GM UNIVERSITY

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NCSEEE 2025

National Conference
on

"Smart Systems and Emerging Trends in Electronics & Electrical Engineering"

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21st August 2025

Organized by:

Department of Electronics and Communication Engineering
&
Department of Electrical and Electronics Engineering

FACULTY OF ENGINEERING AND TECHNOLOGY

School of Engineering

B.Tech. in

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Advanced Electronics and Intelligent Communication Systems (AEICS)

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1st National Conference on "Smart Systems and Emerging Trends in Electronics &Electrical Engineering" (NCSEEE 2025)

Organized by the Departments of ECE and EEE, School of Engineering, Faculty of Engineering and Technology

Dear Esteemed Delegates, Researchers, and Industry Experts,

It is with great pleasure that I welcome you all to the 1st National Conference on "Smart Systems and Emerging Trends in Electronics & Electrical Engineering" (NCSEEE 2025), organized by the Departments of Electronics & Communication Engineering (ECE) and Electrical & Electronics Engineering (EEE) under the School of Engineering, Faculty of Engineering and Technology.

This conference serves as a distinguished platform, bringing together innovators, academicians, industry leaders, and policy-makers to deliberate on the transformative advancements shaping the fields of smart systems, electronics, and electrical engineering. As technology continues to advance at an unprecedented pace, these domains stand at the forefront of driving intelligent solutions, sustainable energy systems, and future-ready infrastructure.

In today's era of Industry 4.0 and 5.0, concepts like automation, embedded intelligence, renewable integration, and advanced communication technologies are no longer distant possibilities but practical realities. While these innovations promise immense opportunities for societal growth and economic progress, they also present technical and ethical challenges that demand our collaborative insight, rigorous research, and innovative approaches.

The sessions in this conference will explore cutting-edge developments in areas such as smart grids, IoT-based automation, power electronics, embedded systems, AI-driven engineering applications, and sustainable electrical infrastructure. We aim to foster meaningful interactions that bridge the gap between academic research, industrial needs, and societal benefits.

I encourage all participants to actively engage, share knowledge, and challenge conventional thinking. The discussions and outcomes of this conference will not only enrich scholarly understanding but also influence practical applications and future innovations in the engineering landscape.

I am confident that NCSEEE 2025 will serve as a vibrant forum for learning, collaboration, and visionary discourse, paving the way for a smarter, more sustainable, and technologically empowered future.

I look forward to the insightful exchanges and valuable contributions that will emerge from this gathering.

Warm regards,
Dr. S R Shankapal
Vice Chancellor
GM University

1st National Conference on "Smart Systems and Emerging Trends in Electronics & Electrical Engineering" (NCSEEE 2025)

Organized by the Departments of ECE and EEE, School of Engineering, Faculty of Engineering and Technology

Dear Distinguished Guests, Researchers, and Industry Experts,

It is both an honour and a privilege to extend a warm welcome to all of you to the 1st National Conference on "Smart Systems and Emerging Trends in Electronics & Electrical Engineering" (NCSEEE 2025), organized by the Departments of Electronics & Communication Engineering (ECE) and Electrical & Electronics Engineering (EEE) under the School of Engineering, Faculty of Engineering and Technology. This conference marks a significant milestone in our collective journey to explore and advance the frontiers of engineering innovation.

We are living in an era defined by rapid technological transformation, where smart systems, emerging electronics, and advanced electrical engineering solutions are driving the evolution of industries, infrastructure, and everyday life. From intelligent automation to sustainable power systems, from embedded technologies to AI-driven engineering applications, these fields are shaping the future in ways that are both profound and far-reaching.

These developments represent far more than technical achievements - they are catalysts for economic growth, enablers of sustainable development, and cornerstones of a smarter, more connected society. This conference provides an invaluable platform for scholars, practitioners, innovators, and students to engage in critical discussions on these cutting-edge advancements and their implications for the future.

As we embark on sessions that address the latest trends, challenges, and breakthroughs in smart systems, electronics, and electrical engineering, I encourage each participant to share insights, question assumptions, and seek collaborative pathways that can transform ideas into impactful solutions.

I am confident that NCSEEE 2025 will spark innovative thinking, foster interdisciplinary collaboration, and inspire actionable outcomes that will benefit both academia and industry.

On behalf of the University, I congratulate the Departments of ECE and EEE for their vision and leadership in organizing this important event, and I thank all participants for their valuable presence and contributions. Together, let us shape the future of engineering with innovation, responsibility, and purpose.

Warm regards,

Dr. H D Maheshappa

Pro-Vice Chancellor

GM University

National Conference on Smart Systems and Emerging Trends in Electronics & Electrical Engineering (NCSEEE 2025)

It is with great enthusiasm that I welcome all delegates, researchers, academicians, and industry professionals to the National Conference on Smart Systems and Emerging Trends in Electronics & Electrical Engineering (NCSEEE 2025). This conference is a platform to showcase pioneering research, share innovative ideas, and discuss transformative technologies that are shaping the future of electronics, electrical engineering, and smart systems.

The rapid integration of smart systems into every facet of modern life demands continuous exploration, collaboration, and innovation. NCSEEE 2025 brings together diverse expertise to address the challenges and harness the opportunities offered by emerging technologies. Through keynote addresses, technical sessions, and research presentations, we aim to inspire new perspectives and strengthen the bridge between academia, industry, and society.

I extend my heartfelt appreciation to our distinguished speakers, participants, reviewers, sponsors, and the organizing committee for their unwavering support and dedication in making this conference a reality.

On behalf of the organizing team, I wish all participants a productive and insightful experience at NCSEEE 2025, and I hope the interactions here lead to lasting collaborations and impactful contributions to our fields.

Warm regards,
Dr. Praveen J
Convenor, NCSEEE 2025
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ABOUT THE DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

The Department of Electronics and Communication Engineering (ECE) at GM University, Davanagere, offers undergraduate to doctoral programs aligned with NEP 2020 and industry needs. With state-of-the-art labs, strong industry linkages, and a focus on experiential learning, the department prepares students for careers in core and emerging technologies. Research areas include quantum communication, AI-driven automation, and medical signal processing. Students engage in real-time projects, internships, and interdisciplinary innovation. Supported by funded projects and technical workshops, the department fosters academic excellence and societal impact, aiming to become a centre of excellence in education, research, and entrepreneurship.

ABOUT THE DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

The Department of Electrical and Electronics Engineering (EEE) at GM University, Davanagere, is committed to producing skilled, industry-ready engineers. With a curriculum aligned to technological advancements, it integrates core electrical subjects with programming and embedded systems. Advanced laboratories, project-based learning, and strong industry interaction enhance practical skills. Students are encouraged to participate in technical fests, conferences, and research activities. The department regularly hosts expert lectures and workshops to bridge academia-industry gaps. Faculty members are engaged in diverse research areas, promoting interdisciplinary and entrepreneurial learning. The department aims to foster competent professionals who drive innovation in the engineering and technology sectors.

ABOUT NCSEEE 2025

The National Conference on Smart Systems and Emerging Trends in Electronics & Electrical Engineering (NCSEEE 2025) aims to bring together academic researchers, industry experts, and young scholars to exchange knowledge, innovations, and trends in smart systems, next-generation electronics, and interdisciplinary electrical engineering applications. This conference will serve as a platform for fostering collaboration, showcasing cutting-edge research, and exploring emerging technologies shaping the future of engineering.

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Efficient CNN for Retinopathy Detection

Hariprasad S A, Chethana G S, Hemang Nagpal, Arsh Singh, Daniya Biradar and Amit Kushwaha
Department of ECE, Jain (Deemed-to-be-University) Bengaluru, India

Abstract

Diabetic retinopathy (DR) is a leading cause of vision impairment, necessitating early detection for effective treatment. Existing deep learning-based diagnostic approaches often face challenges related to computational complexity and suboptimal generalization. This study employs EfficientNetB0 with transfer learning and data augmentation to enhance classification performance. A custom learning rate scheduler and the Adam optimizer improve model stability, while statistical validation through K-fold cross-validation and confusion matrices confirms reliability. Comparative analysis against MobileNet (79%) and VGGNet (78.6%) demonstrates that EfficientNetB0 achieves better accuracy, making it a viable solution for clinical applications.

Keywords: Diabetic Retinopathy, Deep Learning, EfficientNetB0, Transfer Learning

Smart Parking System Based on Arduino Uno

Amulya J M, Meghana G U, Husna Banu and Niveditha M
Department of ECE, Government Polytechnic, Harihara, India

Abstract

With the growing number of vehicles in urban areas, parking has become a critical concern. Traditional parking systems often result in wasted time, fuel, and congestion. This paper presents a smart parking system based on Arduino Uno that automates vehicle detection and parking availability indication. Using ultrasonic sensors, servo motors, and Arduino, the system detects available slots, provides real-time updates, and automates gate control. The system is designed to be low-cost, user-friendly, and suiable for small to medium-sized parking facilities.

Keywords: Smart Parking, Arduino Uno, Ultrasonic Sensor, IoT

Smart Campus Bot for Navigation and Information Sharing through AI

Siddesh K B, Tanuja T, Ajith Ningappa Jayagond, Murali Madakari D T, Sharanappagouda R Patil, Thimmareddy V
Department of ECE, SJM Institute of Technology, Chitradurga, India

Abstract

Chat bots are expert systems that understand and respond to queries asked by users in their own language. A chat bot responds in conversation just like how humans interact with each other. It works as a virtual assistant, and its accuracy is determined by finding the correlation between users' queries and the answers provided by chat bots. The implemented chat bot provides two modes: text mode and audio mode, for better user experience. In audio mode, it facilitates an interactive way of answering through voice messages. During an institute's academic admission procedure, there is often a huge queue at the enquiry window. The situation is even more difficult for parents who reside in different cities, states, and countries. The goal of this system is to provide a platform for students and parents to ask queries and clear doubts through simple English language text messages or audio commands. Students and parents will interact with the bot instead of forming queues at the enquiry desk to ask queries related to the admission procedure.

Keywords: Chat Bot, NLP, Interactive Bots, Virtual Assistant

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LoRa Agri: Smart Agricultural Automation and Security System with Renewable Energy Integration

Suhana F Kanamani, Shaista Jabeen K S, Saniya and Veena H T
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Abstract

In recent years, agriculture has seen major technological progress, becoming more data-driven and efficient. Farmers now benefit from tools that improve crop monitoring, irrigation control, soil moisture tracking, climate analysis, and intrusion detection. These smart farming practices focus on broad area coverage rather than high data volumes or fast transmission. In rural and remote regions, where power and connectivity are limited, LoRa technology provides a practical solution due to its long range and low power needs, supporting sensor communication over distances of up to fifteen kilometres. This paper presents an overview of LoRa-based farm monitoring systems, highlighting their uses, benefits, and challenges. Additionally, it emphasizes the role of renewable energy in powering these systems, especially in off-grid agricultural areas. By using sustainable energy sources, farmers can ensure reliable and eco-friendly operation of monitoring devices, improving productivity while reducing environmental impact. This approach supports sustainable farming and aligns with global development goals such as improving food security, promoting innovation, and protecting natural ecosystems.

Keywords: LoRa, Smart Farming, Renewable Energy, Sustainable Agriculture

Brainwave-Powered Smart Wheelchair with Essential Needs Indication for Individuals with Disabilities

Anusha K, Bhavana Gubber, Chinmayi D G, Keerthi H C and Sri Gowri G B
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Abstract

Smart wheelchairs play a significant role in supporting disabled people. Individuals with motor function impairments due to disorders such as strokes or multiple sclerosis face frequent mobility difficulties. Hence, they need constant support from an assistant. This work presents a brain-controlled wheelchair model to assist disabled and paralyzed patients. The wheelchair is controlled by interpreting Electroencephalogram (EEG) signals, also known as brain waves. In the EEG technique, an electrode cap is positioned on the user's scalp to receive EEG signals, which are detected and transformed by the Arduino microcontroller into motion commands that drive the wheelchair. The proposed wheelchair is implemented using an Arduino-based system controlled by human brain waves through a Brain-Computer Interface (BCI). The brain waves are captured using a low-cost Neurosky Mindwave headset. The proposed wheelchair has the potential to make an immense impact on the healthcare industry. The use of this brain-controlled wheelchair can improve the quality of life for paralyzed patients.

Keywords: Brain-Computer Interface (BCI), Electroencephalography (EEG), Brain-Controlled Wheelchair (BCW), Paralysis Assistance

Smart Backpack for Self-Defense

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Department of ECE, GMIT (VTU), Davanagere, India

Abstract

The Smart Backpack Self-Defense System is an innovative solution designed to enhance personal safety and health monitoring. It integrates IoT and self-defense technologies to address emergency situations effectively. The system features a GSM module for sending SMS alerts and making emergency calls, a GPS module for real-time location tracking, and a flex sensor to detect threats and activate defensive measures like a buzzer and pepper spray. A heartbeat sensor monitors the user's health, with real-time updates sent to the ThingSpeak cloud via an ESP8266 module. The inclusion of a solar panel ensures a continuous power supply, making the system reliable and energy-efficient for outdoor use. This project demonstrates how advanced technologies can be combined to provide a portable, user-friendly, and sustainable safety solution.

Keywords: Smart Backpack, IoT, Personal Safety, Renewable Energy

Design And Performance Analysis of Monopole Dual and Wide Band Microstrip Patch Antenna for Wireless Applications

Chetan S, Siddesh K B, Rakshitha R, Varshitha N N, Vennala R L and Vasudev M N
Department of ECE, SJM Institute of Technology, Chitradurga, India

Abstract

This paper presents the design and performance analysis of a compact dual-band and wideband frequency antenna intended for modern wireless communication applications. The antenna is designed to operate efficiently in the S-band, covering approximately 2.25–2.67 GHz for standard wireless services such as WLAN and LTE, and in the C-band, covering approximately 5.24-7.21 GHz with a wide bandwidth suitable for WiMAX and advanced high-speed wireless systems. The proposed design achieves strong dual-band operation with wide impedance bandwidth at the higher band, supporting reliable multi-standard operation within a simple and low-profile structure. The antenna is modeled and simulated using a full-wave electromagnetic solver to evaluate key performance parameters including return loss, impedance bandwidth, radiation pattern, gain, and efficiency across both bands. Simulation results confirm good impedance matching, stable bidirectional radiation patterns, and consistent gain, demonstrating robust dual-band and wideband performance. Its compact size and effective characteristics make it well-suited for integration into portable and embedded wireless devices. Overall, the proposed antenna provides a practical and cost-effective solution for reliable dual-band S-band and wideband C-band wireless communication with improved flexibility and efficient spectrum use.

Keywords: Dual-Band Antenna, Wideband Antenna, S-Band, C-Band

Rhombus Ring Microstrip Patch Antenna for WBAN Application

Rajappa H S, Moulya S K, Monika N R, Priyadarshini C P and Monisha G R
Department of ECE, AIT, Chikkamagaluru, India

Abstract

The rhombus ring microstrip patch antenna, operating at 5.8 GHz for Wireless Body Area Network (WBAN) applications, has been successfully designed and simulated. The design aims to reduce SAR (Specific Absorption Rate), enhance gain, and ensure reliable body-centric wireless communication. Simulations in CST Microwave Studio validate the proposed design with impedance bandwidths exceeding 80% and SAR values. Simulation results indicate promising outcomes, demonstrating the antenna's potential for reliable and efficient wireless communication. This design offers a compact, efficient, and feasible solution for WBAN applications, paving the way for further experimental validation and practical implementation.

Keywords: Microstrip Patch Antenna, Wireless Body Area Network (WBAN), Specific Absorption Rate (SAR), Return Loss, Gain

Wearable facial Recognition System for Visually Impaired Individuals

Chetana G S, Manoj Kumar S, Namitha Velpula and Kowshik G
Department of ECE, Jain (Deemed-to-be-University), Bengaluru, India

Abstract

The article proposes a Facial Recognition Assistive System aimed at helping visually impaired people recognize individuals nearby and enhance interaction and independence. The system is implemented on a Raspberry Pi, camera module, ultrasonic sensor, and text-to-speech (TTS) engine. It captures and extracts facial images with OpenCV and the Haar cascade classifier, matches them against a pre-stored database, and speaks out the recognized person's name through speech synthesis. The ultrasonic sensor is also used for detecting close obstacles for further support. The solution is low-cost, handheld, and designed to increase accessibility. Future plans involve incorporating deep learning models for improved accuracy and scalability.

Keywords: Facial Recognition, Assistive Technology, Raspberry Pi, Accessibility

Automatic Driving License Test using LabVIEW

Swetha K T, Surya Kumar P, Sanjay D P, Vineeth S Shastry, Harsha Vasappa Shatavaji and Chandra Shekar P
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Abstract

In the present world, we are seeing many road accidents due to the lack of driving skills, and in present society, corruption is becoming very common in the government sector. This project helps to overcome these issues while issuing a driving license to the test taker. The main aim of this project is to provide road safety to reduce bad driving habits as well as corruption and improve the accuracy of driving tests. Previously, many ways were there to overcome this issue, but using LabVIEW we can design and interface easily, and the software is user-friendly. The driving path can be observed by LabVIEW; if the test is successful, then LabVIEW can generate the acknowledgement for the test taker stating a test successful message, and there is no chance for corruption.

Keywords: LabVIEW, Driving License, Driving Test Automation, Road Safety

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The Smart Guiding Cap: A Comprehensive Wearable System for Visually Impaired Navigation

Ravikumar K I, Kartik S K, Rajendra Prasad D, Keerthikumar M and Ashish G
Department of ECE, Jain Institute of Technology, Davanagere, India

Abstract

Independent navigation is extremely difficult for people with visual impairments. There are drawbacks to traditional aids like guide dogs and white canes, such as the requirement for intensive training, limited range of motion, and poor information delivery. In order to improve the independence of visually impaired individuals, this paper suggests a novel solution: a smart guiding cap. The developed cap incorporates a camera to record live video streams of the environment, identifying obstacles and their types using deep learning and sensor fusion techniques. Sound feedback is used to communicate proximity alerts. Additionally, the system uses optical character recognition (OCR) to read messages and text on boards while producing audio. Additionally included is voice-assisted navigation using GPS and speech recognition, which provides reliable direction to predetermined locations. Using cutting-edge deep learning and sensor fusion, this project provides a complete, stick-free solution for people with visual impairments, enhancing their mobility and independence.

Keywords: Smart Guiding Cap, Deep Learning, Sensor Fusion, Visual Impairment

ECG Monitoring System Using Arduino and AD8232 Sensor Module

Raghukumar B S, Sunaina, Sanjana H R, Raksha R, Uzma Siddiqa and Rajappa H S
Department of ECE, AIT, Chikkamagaluru, India

Abstract

A cost-effective ECG monitoring system was developed using an Arduino Uno and the AD8232 sensor module to acquire and analyze real-time cardiac signals. The implementation involved configuring a breadboard-based circuit using standard components, without the design of custom hardware or PCBs. The AD8232 sensor captured ECG waveforms, which were processed and visualized on a computer via the Arduino serial monitor. Open-source tools were employed for coding, interfacing, and data tracking. The method provides a simple and accessible solution for basic biomedical signal acquisition and analysis. Observations of real-time waveforms facilitated the understanding of signal patterns and noise behavior. Designed primarily for educational and learning environments, the device serves as a foundational platform for students and researchers in biomedical electronics.

Keywords: Electrocardiogram (ECG), Arduino Uno, AD8232, Real-time Monitoring

Development of an IoT-Enabled Solar-Powered Robotic System for Precision Seed Sowing and Fertilizer Spraying

Tejasvi D, Vijesh, Apoorva A, Ashwini K and Mahabaleshwara Bhat P
Department of ECE, Vivekananda College of Engineering and Technology, Puttur, India

Abstract

This paper presents an IoT-enabled solar-powered robotic system for automated seed sowing and fertilizer spraying in small-scale agriculture. Addressing labor shortages and fuel dependency, the proposed work integrates a Wemos D1 ESP8266 microcontroller with Bluetooth mobile control, solar energy harvesting (6-hour runtime), and ultrasonic navigation. The servo-actuated seed mechanism achieves 85–90% placement accuracy with consistent 15 cm spacing, while a 12 V DC pump enables simultaneous fertilization. Field tests show a reduction in manual labor and zero fossil fuel use. Key innovations include: (1) low-power IoT control, (2) optimized solar charging, and (3) dual seed/fertilizer delivery. The 4-wheeled platform proves effective in semi-dry regions, though terrain adaptability needs improvement. This work demonstrates how renewable energy and automation can boost productivity while cutting costs for small farmers.

Keywords: Precision Agriculture, Solar Robot, IoT Farming, Smart Fertilization

Smart Plant Monitoring using Edge-AI and Federated Learning

Someshwar V Shejwadkar, Rahil A S, Shrikanth C A, Sharath Kumar K R and Veena H T
Department of ECE, GM Institute of Technology, Davanagere, India

Abstract

In recent years, agriculture has seen major technological progress, becoming more data-driven and efficient. Farmers now benefit from tools that improve crop monitoring, irrigation control, soil moisture tracking, climate analysis, and intrusion detection. These smart farming practices focus on broad area coverage rather than high data volumes or fast transmission. In rural and remote regions, where power and connectivity are limited, LoRa technology provides a practical solution due to its long range and low power needs, supporting sensor communication over distances up to fifteen kilometers. This paper presents an overview of LoRa-based farm monitoring systems, highlighting their uses, benefits, and challenges. Additionally, it emphasizes the role of renewable energy in powering these systems, especially in off-grid agricultural areas. By using sustainable energy sources, farmers can ensure reliable and eco-friendly operation of monitoring devices, improving productivity while reducing environmental impact. This approach supports sustainable farming and aligns with global development goals such as improving food security, promoting innovation, and protecting natural ecosystems.

Keywords: Edge AI, Federated Learning, IoT, Smart Agriculture

Portable ECG M Health

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Abstract

Cardiovascular diseases remain one of the leading causes of mortality worldwide, necessitating the development of low-cost, portable, and real-time monitoring systems. This paper presents the development of a portable, AI-enabled ECG monitoring system designed for real-time cardiac health assessment. The proposed system employs the ADS1292R analog front-end in conjunction with an STM32F4 microcontroller to acquire high-fidelity ECG signals. The data is transmitted via Bluetooth to a dedicated mobile application, which provides real-time waveform visualization and patient data management. A lightweight, on-device artificial intelligence model is integrated into the application to automatically classify cardiac conditions, including arrhythmia, atrial fibrillation, and bradycardia. Unlike conventional ECG monitoring solutions, the proposed system offers low power consumption, cost efficiency, portability, and AI-assisted diagnosis, making it suitable for remote healthcare and telemedicine applications.

Keywords: ECG Monitoring, AI-enabled Diagnosis, Portable Healthcare, Real-time Monitoring

Home Automation System Using Arduino Uno

Veeresh S A, Vikas K S, Akash N and Akash G M
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Abstract

This paper presents a cost-effective and energy-efficient home automation system using the Arduino Uno microcontroller. The aim is to control home appliances remotely and automatically using sensors, relays, and communication modules. The system improves comfort, security, and energy management. A prototype was developed to demonstrate the system's effectiveness, using temperature, light, and motion sensors, along with mobile app integration through Bluetooth.

Keywords: Home Automation, Arduino Uno, Sensors, IoT

Student Count in a Classroom using Arduino Uno

Arun M, Veeresh H, Ajay Kumar K M, Arun K N and Darshan K K
Department of ECE, Government Polytechnic, Harihara, India

Abstract

This paper presents a cost-effective and efficient solution to count the number of students in a classroom using Arduino Uno. By leveraging infrared sensors and microcontroller logic, the system accurately detects and maintains the real-time count of individuals entering and exiting the room. This prototype aims to support automation in educational environments for attendance monitoring, energy optimization, and space management.

Keywords: Arduino Uno, Student Count, Infrared Sensor, Automation

Predictive Health Monitoring for Proactive Public Management

Tanuja T, Deeksha M U, Varshitha S, Anusha B A and Bhargavi E
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Abstract

This study introduces a cost-effective wearable system designed to monitor vital health indicators in real time using Internet of Things (IoT) and machine learning (ML) technologies. The proposed solution comprises an intelligent wristband equipped with biomedical sensors-MAX30100 for monitoring heart rate and SpO_2, DS18B20 for temperature tracking, MQ-135 for detecting CO_2, and an accelerometer for identifying falls. The sensors are connected to a NodeMCU ESP8266 microcontroller, which transmits data wirelessly to a cloud-based dashboard. A Logistic Regression model is employed to classify critical health events based on the sensor data. When an abnormal condition is detected, the system immediately sends a WhatsApp alert along with the user's location. This approach offers an accessible, continuous health monitoring solution that enhances emergency responsiveness, particularly for vulnerable individuals such as the elderly or those in remote areas.

Keywords: IoT, Wearable Health Monitoring, Machine Learning, Emergency Alert

Automatic Intelligent Waste Segregation System

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Abstract

This paper presents a smart waste segregation system leveraging IoT and sensor technologies to enhance urban sustainability. The system integrates Arduino, IR sensors, metal detectors, moisture sensors, and ultrasonic sensors to automate waste categorization into dry, wet, and metal types. A Node MCU module enables real-time monitoring and sends notifications via Telegram when bins are full. This approach reduces manual intervention, improves hygiene, and supports data-driven waste collection strategies. By promoting efficient waste management, the proposed system contributes to cleaner and more sustainable urban environments.

Keywords: IoT, Waste Segregation, Arduino, Smart City

Comparison Analysis of Proposed Corn Leaf Disease Detection EKNN Model with Other Robust Existing Methods

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Abstract

Since maize is a staple diet for people, especially vegetarians and vegans, maize leaf disease has a significant influence on the food industry, including maize crop productivity. Therefore, it should be understood that maize quality must be optimal; yet, to do so, maize must be safeguarded from several illnesses. As a result, there is a great demand for such an automated system that can identify the condition early on and take the appropriate action. Early disease identification is crucial, but it also poses a major obstacle. As a result, in this research project, we adopt the fundamental k-nearest neighbor (KNN) model and concentrate on building and developing the enhanced k-nearest neighbor (EKNN) model. EKNN aids in identifying several classes of disease. To gather discriminative, boundary, pattern, and structurally linked information, additional high-quality fine and coarse features are generated. This information is then used in the classification process. The classification algorithm offers high-quality gradient-based features. Additionally, the proposed model is assessed using the Plant Village dataset, and a comparison with many standard classification models using various metrics is also done.

Keywords: Plant Disease Detection, Plant Leaf Disease Identification, Image Processing, Leaf Disease Classification, KNN (K-nearest neighbor), EKNN (Enhanced K-nearest neighbor)

Design of CMOS Ring Oscillator using 45 nm Technology for Different Stage Configurations

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Abstract

A ring oscillator consists of an odd number of inverter stages connected in a closed loop, where the output of each stage drives the input of the next, and the final stage output is fed back to the first. Operation is initiated by a single reset pulse, with no continuous external input required. In this work, 5-stage, 7-stage, and 9-stage CMOS ring oscillators were designed and analyzed using the Cadence Virtuoso tool in 45 nm technology. Each stage output was loaded with a 520 aF capacitor, and the final load with a 5 fF capacitor. Simulation results indicate a 79% reduction in power consumption for the 5-stage design compared to the 9-stage configuration.

Keywords: Ring oscillators, CMOS, System on Chip, frequency, power consumption, delay.

Image Processing in CT Scan and Quality Assessment

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Abstract

This paper explores the application of image processing techniques in assessing and enhancing the quality of CT scans, a critical component in medical imaging and diagnosis. It provides an overview of various methods used to improve the clarity and diagnostic reliability of CT images. Beginning with a discussion on the pivotal role of CT scans in medical diagnosis and the challenges posed by image quality issues, the paper examines key image processing techniques such as noise reduction, artifact removal, contrast enhancement, and image registration. Their contributions to enhancing the interpretability and diagnostic value of CT images are emphasized. It also addresses quality assessment methods, including objective metrics and subjective evaluations by radiologists, to ensure the accuracy and dependability of processed images. It concludes by highlighting future research directions and the transformative potential of image processing in advancing CT scan quality, ultimately improving patient care and fostering innovations in medical imaging technology.

Keywords: CT scan, artifact, image registration, contrast enhancement

Design and Implementation of Asynchronous FIFO using 90Nm Technology

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Abstract

An asynchronous FIFO is a widely used circuit for caching data and handling frequency differences between asynchronous signals. This paper presents the design and implementation of an asynchronous FIFO using 90nm CMOS technology, emphasizing its advantages in real-time data transfer, multi-core processing, and data acquisition systems. Optimization techniques such as pipeline registers, dual-clock FIFO design, and Gray-code-based pointers are explored. The proposed FIFO is verified via simulation and synthesized using Cadence EDA tools. The implementation demonstrates high efficiency in safe clock domain crossing, metastability handling, and low power consumption, making it suitable for embedded and communication systems.

Keywords: Asynchronous FIFO, 90nm CMOS technology, Clock domain crossing, Gray code, Cadence EDA

Design and Verification of AMBA APB Protocol Using SV

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Abstract

This paper presents the architectural design and functional modeling of the AMBA Advanced Peripheral Bus (APB), a key component of the Advanced Microcontroller Bus Architecture (AMBA) widely used in modern System-on-Chip (SoC) designs. The APB is optimized for low-bandwidth, low performance peripheral communication, making it ideal for interfacing devices such as UARTs, timers, and general-purpose I/O modules. Unlike other AMBA protocols, APB operates without pipelining, and its signal transitions are synchronized with the rising edge of the clock, simplifying integration into diverse design flows. The APB model is implemented using Verilog and verified through a SystemVerilog-based testbench, demonstrating its correctness and suitability for ASIC and SoC environments.

Keywords: AMBA, APB, SoC, ASIC, Verilog, SystemVerilog, Design Verification

Design and Implementation of a Single Stage Amplifier for Biomedical Applications

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Abstract

This project presents the design of a low- power single stage operational amplifier (op-amp) tailored for biomedical applications that require high performance with minimal energy consumption. The op amp uses a differential amplifier configuration optimized for low voltage operation. To ensure efficiency, the design integrates current mirrors, current biasing techniques, and other low power circuit topologies. Comprehensive AC and DC simulations were conducted using industry standard electronic design tools. The results demonstrate that the proposed op-amp achieves strong performance metrics, including high gain, wide bandwidth, gain margin (GM), stable phase margin (PM), excellent power supply rejection ratio (PSRR) and common-mode rejection ratio (CMRR). These characteristics make the design highly suitable for biomedical devices where both low power consumption and signal integrity are essential.

Keywords: Operational Amplifier (op-amp), Gain Margin (GM), Stable phase margin (PM), Excellent power supply rejection ratio (PSRR), Common- mode rejection ratio (CMRR).

Emergency Traffic Light Communication with Ambulance using ESP32 and Multi-Sensor Fusion

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Abstract

Emergency medical services are highly dependent on timely access through urban traffic. Traditional traffic light systems often fail to prioritize ambulances, causing critical delays that may endanger patient lives. This paper presents the design and implementation of an intelligent emergency traffic light communication system using ESP32, ULN2803A driver circuits, and a multi-sensor fusion approach. The system detects approaching ambulances automatically through acoustic siren sensing, vehicle presence detection, and Bluetooth Low Energy (BLE) beacon scanning. A finite state machine (FSM) algorithm manages the normal four-way traffic cycle with pedestrian phases and all-red clearances. Upon ambulance detection, the controller interrupts the sequence, grants immediate green to the ambulance lane, and resumes normal operation after clearance. A prototype was developed and tested with LEDs representing traffic lights. Results demonstrate reliable ambulance priority handling, low hardware cost, and scalability for future smart city deployments.

Keywords: Emergency vehicle priority, traffic preemption, ESP32, ULN2803A, ambulance communication, smart traffic system.

Automatic Unmanned Pesticide Sprayer

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Abstract

In modern agriculture, automation plays a vital role in improving productivity, ensuring crop health, and minimizing human exposure to harmful chemicals. The Automatic Unmanned Pesticide Sprayer (AUPS) is designed to autonomously navigate agricultural fields and apply pesticides with precision and efficiency. The system integrates sensors, microcontrollers, and motorized spraying mechanisms to detect crop patterns, control spray volume, and optimize chemical usage. It operates without direct human intervention, thereby reducing labour requirements and environmental contamination. The AUPS is capable of functioning in varying field and weather conditions, offering a cost-effective, safe, and sustainable solution for large-scale pesticide application.

Keywords: Pesticide Sprayer, Agricultural Automation, Autonomous Navigation

Development of IoT-Based Battery Management System for Electric Vehicles

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Abstract

Electric Vehicles (EVs) are gaining rapid traction in the global mobility shift. Yet, critical challenges such as battery safety, degradation, and efficient energy use remain. This review explores the application of the Internet of Things (IoT) in Battery Management Systems (BMS) for EVs, emphasizing the monitoring of vital parameters like temperature, voltage, current, State of Charge (SoC), and State of Health (SoH). The study compiles existing research, identifies the gaps in traditional BMS, and evaluates the potential of IoT-enhanced systems. Real-time monitoring, predictive maintenance, and cloud-based data analytics are highlighted as enablers for better EV performance, safety, and battery longevity. Overall, IoT-based BMS represents a transformative advancement for EV technology, offering a pathway toward safer, more efficient, and sustainable electric mobility. By addressing key challenges in battery management, these systems can accelerate EV adoption, support renewable energy integration, and contribute to the realization of global carbon reduction goals.

Keywords: Electric Vehicles, IoT-enabled BMS, Battery Monitoring, Predictive Maintenance

Intelligent Navigation Using Autonomous Robots

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Abstract

This work aims to develop an autonomous pick-and-place robot using a line-following algorithm. Designed around three core components-electronic circuitry, mechanical design, and programming-the robot minimizes manual effort and saves time in large-scale, repetitive tasks. This project employs autonomous navigation to reduce the manual effort involved in repetitive tasks. The robot uses an array of sensors to navigate along a path marked by black tape on a white surface. Controlled by an Arduino microcontroller, it functions as a line-following pick-and-place robot. The system enables the robot to detect the pickup location, position itself accurately, and use its gripper to lift and transport objects to specified drop-off points. The results demonstrate significant improvements in navigation accuracy, energy efficiency, and task completion time compared to conventional autonomous systems. The study further discusses potential applications in warehouse automation, search and rescue, agricultural robotics, and planetary exploration. By combining intelligent perception with adaptive control, the proposed autonomous navigation framework paves the way for more robust, scalable, and versatile robotic solutions.

Keywords: Autonomous Pick-and-Place Robot, Line-Following Algorithm, Robotic Automation

Modeling Simulation and Analysis of Permanent Magnet DC Motor to a Water Pumping System

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Abstract

The modelling, simulation, and performance analysis of a Permanent Magnet DC (PMDC) motor applied to a water pumping system. The PMDC motor is chosen for its high efficiency, compact size, and reliable torque-speed characteristics suitable for pumping applications. A mathematical model of the motor is developed based on its electrical and mechanical equations, incorporating load dynamics of the pump. The system is simulated in MATLAB/Simulink to evaluate transient and steady-state behaviour under varying load and supply conditions. Key parameters such as speed, torque, armature current, and efficiency are analysed to assess performance. The simulation results demonstrate the motor's capability to maintain stable operation with minimal fluctuations. Energy consumption and output flow rate are also examined to determine operational efficiency. The study provides insights for optimizing motor design and pump matching for rural and industrial water supply systems.

Keywords: PMDC, Water Pumping System, MATLAB/Simulink Simulation

The Internet of Things: Ecosystem, Technologies & Application Domains

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Abstract

There is no doubt that IoT has added a new dimension to living beings by enabling links between smart objects. Thus, making the connection among any media and anything, at any place and anytime, is appreciable. Under the umbrella of the Internet of Things (IoT), the number of interconnected devices is expected to grow exponentially to more than 34 billion devices by 2021. IoT will provide the unique identification of objects and their virtual representation as the basis for the autonomous development of applications and services. These will be characterized by enormous and self-governing data capture, incident transfer, network connectivity, and interoperability. This technology has numerous applications in heterogeneous fields. The IoT technology and applications are likely to be major drivers of investment and innovation in the communications sector over the forthcoming years, delivering valuable advantages to citizens, clients, and industrial end-users. These will lead to the introduction of many new and modern services. It will permit data to be transmitted between many various types of devices, enhance the safety of transportation, decrease energy consumption, and improve our health. In this paper, we briefly discuss the Internet of Things and its applications in several fields. IoT applications, using edge-of-network sensors, accumulate data on a computing and communicating device, with actuators performing distinguished tasks controlled by these devices.

Keywords: Internet of Things, Smart Devices, IoT Applications, Network Connectivity

Electric Vehicles Fast Charging System by Using DAB Converter

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Abstract

The EU has proposed an ambitious goal to achieve widespread e-mobility in both the electrical and commercial sectors. To accomplish this, a substantial number of DC fast-charging stations must be built. These power converters, installed in DC fast-charging stations (DCFC), differ from traditional DC-DC converters as they exhibit high power density, reaching tens of kilowatts. In contrast to traditional non-isolated power converters, isolated power converters offer ideal galvanic isolation, providing protection to both the local power grid and electric vehicles. Among the DC power converters designed for industrial applications, LLC resonant converters and DAB (Dual Active Bridge) converters have gained significant popularity. When compared to LLC converters, DAB converters demonstrate a more flexible input and output power range, as well as a higher power density. Considering these advantages, a 10-kW bidirectional DAB power converter has been designed to fulfil the requirements of this thesis project. The thesis is organized into four distinct parts. The first part focuses on conducting a comprehensive literature review to explore the challenges prevalent in the current electrical field. Various DC-DC topologies are compared based on different factors, including component analysis, controllability, safety considerations, and cost-effectiveness. By examining these aspects, potential solutions for Electric Vehicles (EVs) are identified. In the second part, a specific DC-DC converter with a power rating of 10 kW is chosen, utilizing the DAB topology.

Keywords: DC Fast Charging, Dual Active Bridge Converter, Electric Vehicles, Isolated Power Conversion

Solar Powered Electric Vehicle

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Abstract

As the global demand for sustainable and energy-efficient transportation solutions grows, Solar Electric Vehicles (SEVs) are emerging as a promising innovation. These vehicles utilize integrated photovoltaic (PV) panels to harness solar energy and power electric drivetrains, offering a clean alternative to conventional fossil-fuel-powered transport. SEVs are designed with high-efficiency solar panels, which convert sunlight directly into electricity. This energy is either used immediately to propel the vehicle or stored in lithium-ion battery systems for later use. A smart battery management unit (BMU) ensures optimal performance by regulating the charging and discharging cycles. By reducing reliance on external charging infrastructure, SEVs support greater energy independence while significantly lowering greenhouse gas emissions. To enhance overall efficiency, SEVs incorporate lightweight materials and aerodynamic designs, which reduce energy consumption and improve driving range. In regions with high solar irradiance, these vehicles have the potential to achieve partial or complete energy self-sufficiency, making them particularly suitable for both urban and off-grid rural environments. In addition, IoT-enabled systems provide real-time monitoring of energy generation, battery status, and vehicle diagnostics, ensuring optimal operation and simplifying maintenance. These digital features contribute to improved reliability and user convenience. This integrated solar-electric approach represents a forward-looking, cost-effective, and scalable solution that aligns with global sustainability goals. With ongoing research, innovation, and supportive policies, SEVs have the potential to become a key component of the future green transportation ecosystem.

Keywords: Solar Electric Vehicles, Photovoltaic Panels, Battery Management Unit, Green Transportation

Planning Renewable Heating for Smarter Energy Future

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Abstract

This paper presents a comparative analysis of different strategies for transitioning the heating sector toward a 100% renewable energy future, with a particular focus on the infrastructure implications across electricity, gas, and heating networks. It argues that these infrastructural consequences-especially regarding grid capacity and energy storage-are often underestimated, despite their significant impact on overall system costs and feasibility. Two primary approaches are explored: the "smart grid" strategy, which centers on electricity as the dominant energy carrier, and the "smart energy systems" approach, which promotes a cross-sectoral integration of all available energy infrastructures. Using Denmark as a case study, the paper reveals that the existing gas and district heating grids each offer approximately twice the capacity of the current electricity distribution grid. Furthermore, gas and thermal energy storage systems not only already possess greater capacities but are also more economical to expand compared to their electric counterparts. The findings suggest that pursuing a smart grid-based pathway would necessitate a two- to fourfold expansion of the electricity grid along with substantial investments in electrical storage solutions. In contrast, the smart energy systems approach can achieve similar energy goals with relatively modest and cost-effective upgrades to existing infrastructures.

Keywords: Renewable Energy Transition, Smart Energy Systems, Grid Capacity, Energy Storage

Implementation of Anti Bike Theft Using Arduino

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Abstract

This paper presents a smart bike monitoring system for cyclists via the Internet of Things (IoT). The system is designed for real-time monitoring of a cyclist's health condition and performance. The sensors are connected to a microcontroller and Wi-Fi module, which can be accessed through an IoT platform, specifically the Blynk application. In India, transportation is a booming field where the number of vehicles is increasing day by day. Security and maintenance of these vehicles is a critical issue. Monitoring a vehicle's digital locking system is a much-needed feature in this digital era. Tracking a vehicle is also vital when it is not in the owner's possession. The IoT-based vehicle parameter monitoring system is capable of tracking and monitoring vehicle parameters through the Blynk app. The Internet of Things enables sharing data over large or small scalable networks, consisting of interrelated computing devices-sometimes referred to as nodes-without human or machine interference. Because of the effortless communication between IoT devices, IoT is prevalently used in security systems. Two-wheelers are often targeted for theft due to the ease with which they can be dismantled, and such thefts are rapidly rising in India. The rate of recovery remains extremely low, leading to significant and often unrecoverable losses. A survey was conducted to understand the security measures that need to be implemented, as well as the current availability of such measures in the market. Based on this, a system was designed and developed using IoT components to create a smart security system that is both effective and affordable.

Keywords: IoT-based Vehicle Monitoring, Smart Bike Security, Blynk Application, Two-Wheeler Theft Prevention

Electrically Charged Green Sweep

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Abstract

This work presents the design and development of a remote-controlled grass-cutting machine powered by an ESP32-CAM module, offering an efficient and cost-effective solution for lawn care. This grass cutter is controlled remotely through a web interface, enabling users to monitor and operate it with ease. Equipped with a camera for real-time video feedback, it provides users with the ability to oversee the cutting process and navigate the machine. The system is powered by a rechargeable battery, ensuring portability and autonomy in outdoor environments. With efficient power management and seamless control, this grass cutter reduces manual effort, making grass cutting more convenient, time-saving, and suitable for both residential and commercial applications.

Keywords: Remote-Controlled Grass Cutter, ESP32-CAM, Real-Time Monitoring, Lawn Care Automation

Solar Based Smart Irrigation System using Node MCU and Blynk Server

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Abstract

Water scarcity and inefficient irrigation techniques are significant challenges in modern agriculture. To overcome these issues, this project presents a solar-powered smart irrigation system using the ESP8266 microcontroller, designed to automate irrigation based on real-time soil moisture and environmental conditions. This system aims to optimize water usage, reduce manual labor, and promote sustainable farming practices. The setup includes soil moisture sensors, an ESP8266 Wi-Fi module, and a solar-powered water pump. The ESP8266 collects sensor data and activates the pump automatically when soil moisture falls below a set threshold. With Wi-Fi connectivity, farmers can monitor and control the system remotely through a mobile app or web dashboard. Key benefits of this system include efficient water management, reduced dependence on grid electricity, and real-time remote monitoring. The integration of IoT technology allows for data logging, environmental analysis, and predictive irrigation scheduling, improving crop health while reducing operational costs. By combining renewable energy with smart automation, this system offers an eco-friendly, sustainable solution ideal for regions facing water and power shortages. Future upgrades may include AI-based analytics, weather forecasting, and automated fertilization, further enhancing system efficiency and productivity.

Keywords: Smart Irrigation System, ESP8266 Microcontroller, Solar-Powered Automatio IoT in Agriculture

Laser Home Security System

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Abstract

This paper presents the design and implementation of a Laser Home Security System aimed at enhancing residential security through a low-cost, efficient, and reliable mechanism. The system utilizes a laser module aligned with reflective mirrors to create an invisible security barrier. At the endpoint, a Light Dependent Resistor (LDR) detects the presence of the laser beam. Upon any disturbance of the laser light, indicative of unauthorized entry, the LDR signals an Arduino Uno microcontroller, which subsequently activates a buzzer alarm to alert homeowners. This innovative approach leverages simple yet effective components, making it accessible for personal security applications. The system's performance was evaluated through various tests, demonstrating its ability to reliably detect intrusions and provide timely alerts. The findings indicate that this laser-based security solution can significantly enhance the safety of residential properties while being cost-effective and easy to implement.

Keywords: Laser Home Security System, Arduino Uno, Intrusion Detection, Residential Safety

An Efficient Passive Cell Balancing Approach for Lithium-Ion Batteries

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Abstract

Lithium-ion batteries are extensively used in electric vehicles, renewable energy systems, and portable devices owing to their high energy density, long service life, and efficiency. However, unequal voltage levels among cells caused by manufacturing variations, cell aging, and non-uniform charging or discharging can shorten battery life, reduce capacity, and pose safety concerns. This work presents an improved passive cell balancing strategy modelled in MATLAB Simulink. The approach employs a resistor-based dissipation circuit regulated by Proportional Integral (PI) controllers to bring cell voltages into alignment. The controller continuously checks individual cell voltages and engages resistive balancing for cells with higher voltage until all State of Charge (SoC) values match. Simulation outcomes indicate enhanced voltage uniformity, reduced balancing time, and increased usable pack capacity. This method offers a cost-effective and dependable solution for integration into Battery Management Systems (BMS).

Keywords: Passive Cell Balancing, Lithium-Ion Battery, Battery Management System, MATLAB Simulink, PI Controller, State of Charge (SoC).

Design and Implementation of a UART Module for High-Speed Serial Communication

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Abstract

Remarkable innovations in technology are driven mainly by the high speed data communication requirements of the modern generation. The Universal Asynchronous Receiver Transmitter (UART) is one of the most sought-after communication protocols. This work mainly focuses on implementing and analyzing the UART for data communication. The system includes a baud rate generator, transmitter, and receiver to ensure accurate, low-latency, and error-free data transfer. A hardware-based approach minimizes inefficiencies, making it suitable for high-speed and real-time applications. The design is tested through simulation to verify its functionality and performance. This UART module can be integrated into FPGA and embedded systems, ensuring seamless communication with minimal resource utilization. Power-Efficient FSM based UART is also implemented using FSM. The Finite State Machine (FSM) implements the baud rate generator, transmitter, and receiver modules. Cadence NCSIM was utilized for simulation, and Cadence RTL Compiler was used during synthesis using the 45 nm and 90 nm General Process Design Kit (GPDK) library files. The experimental results show that the receiving and sending module of this module works well and meets the requirements of full-duplex serial communication equipment. There is no doubt that the design of this paper has made a more detailed explanation of the basic operating principle of UART, which will contribute to its further development.

Keywords: UART, FSM, GPDK, NCSIM

Sustainable Utilization of Waste Materials for Electrical and Thermal Insulator Development

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Abstract

Our paper entitled "Sustainable Utilization of Waste Materials for Electrical and Thermal Insulator Development. This paper is about turning different waste materials, like fly ash, rubber, plastic bottles, and rice husks, into useful electrical and thermal insulators. The goal is to solve environmental problems caused by waste and the need for more sustainable materials. The researchers mixed and processed these waste materials to create new composite materials. They then tested these new materials to see how well they performed regarding electrical insulation (preventing electricity from flowing), thermal insulation (preventing heat transfer), and strength. The main finding is that these new waste-based composites work just as well as or even better than traditional insulators, especially for certain applications. Plus, producing them is cheaper and better for the environment.

Keywords: Fly ash, Rubber, Plastic bottles, Rice husks, Thermal Insulator

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Smart Drone for 360° Electrical Monitoring and Control

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Abstract

This paper presents the development of a 360-degree obstacle avoidance and electrical regulation system for autonomous drones, aimed at enhancing navigation safety, power efficiency, and operational reliability. The drone integrates a multi-directional sensor array-comprising ultrasonic, LiDAR, and infrared sensors-facilitating real-time detection and avoidance of obstacles in all directions. A centralized processing unit interprets sensor data using advanced algorithms to dynamically adjust flight paths, ensuring uninterrupted movement even in complex environments. Concurrently, the electrical regulation system optimizes power distribution across propulsion, navigation, and communication subsystems, reducing energy loss and extending flight duration. The combination of full-surround obstacle detection with intelligent power management enables the drone to operate more safely and efficiently in diverse indoor and outdoor scenarios. Experimental results validate the system's effectiveness in navigating obstacle-dense environments and maintaining stable electrical performance under varying load conditions.

Keywords: Autonomous Drones, Obstacle Avoidance, Electrical Regulation, Power Management

Smart ID Card - A Wearable Device for Real-Time Tracking and Emergency Communication

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Abstract

This literature suggests an IoT-based Smart ID Card to improve the security of children, elderly people, and working women using real-time tracking and emergency assistance. The small, wearable card incorporates GPS and GSM to facilitate location tracking. Users can initiate an SOS signal, which sends their location and information to preconfigured contacts and authorities. The low-power design provides long battery life, while a mobile app companion enables personalization and safety alerts. The system is designed to offer quick intervention in emergencies, ensuring user safety in both urban and rural areas. Initial testing proves its effectiveness and reliability in resolving safety issues.

Keywords: IoT-based Smart ID Card, Real-time Tracking, Emergency Assistance, Personal Safety

Power Bank with Plasma Lighter

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Abstract

The main aim of this project is to develop a portable power bank with plasma lighter. This project combines two tools into a single device, functioning both as a power bank and as plasma lighter. It can either be used to charge electronic devices or as a fire source. The lighter uses high voltage from the power bank's batteries to create an electric arc for ignition. This project provides an eco-friendly solution for fire production and serves as a portable unit for charging electronic devices. Plasma lighters are resistant to wind and safer than traditional lighters, as they do not directly produce fire but instead generate an electric arc that creates fire.

Keywords: Power bank, Plasma Lighter, Electric Arc, Dual purpose Device

A Single Inductor Multi-Port Power Converter for Electric Vehicle Applications

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Abstract

Electric Vehicles (EVs) are rapidly gaining attention due to their potential to reduce greenhouse gas emissions and dependence on fossil fuels. However, one of the major challenges in EV technology is the effective integration and management of multiple energy sources, such as batteries and renewable sources like solar energy. This paper proposes a novel Single Inductor Multi-Port (SIMP) DC-DC converter designed specifically for electric vehicle applications. The converter enables efficient and flexible integration of multiple DC power sources using a single inductor, significantly reducing the overall size, weight, and cost of the power conversion system. The proposed system architecture features a dual-input SIMP converter connected to both a solar panel and a battery system, delivering power to the main traction drive (via an inverter and electric motor) as well as auxiliary loads. The converter topology supports multiple modes of operation, including solar-to-load, battery-to-load, and solar-to-battery charging, ensuring optimal power distribution and minimal energy loss. The single inductor is time-multiplexed to manage energy transfer between different ports, enabling dynamic source switching and energy sharing without the need formultiple bulky inductors or transformers.

Keywords: Electric Vehicles (EVs), SIMP DC-DC Converter, Renewable Energy Integration, Multi-Source Power Management, Energy Efficiency

Modular Agriculture Vehicle

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Abstract

The increasing demand for automation in agriculture has led to the development of low-cost and efficient solutions aimed at enhancing productivity and reducing manual labor. This paper presents the design and implementation of a Multipurpose Agriculture Vehicle based on Arduino microcontroller technology. The vehicle is capable of performing multiple agricultural tasks such as soil ploughing, seed sowing, pesticide spraying, and crop monitoring. It is developed using easily available components to ensure affordability and scalability for small- and medium-scale farmers. The Arduino serves as the central controller, interfacing with motor drivers, sensors, and actuators to execute programmed operations according to field requirements. The modular design allows easy customization and integration of additional tools. The prototype was tested under controlled conditions and demonstrated promising performance in terms of efficiency, precision, and adaptability. This project highlights the potential of open-source electronics in transforming traditional agricultural practices through smart mechanization.

Keywords: Agricultural Automation, Arduino Microcontroller, Multipurpose Agriculture Vehicle, Smart Mechanization

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