (NPs) were synthesized via a facile reflux condensation route. The optical properties of ZnO NPs were optimized by the surface functionalization of ZnO NPs with varying aluminium (Al) metal particles by co-precipitation method. The influence of the functionalization of Al on the surface of ZnO NPs was investigated by X-ray diffraction, UV-visible diffuse reflectance spectroscopy and photoluminescence spectroscopy. The enhanced properties of the Al functionalized ZnO nanparticles were attributed to the localized surface plasmon resonance effect.

Keywords: *ZnO nanoparticles; reflux condensation; surface functionalization; surface plasmon resonance.*

NCCRSET – 037

DESIGN AND DEVELOPMENT OF SMART GUIDE FOR VISUALLY IMPAIRED PEOPLE

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Abstract

This project introduces an innovative Smart Guide System aimed at significantly enhancing the safety and autonomy of visually impaired individuals. The primary objective is to empower users with greater independence in daily mobility tasks, thereby reducing their reliance on external assistance. By addressing challenges related to orientation, mobility, and spatial awareness, the system facilitates navigation within physical environments while promoting the social inclusion of visually impaired individuals. Leveraging cutting-edge technology, including onboard cameras and advanced machine learning algorithms, the Smart Guide System offers real-time obstacle detection and recognition capabilities. By analyzing captured images, the system identifies various obstacles such as pedestrians, vehicles, and objects obstructing the user's path. Moreover, sophisticated algorithms enable the system to differentiate between different types of obstacles and assess their spatial characteristics, allowing for prompt alerts and adaptive navigation adjustments. This project signifies a significant advancement in assistive technology, promising to transform the everyday experiences of individuals living with visual impairments by granting them a newfound level of independence and confidence in navigating their surroundings.

KEY WORDS:

Smart Guide System, Visually impaired individuals, Safety, Autonomy, Independence, Navigation, Orientation, Mobility, Spatial awareness, Social inclusion, Obstacle detection, Real-time, Onboard cameras, Machine learning algorithms, GPS navigation, Auditory feedback, User interface, Accessibility, Controls, Customizable settings, Research and development, Algorithms, Sensors, Environmental perception, Innovation.

NCCRSET – 038

Synthesis sequence of Charcoal based CNTs with Magnesium Chloride as electrodes in supercapacitor devices

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Abstract

Carbon nanotubes were synthesized through a facile co-precipitation approach and comprehensively characterized using X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), transmission electron microscope (TEM), field emission electron microscope (FESEM), Cyclic Voltammetry (CV) and Brunauer-Emmett-Teller (BET) techniques. Charcoal powder, doped with $MgCl_2$ in a concentrated H_2SO_4/HNO_3 solvent, exhibited remarkable specific capacitance, rendering them well-suited for energy storage applications. A supercapacitor featuring charcoal/$MgCl_2$ as the positive electrode and activated carbon (AC) as the negative electrode showcased heightened supercapacitive performance. The superior performance of the doped material in augmenting supercapacitive capabilities was attributed to the conducive alkaline environment for CNTs formation, which facilitated efficient electronic pathways for charge transport during cycling. Synthesized CNTs displayed considerable potential as composites in electrodes and fillers in polymer matrices, underscoring their versatility in various applications. The series-connected SC effectively powered parallel LEDs, a kitchen timer, and a toy motor fan.

SMART ALLIUM CEPA PRESERVATION AND TRACKING SYSTEM

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Abstract

Onions, a prominent crop cultivated worldwide, find application in nearly every global cuisine, necessitating long-term storage. Preservation is crucial, with the onion's dryness linked to its humidity level, requiring a humidified storage environment. Factors such as temperature and humidity fluctuations contribute to onion loss, alongside the susceptibility to various diseases. Storage conditions typically involve maintaining temperatures between 37 to 45 degrees Celsius and humidity levels ranging from 60 to 70 percent. Advancements in technology now enable autonomous onion preservation. This research proposes an innovative system designed to safeguard onions from diverse threats. The onion monitoring system outlined in this study allows customers to access it conveniently through their mobile phones.

Key Words: Temperature, Humidity, Internet of Things, Sensors, Onion Preservation.

ECORESPIRE SYSTEM FOR SUSTAINABLE ENVIRONMENT

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Abstract

The ECORESPIRE project introduces a novel system that integrates environmental monitoring with sustainable energy production by leveraging the capabilities of atmospheric air and algae. The core mechanism involves extracting air from the atmosphere using a pump and channeling it into an algae tank through an air bubbler. Within this controlled environment, the algae engage in photosynthesis, a natural process that converts carbon dioxide into oxygen, thereby contributing to oxygen production and reducing atmospheric carbon content.

To ensure accurate monitoring of air quality and temperature, the system is equipped with gas sensors at the inlet and outlet of the airflow. These sensors measure the carbon content in the incoming air and the oxygen levels in the outgoing air, providing real-time data on the efficiency of the photosynthesis process. Additionally, a temperature sensor is integrated to monitor temperature fluctuations within the algae tank and the ambient environment.

The collected data from the sensors is displayed on an LED display, offering users immediate insights into the system's performance and environmental impact. This transparency facilitates system optimization and accountability.Designed with sustainability at its core, ECORESPIRE operates on solar energy, sourced from a solar panel equipped with a solar tracking system. This renewable energy source powers the pump, air bubbler, sensors, and LED display, reducing the system's carbon footprint and ensuring uninterrupted operation in various settings, including remote or off-grid locations.

Keywords*: ECORESPIRE, environmental monitoring, sustainable energy, atmospheric air, algae, photosynthesis, carbon dioxide, oxygen production, solar energy, solar tracking system, renewable energy, carbon footprint.*

NCCRSET – 041

Synthesis, electrical and optical characteristics, and characterization of copper-doped tin oxide nanoparticles

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Abstract

The primary goal of the research is to investigate the manufacture of copper-doped tin oxide powder as well as its electrical and optical properties. The wet chemical approach was used to create copper-doped tin oxide. With a low doping concentration, copper could improve photocatalytic activity. X-ray diffraction (XRD), scanning electron microscopy, energy dispersive X-ray analysis (SEM-EDX), and UV-Vis spectroscopy were used to analyze the material. The crystalline structure of pure SnO_2 nanoparticles and copper-doped SnO2 nanoparticles is revealed by XRD. Pure SnO2 has a crystalline structure of 20.60 nm, while copper-doped SnO2 has a crystalline structure of 23.74 nm. A scanning electron microscope was used to examine the surface morphology of pure SnO2 and copper-doped SnO2. The presence of very small crystalline nanoparticles is confirmed by SEM photos of pure SnO2 nanoparticles. The EDX examination revealed unambiguous peaks of solely Sn and O elements, with no other peaks observed, indicating that the as-prepared powder is free of contaminants derived from the initial precursor, such as carbon. UV-Vis spectroscopy was used to record the optical absorption spectra of pure SnO2 nanoparticles as a function of wavelength. Pure SnO2 nanoparticles' optical absorption spectra were obtained as a function of wavelength in the 200-900 nm range.

NCCRSET – 042

GREEN SYNTHESIS OF METAL OXIDE NANOPARTICLES FOR THE APPLICATION OF NANO FERTILIZER.

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Abstract

Metal oxide nanoparticles are a compound that is a combination of metal with at least one oxygen element. Metal oxides possess unique properties like a change in surface morphology results in a change in the band gap, capable of showing a response to visible light, that pays way for numerous applications in various disciplines. The green synthesis method of synthesizing metal oxide reduces or eliminates the use of hazardous chemical substances. Green synthesis of metal oxides is applied by employing natural reducing agents instead of chemical reducing agents like EDTA, glycine, oxalic acid, etc., by combustion method. In combustion, it uses the heat that is generated due to oxidation and reduction between precursors of metal nitrates as oxidizing agents and natural fuels as reducing agents. In natural reducing agents biomolecules like polysaccharides, ascorbic acids, protein, glucose, fructose, and amino acids play a crucial role as capping and reducing agents have positive effects. Metal oxide synthesized by green synthesis is simple, cost-effective, eco-friendly, economical, and highly efficient. The application of metal oxides as nano fertilizer helps to maintain balance in the natural environment by reducing the effectiveness of chemical fertilizers by high absorption rate, effective delivery of nutrients, slow release of nutrients and also prevents leaching and eutrophication.

NCCRSET – 043

FABRICATION OF NANOCOMPOSITES COMPRISING GASSISTOR-BASED BIOPOLYMER BLENDED WITH METAL OXIDE FOR GAS-TRIGGERED SWITCH AND MEMORY FUNCTION IN ENVIRONMENTAL MONITORING

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Abstract

The project aims to develop a next-generation gas sensor, termed gasistor, to replace conventional ones for detecting hazardous gases in the environment. This involves creating memristor-based gasistors with both sensing and memory capabilities. Biopolymer-blended metal oxide (POLY-ZnO-TiO2) nanocomposites will be synthesized using the hydrothermal method, followed by characterizing their morphology and microstructural properties. The gasistor-based biopolymer-blended metal oxides will then be tested to demonstrate their gas sensing and memory functions. Gas sensors must possess good selectivity, stability, sensitivity, low working temperature, and rapid response-recovery time, all of which are not fully met by current commercial sensors utilizing conducting polymers, metal oxides, and metal-doped metal oxide semiconductors. The proposed project aims to enhance the sensing performance of biopolymer-blended metal oxide nanocomposites through functionalization and heterojunction formation, providing high sensitivity, selectivity, and stability as biomarkers for certain diseases and detection of harmful gases. The unique features of memristor-based gasistors, including sensing and memory functions, are not present in conventional gas sensors. Consideration of material surface shape is crucial for developing gasistors with optimal memory and gas detection performance. Utilizing one-dimensional nanowires (n-type ZnO and TiO2 combined with biopolymer) is chosen due to their high surface-to-volume ratio and crystallinity. Biopolymer shows promise in enhancing the stability of ZnO and TiO2-based gasistors for detecting various dangerous chemicals in the environment.

NCCRSET – 044

Sustainable synthesis of Cobalt oxide nanoparticles: Evaluation of their Physicochemical and gas sensing properties

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Abstract

Green chemistry opens up the sustainable approach of nanoparticle and thin film synthesis. Various plant based extracts are incorporated in this synthesis. This study involves the synthesis of metal oxide nanoparticles using the fruit extracts of Ananas Comosus which contains of various organic compounds. A simple combustion method is employed in this synthesis. The solution containing the desired ratio of pineapple extract along with cobalt nitrate is subjected to the combustion reaction. The metal nitrate solution is reduced to metal oxide particles. Finely grounded cobalt oxide nanoparticles are then calcinated are two different temperatures (350°C and 450°C). Various analytical tests are done to find the structural, morphological, and thermal properties. The presence of cubic spinel structure is confirmed through XRD analysis. Along with this the occurrence CoO can be seen due to the effect of calcination. Calculated crystallite sizes are 28nm, 21nm and 19nm for the as prepared, 350°C and 450°C temperatures respectively. FESEM analysis shows the presence of the porous structure. The TG analysis exhibits the thermal stability of the prepared cobalt oxide nanoparticles. Overall, these cobalt oxide nanoparticles exhibited a good gas sensing property with a promising response time. The study concludes the, greater impact of the natural organic acid over the physicochemical properties and the sample annealed at 450°C exhibits a outstanding gas sensing ability.

Keywords: *Natural organic acid, Pineapple extract, crystallite size, morphological analysis*

Automatic pace detection and mobility Control with configuration of zone Levels Using IOT

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Abstract

In today's modern world, mobility control and management play a crucial role in various settings. For instance, in the case of mobile industrial robots, maintaining a specific pace within designated zones is essential for energy efficiency, crowd control, and mitigating unforeseen accidents. Similarly, on roadways, it is imperative to enforce speed limits on vehicles, especially in areas surrounding schools and hospitals. Our project focuses on the control and management of mobility vehicles by configuring speed limits for specific zones. We utilize RFID technology to create entry and exit points for zones, marked by a series of RFID tags along the vehicle's route. Upon entering a zone, the vehicle's speed limit is communicated and set accordingly. This limit remains enforced until the vehicle exits the zone. Upon exit, the speed limit is either removed or adjusted if the vehicle enters another zone. Furthermore, our system incorporates inertial control, ensuring that vehicles adjust their speed upon entering a zone if they are traveling at a higher speed than the designated limit. One of the notable features of this project is its flexibility and scalability. Numerous zones can be configured and created, and each vehicle can be identified with a unique Gowtham R Electronics and Communication Engineering Sri Krishna College of Engineering and Technology Coimbatore, India 20euec051@skcet.ac.in identity. This management system operates using the Internet of Things (IoT), where vehicles communicate with a cloud server to confirm their entry and exit from zones. Overall, this project is beneficial for industries, universities, and government organizations, allowing them to monitor and manage the movements of their vehicles or robots effectively.

Key Words: IOT , Zone levels , Mobility speed, Microcontroller , RFID , Motor Driver , Hosted software.

Biosynthesis and Characterization of Silver and Gold Nanoparticles using Milk Thistle (Silybium marianum) Leaf Extract

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Abstract

Biosynthesis of gold and silver nanopaticles from aqueous solution using milk thistle (Silybum marianum) leaf extract as reducing and stabilizing agent has been reported. Formation and stabilization of nanoparticles were monitored using surface plasmon resonance (SPR)bands of UV-Vis Spectroscopy.Morphology of Gold and Silver nanoparticles was investigated using x-ray diffraction, high-resolution transmission electron microscopy with selected area electron diffraction analysis,and dynamic light scaterring. Fourier transform-infrared spectroscopy(FT-IR) was employed to identify the possible biomolecules responsible for the reduction and stabilization of nanoparticles.

Keywords: Biosyntesis, Silver nanoparticles, gold nanoparticles, Silybum marianum

NCCRSET – 047

Spectroscopic and quantum chemical investigations on 2-amino 4-methylpyridinium 3-chlorobenzoate – An organic nonlinear optical material

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Abstract

The synthesis of 2-amino-4-methylpyridinium 3-chlorobenzoate (2A4M3CB) yielded high-quality single crystals measuring 8 x 2 x 1.2 mm^3, obtained via the slow evaporation solution growth technique from methanol at ambient temperature. Analysis using single crystal X-ray diffraction (XRD) revealed that 2A4M3CB crystallized in the monoclinic system with the noncentrosymmetric space group $P2_1$. The crystalline phases and functional groups were identified and confirmed through powder X-ray diffraction and Fourier transform infrared (FTIR) studies, respectively. Molecular structure interpretation was further supported by 1H and 13C NMR spectroscopy. The optical transmittance window and lower cutoff wavelength of 2A4M3CB were determined through UV–Vis–NIR studies. Thermal and mechanical stability were elucidated through TG/DTA and Vickers hardness analysis, respectively. Charge transport mechanism and photo response properties were assessed via dielectric and photoconductivity studies. Powder second harmonic generation (SHG) characteristics and phase matching ability were explored using the Kurtz and Perry powder SHG technique.

Keywords: Nlo, 2-amino 4-methylpyridinium 3-chlorobenzoate, SHG, Crystal