



E-PROCEEDINGS

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

"Fostering a Culture of Innovation and Entrepreneurial Excellence"



e ISBN 978-967-0033-34-1



23 January 2025
PTDI, UiTM Cawangan Johor
Kampus Pasir Gudang

ORGANIZED BY:

Electrical Engineering Studies, College of Engineering
Universiti Teknologi MARA (UiTM) Cawangan Johor
Kampus Pasir Gudang
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e ISBN: 978-967-0033-34-1

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Published in Malaysia by
Universiti Teknologi MARA (UiTM) Cawangan Johor
Kampus Pasir Gudang, 81750 Masai



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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.

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B-ST087: DETECTION AND MONITORING SYSTEM MATERIAL RACK LOCATION IN WAREHOUSE USING INTERNET OF THINGS

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ABSTRACT

The Internet of Things (IoT) is now a technology that is changing the way we live and work in an increasingly digital era. The IoT is a way to connect and communicate with real-world objects. In the modern era, IoT entered a modern era called Industry 4.0. PT. Doellken Bintan manually checked the material shelves one by one until they found the material they were looking for. Materials used at PT. Doellken Bintan are available in various types, the spacious warehouse structure and multi-story material racking model makes it less efficient. In this design, the system is connected to the internet and users can access this system by smartphone. This equipment uses the Esp8266 MCU node to read commands from a smartphone, then sends data bytes to the Arduino Mega 2560 to turn on the LED light as an indicator of the position of the shelf being searched. The final results show that this project can work well where the user can change the amount of material stock on the smartphone application according to the actual amount on the material shelf in the warehouse and can detect the location of the material on the shelf from the user's smartphone with a time delay which is influenced by speed of internet network.

Keywords: Internet of Things, ESP8266, Material rack, LED indicator.

1. Product Description

In industry sector, materials play an important role in the production process. Ingredients can be the main ingredients used to make a product or raw materials. Materials are used to make finished goods that are ready for consumer use in the manufacturing sector. Generally, these materials are stored neatly in the warehouse so they can be brought directly to the location if needed. In the equipment, several components are used, namely : 5V 5A DC power supply, NodeMCU ESP8266, Arduino Mega 2560, Arduino Mega I/O Expansion Sensor Shield, IC Regulator 7805, and LED. The user's smartphone and ESP8266 are connected to the internet network so that devices with an Android application interface can communicate with each other. When controlling the modular application on an Android smartphone, namely by pressing the search shelf button on one of the material items, a NodeMCU ESP8266 will send bytes of data to the Arduino, therefore the Arduino will provide a voltage output of 2.6 VDC to turn on the LED. The LED on the shelves correspond to the material items searched for in the user's smartphone codular application. To interface the android application using Kodular and to detect material location from the Kodular application.

2. Block Diagram and Schematic Diagram

The block diagram at figure 1 consist of mobile device, firebase database, NodeMCU ESP8266, Arduino Mega 2560 and LED for indicator.

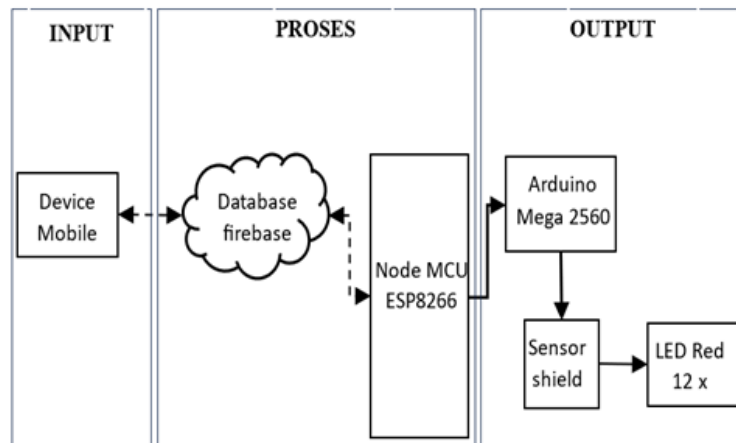


Figure 1. Block diagram system

The schematic diagram at figure 2 at below have power supply 5V DC to support all system.

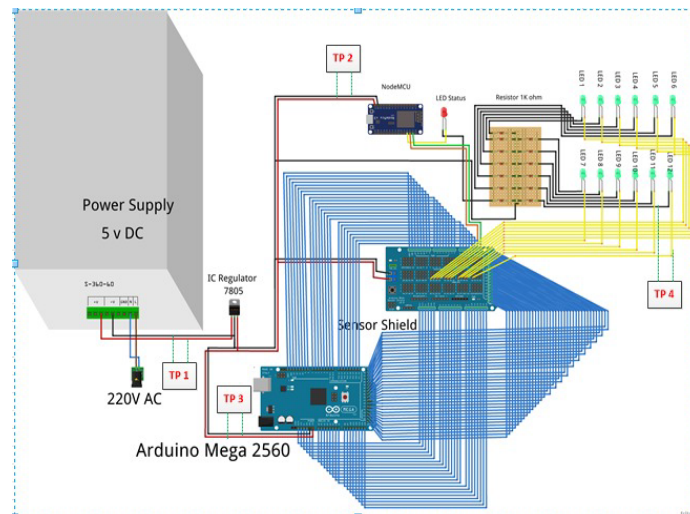


Figure 2. Schematic diagram

3. Novelty and uniqueness

The system utilizes IoT-enabled sensors and devices to provide real-time tracking of material rack locations within the warehouse, ensuring accurate and up-to-date location data. By combining IoT technologies with advanced data analytics, the system not only tracks rack locations but also analyzes trends in material movement, optimizing inventory management. The use of cloud technology allows for centralized data storage and access, enabling seamless synchronization and monitoring across multiple devices and locations. Designed with intuitive dashboards and user interfaces, the system ensures ease of use for warehouse staff, minimizing training requirements. Unique to this system is its ability to

send instant alerts to warehouse managers in case of misplaced racks, unauthorized access, or deviations from predefined parameter.

4. Benefit to mankind

By automating the detection and monitoring of material rack locations, the system significantly reduces manual labor, streamlines warehouse operations, and improves overall productivity. The real-time tracking capabilities eliminate the need for time-consuming searches for misplaced materials, allowing workers to focus on more critical tasks and increasing workflow efficiency. Workers and warehouse managers benefit from learning to operate and manage advanced IoT technologies, leading to skill enhancement and fostering a tech-savvy workforce. So overall offers transformative benefits, contributing to improved safety, efficiency, and sustainability in industries while positively impacting human lives globally.

5. Innovation and Entrepreneurial Impact

The integration of IoT technology brings a groundbreaking shift in how warehouses operate, automating the detection and monitoring of material racks, thus eliminating inefficiencies associated with manual tracking. By seamlessly integrating with Warehouse Management Systems (WMS) and Enterprise Resource Planning (ERP) systems, the innovation fosters an interconnected operational environment. Companies adopting this system can significantly lower operational costs by reducing labor, inventory errors, and material mismanagement, making the technology highly attractive to potential clients. By leveraging IoT technology, the system serves as a platform for further innovation in supply chain management, smart logistics, and automated industrial operations, fostering an ongoing cycle of entrepreneurial opportunities. It can be transformative innovation with the potential to revolutionize warehouse management while driving entrepreneurial ventures, fostering efficiency, and supporting sustainable growth across industries.

6. Potential commercialization

Enhance warehouse operations for logistics providers by improving inventory management and tracking. Aid manufacturers in organizing and monitoring raw materials and finished goods in production facilities. Promoting the system as a sustainability-driven innovation by reducing waste, optimizing space utilization, and minimizing energy consumption appeals to environmentally conscious businesses and aligns with corporate social responsibility (CSR) goals. The system can complement other smart logistics solutions, such as autonomous robots and drone delivery systems, enhancing its relevance in advanced supply chain ecosystems. Collaborations with major logistics providers or third-party warehousing firms can drive widespread adoption by leveraging existing networks and customer bases.

7. Acknowledgment

We would like to extend our heartfelt gratitude to all those who contributed to the successful development of the Detection and Monitoring System for Material Rack Location in Warehouse Using Internet of Things (IoT). First and foremost, we thank to Faculty of Engineering, Universitas Riau Kepulauan for their unwavering support, guidance, and resources that made this project possible. Your infrastructure and expertise have been pivotal in every phase of this endeavor. Special thanks

go to the dedicated team members, for their collaboration, creativity, and hard work. Your technical expertise and problem-solving abilities were crucial to overcoming challenges and achieving the project goals. We would also like to thank PT. Doellken Bintan for their financial support, which allowed us to acquire the necessary tools and resources to bring this idea to fruition. Our appreciation also goes to industry partners and stakeholders for sharing their insights and real-world requirements, ensuring the system aligns with practical needs and market expectations. This project represents a collective effort, and we are profoundly grateful to everyone involved for their contributions and commitment.

8. Authors' Biography



Dedy Hamonangan is an undergraduate student in the Department of Electrical Engineering at Universitas Riau Kepulauan, currently in 3rd semester of study. His academic interest center around renewable energy and IoT. During his studies, he has actively participated in research project related to IoT and Renewable energy.



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