E-PROCEEDINGS

INTERNATIONAL TINKER INNOVATION & ENTREPRENEURSHIP CHALLENGE (i-TIEC 2025)

"Fostering a Culture of Innovation and Entrepreneurial Excellence"

23 January 2025
PTDI, UiTM Cawangan Johor
Kampus Pasir Gudang

ORGANIZED BY:

Electrical Engineering Studies, College of Engineering
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PREFACE

It is with great pleasure that we present the e-proceedings of International Tinker Innovation & Entrepreneurship Challenge (i-TIEC 2025), which compiles the extended abstracts submitted to the International Tinker Innovation & Entrepreneurship Challenge (i-TIEC 2025), held on 23 January 2025 at **PTDI, Universiti Teknologi MARA (UiTM) Cawangan Johor, Kampus Pasir Gudang.** This publication serves as a valuable resource, showcasing the intellectual contributions on the invention and innovation among students, academics, researchers, and professionals.

The International Tinker Innovation & Entrepreneurship Challenge (i-TIEC 2025), organized under the theme "Fostering a Culture of Innovation and Entrepreneurial Excellence," is designed to inspire participants at various academic levels, from secondary students to higher education students and professionals. The competition emphasizes both innovation and entrepreneurship, encouraging the development of product prototypes that address real-world problems and have clear commercialization potential. By focusing on technological and social innovations, i-TIEC 2025 highlights the importance of turning creative ideas into viable, market-ready solutions that can benefit users and society. The extended abstracts in this e-proceedings book showcase the diverse perspectives and depth of research presented during the event, reflecting the strong entrepreneurial element at its core.

We extend our sincere gratitude to the contributors for their dedication in sharing their innovation and the organizing committee for their hard work in ensuring the success of the event and this publication. We also appreciate the support of our collaborators; Mass Rapid Transit Corporation Sdn. Bhd. (MRT Corp), Universitas Labuhanbatu, Indonesia (ULB), Universitas Riau Kepulauan, Indonesia (UNRIKA) and IEEE Young Professionals Malaysia, whose contributions have been instrumental in making this event and publication possible.

We hope that this e-proceedings book will serve as a valuable reference for researchers, educators, and practitioners, inspiring further studies and collaborations in both innovation and entrepreneurship. May the knowledge shared here continue to spark new ideas and market-ready solutions, advancing our collective expertise and fostering the growth of entrepreneurial ventures.

A-ST147: INTEGRATED SOLAR POWERED FAN AND LIGHTING SYSTEM.

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ABSTRACT

Integrated Solar-Powered Fan and Lightning System is an innovative solution designed to address the challenges of unstable power supply by utilizing solar energy to ensure uninterrupted operation. This multipurpose device features a fan and LED lamp powered by a rechargeable battery charged via a solar panel. Its smart features include an LDR that turns the LED lamp on in the dark and off in bright environments, ultrasonic sensors to activate the fan when humans are detected, and a DHT22 temperature sensor that adjusts the fan speed based on the surrounding temperature. Additionally, the ESP32 module with Wi-Fi connectivity enables users to control lamp brightness and monitor real-time temperature and humidity data through the Blynk IoT app. By combining renewable energy, sensor automation, and IoT technology, this device promotes eco-friendly practices and provides a sustainable solution for both indoor and outdoor use.

Keywords: ESP32 Microcontroller, Light Dependent Resistor (LDR), Ultrasonic sensor, Renewable Energy, Blynk IoT, Sustainability.

1. Product Description

Integrated Solar Powered Fan and Lightning System is a versatile and eco-friendly solution for areas with unstable power supplies. Powered entirely by solar energy, it includes a solar panel that charges a rechargeable battery, ensuring uninterrupted operation of the fan and LED lamp, even at night. Its intelligent features include a Light Dependent Resistor (LDR), which automatically turns the lamp on in the dark and off in bright environments, and ultrasonic sensors that activate the fan upon detecting human presence. Additionally, a DHT22 temperature sensor adjusts the fan speed based on ambient temperature, providing optimal comfort. The device is equipped with an ESP32 module offering Wi-Fi connectivity, enabling real-time monitoring of temperature and humidity levels. Through the Blynk app, users can conveniently control the lamp's brightness, adding flexibility and ease of use. By integrating renewable energy, smart sensors, and IoT technology, this innovative product promotes sustainable and energy-efficient living. It is suitable for both indoor and outdoor applications, such as homes, remote locations, or outdoor gatherings, reducing reliance on traditional power sources and lowering energy costs. The Integrated Solar Powered Fan and Lightning System is a perfect blend of modern technology and environmental responsibility, offering comfort and convenience while supporting a greener lifestyle.

2. Project schematic diagram, block diagram, system flowchart and Blynk interface.

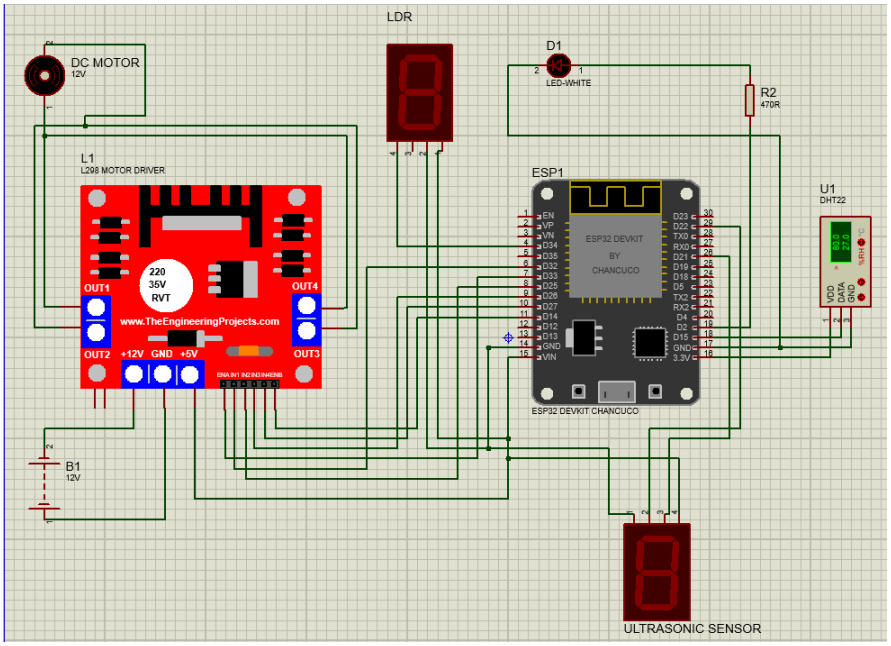

Figure 1. Schematic Diagram.

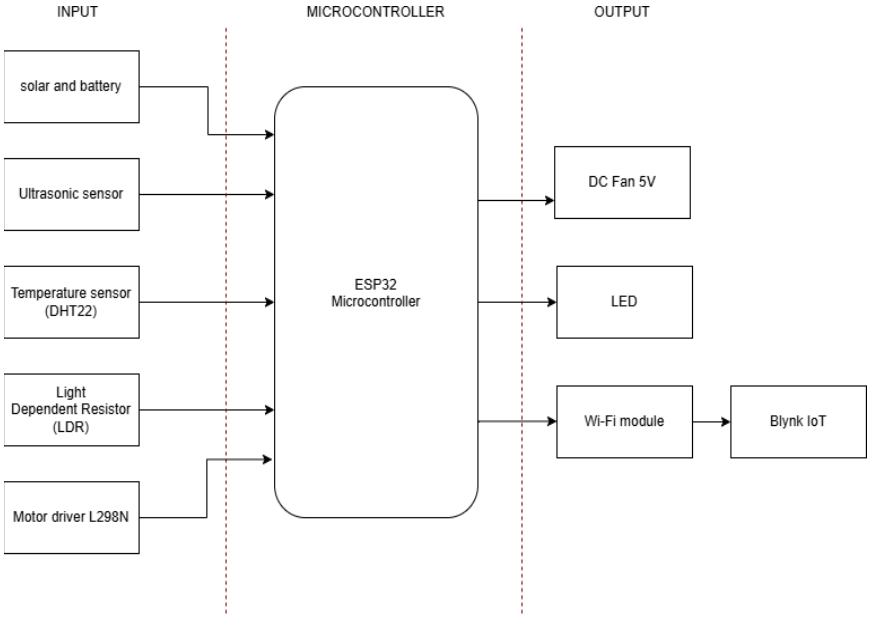

Figure 2. Block Diagram.

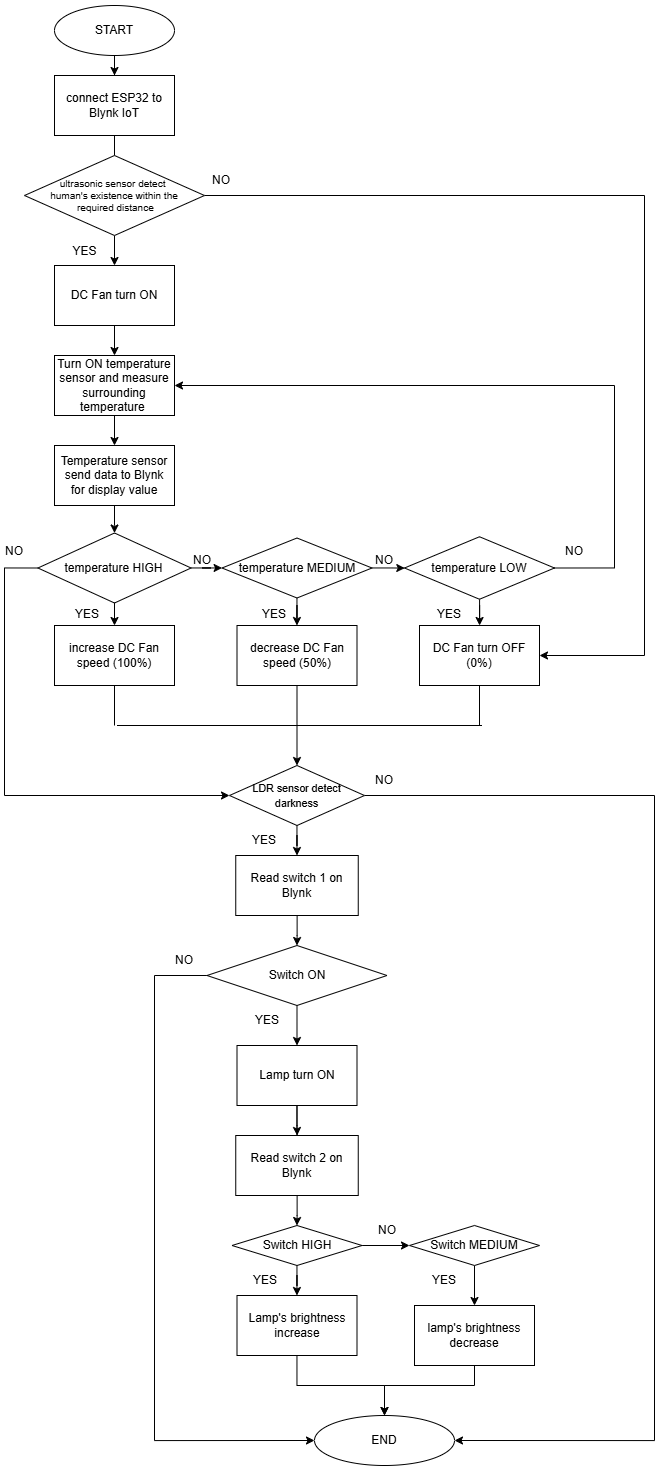

Figure 3. System flowchart.

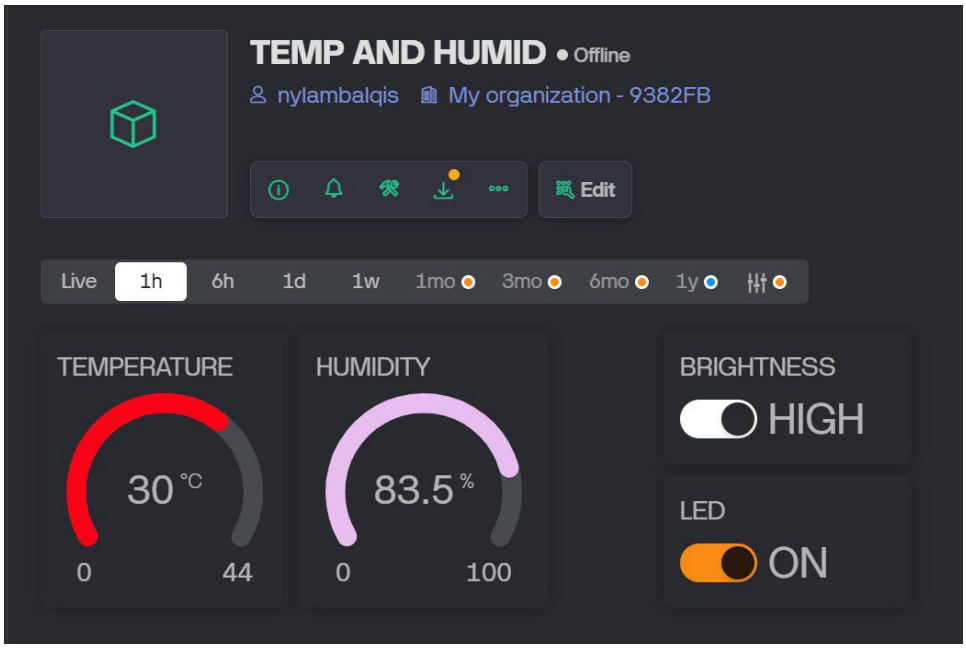

Figure 4. Blynk Interface.

Figure 1 shows the circuit diagram, illustrating the connections between key components such as the ESP32 microcontroller, motor driver, LDR, ultrasonic sensor, DHT22 temperature sensor, and LED lamp. **Figure 2** displays the system block diagram, which highlights the interaction between the input sensors, microcontroller, and output devices. **Figure 3** presents the system flowchart, detailing the operational process, from detecting human presence to adjusting fan speed and lamp brightness. **Figure 4** shows the Blynk app interface, providing real-time data and remote control for optimal system performance.

3. Novelty and uniqueness

Integrated Solar Powered Fan and Lightning System stands out for its seamless integration of solar energy, smart sensors, and IoT technology in one compact device. Unlike conventional solar-powered products, it combines automation and real-time monitoring for enhanced functionality. The inclusion of ultrasonic sensors to detect human presence and activate the fan, paired with a temperature sensor that dynamically adjusts fan speed, ensures personalized comfort and energy efficiency. The device's LDR system goes beyond basic lighting control by automatically adapting to ambient light conditions, preserving battery life without manual intervention. Additionally, its ESP32-powered IoT connectivity not only allows users to monitor environmental data but also customize settings remotely, setting a new standard for convenience and sustainability. These features make it a pioneering solution for eco-friendly living, tailored to modern needs.

4. Benefit to mankind

Integrated Solar Powered Fan and Lightning System provides significant benefits to mankind by addressing energy challenges in areas with unreliable power supplies. Its reliance on solar energy reduces dependence on non-renewable resources, promoting sustainable living. The device enhances convenience and comfort with features like automatic lighting, fan activation based on human presence, and temperature-responsive fan speed, improving the quality of life for users. By integrating IoT technology, it allows real-time monitoring and remote control, enabling smart energy management. This eco-friendly solution not only reduces energy waste but also supports environmental conservation, making it a valuable innovation for a sustainable future.

5. Innovation and Entrepreneurial Impact

Integrated Solar Powered Fan and Lightning System promotes innovation by combining renewable energy, smart sensors, and IoT technologies to address power supply challenges. Its eco-friendly design ensures uninterrupted operation using solar energy, offering practical solutions for areas with unstable electricity. By integrating smart functionalities such as a Light Dependent Resistor (LDR), ultrasonic sensors, and a DHT22 temperature sensor, the device automates fan and lamp operations for optimal energy efficiency. Real-time monitoring and control via the ESP32 module and Blynk app enhance user convenience. This project fosters a culture of entrepreneurship by demonstrating how innovative, sustainable technology can improve daily life while addressing energy and environmental concerns. It encourages the development of smart, energy-efficient solutions within the community, institution, and industry, paving the way for new opportunities in the renewable energy and IoT markets. The project inspires entrepreneurial ventures focused on sustainable and intelligent living technologies.

6. Potential commercialization

Integrated Solar Powered Fan and Lightning System holds strong commercial appeal in today's market, where sustainable energy solutions and cost-effective products are in high demand. By relying on solar power, the device reduces reliance on conventional electricity, making it attractive to consumers in areas with unstable power or those seeking greener living options. Its advanced features—such as automatic fan activation, temperature-responsive speed control, and IoT connectivity—add further value and convenience, positioning it as a premium offering. With the global push for eco-friendly technologies, this integrated solution for ventilation and lighting is well-poised to capture a broad audience, from individual homeowners to businesses and institutions looking to reduce energy costs and environmental impact.

7. Acknowledgment

The authors would like to express their heartfelt gratitude to the Electrical Engineering Studies, College of Engineering, Universiti Teknologi MARA, Johor Branch, Pasir Gudang Campus, Masai, Malaysia, for their invaluable support and guidance throughout this project.

Their assistance and resources have greatly contributed to the successful completion of this work.

8. Authors' Biography

Nur Nylam Balqis Mohd Nafis is a Diploma in Electrical Engineering (Electronic) student at Universiti Teknologi MARA, Johor Branch, Pasir Gudang Campus. She is passionate about IoT projects and solar energy, focusing on innovative and sustainable solutions. Nylam enjoys exploring new technologies and refining her technical skills. She aspires to become a skilled electrical engineer, contributing to advancements in smart systems and renewable energy.

Mastura Omar is a senior lecturer at the Electrical Engineering Studies, College of Engineering, Universiti Teknologi MARA, Johor Branch, Pasir Gudang Campus, Masai, Malaysia. With extensive experience in teaching and research, she specializes in electrical and electronic engineering, focusing on innovative solutions and practical applications in the field. Dedicated to nurturing future engineers, Mastura is passionate about guiding students in their academic and professional growth. Her research interests include automation, Internet of Things (IoT), and artificial intelligence.

Muhammad Mursyid Akma Muhd Farid is currently pursuing a Diploma in Electrical Engineering (Electronic) at Universiti Teknologi MARA, Johor Branch, Pasir Gudang Campus. With a strong passion for IoT and coding, he enjoys exploring how smart technologies can be applied to solve real-world problems. Aspiring to become a skilled and forward-thinking electrical engineer, he aims to contribute to advancements in the fields of electronics and automation, making a positive impact on industry and society.