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
Universiti Teknologi MARA (UiTM) Cawangan Johor
Kampus Pasir Gudang
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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.

B-ST010 - B-ST152

B-ST081: DESIGN OF MOBILE ROBOT FOR GAS AND TEMPERATURE DETECTION INSIDE TANKS BASED ON INTERNET OF THINGS

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ABSTRACT

Monitoring gas level and temperature in the fuel storage tank area uses DHT-11 and MQ-07 sensors. This sensor will send the readings obtained to the system, so that supervisors can find out each gas PPM level due to unknown leaks without having to witness the location of the tank. Normal PPM is 0-15 PPM and if it exceeds it, it needs to be checked directly. For certainly in checking, the test can be carried out 5 times at varying distances or around the steam. Continuous control of the distance of the object monitored by the sensor greatly influences the quality of the readings. The data transmissions medium used in this system is webapps, using a internet network connected to the control system. The ESP32 cam camera will capture video and transmit it to a web server, as well as gas and temperature sensors.

Keywords: Internet of Things, Montoring gas level, Gas PPM level, Temperature, Mobile robot.

1. Product Description

The mobile robot is for gas and temperature detector a cutting-edge solution designed to automate the monitoring and inspection of tank environments, ensuring safety, efficiency, and reliability in hazardous industrial settings. The Mobile robot is made using the ESP-32 microcontroller to function as IoT control in this module, the ESP32 Cam microcontroller as a surveillance camera, DHT-11 as a temperature sensor, MQ-07 as a gas sensor, OLED as a monitor built into the robot body and driver. The LN298 driver motor function as motion control for robot wheels. The ESP32 Cam here functions as a surveillance camera, so that every view at the location can be displayed on the surveillance monitor. The ESP-32 microcontroller is connected to internet by Wi-Fi module. Mobile robot can still run as long as there is an internet network around it. A temperature parameters in the surrounding environment will be measured, gas levels at the monitored location and the results will be used as a comparison against the permitted temperature and gas tolerance limits, and to the desired area and can move in all directions. The ESP32 cam camera will capture video and transmit it to a web server, as well as gas and temperature sensors.

2. Block Diagram, Schematic Diagram and Mobile Robot

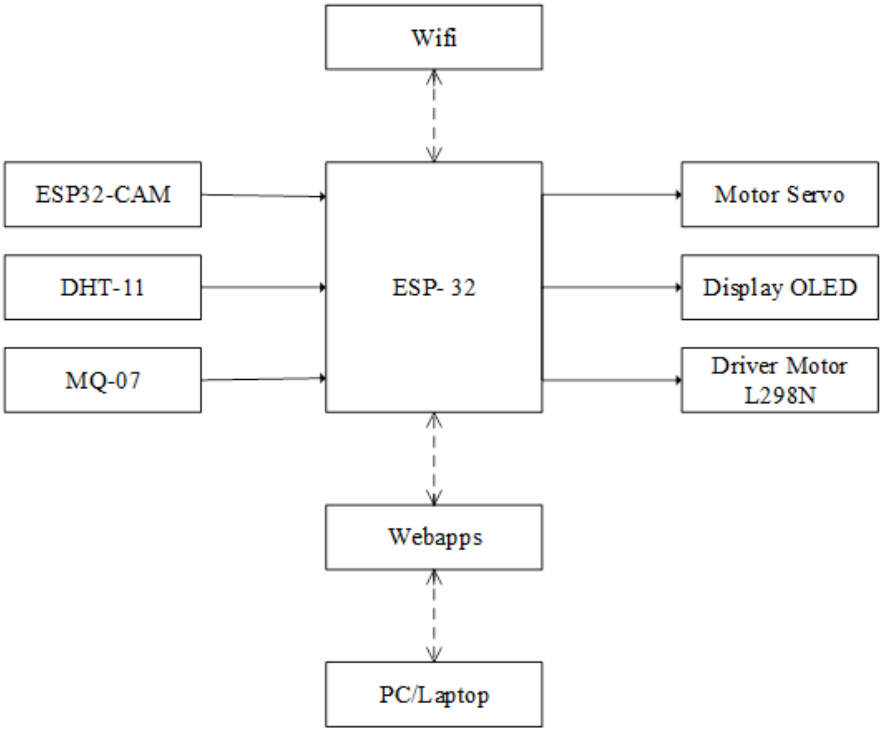

Figure 1. Block Diagram mobile robot detector

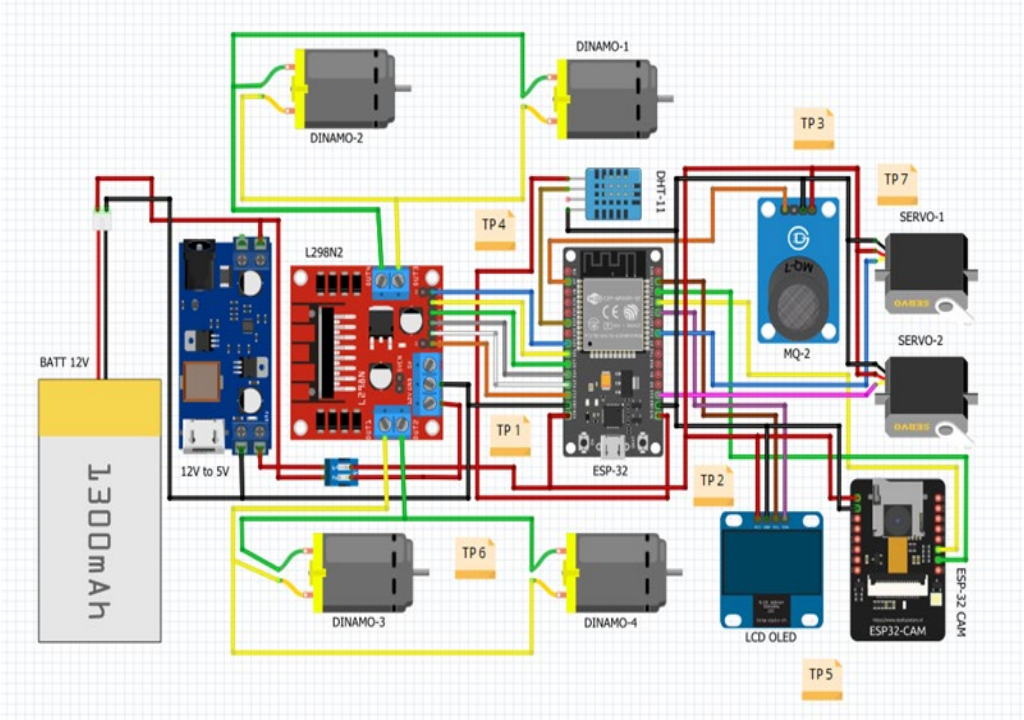

Figure 2. Schematic diagram

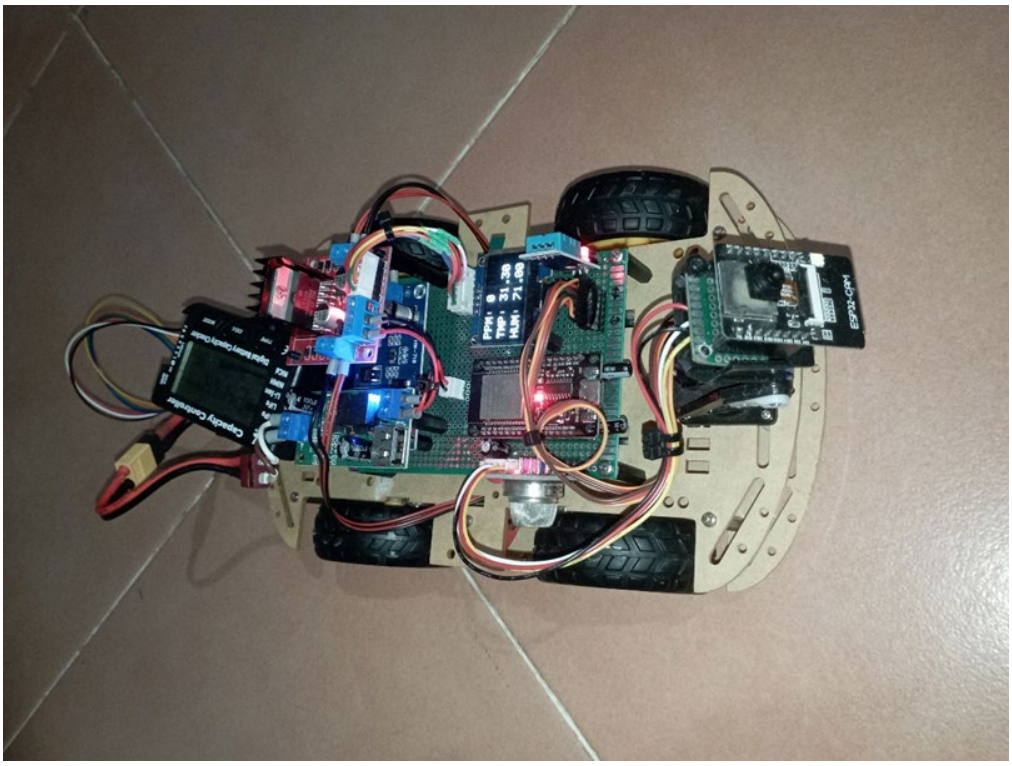

Figure 3. Mobile robot

3. Novelty and uniqueness

The mobile robot can be monitored using a PC/Tab connected to a web server (application control), then the control data is sent to the PC/Tab via serial communication and can be controlled remotely as long as there is an internet signal in the area. The mobile robot is uniquely designed to navigate and operate efficiently in confined and hazardous tank environments. The robot is equipped with advanced sensors and wireless communication technology, enabling real-time data collection and remote monitoring. Therefore, each result is immediately read according to the actual results in the field. This is a reference used to ensure readability on webapps.

4. Benefit to mankind

The mobile robot eliminates the need for humans to enter hazardous environments, protecting them from toxic gases, high temperatures, or explosive atmospheres, thus reducing the risk of injuries or fatalities. Therefore, performs inspections faster than manual methods, enabling quicker detection of issues and reducing the time spent on maintenance tasks. The mobile robot also can operate continuously without breaks, ensuring uninterrupted monitoring of critical conditions. In a hazardous conditions by the mobile robot helps prevent environmental contamination, indirectly safeguarding human communities and natural ecosystems.

5. Innovation and Entrepreneurial Impact

The mobile robot combines state-of-the-art technologies such as advanced gas sensors, temperature monitors, autonomous navigation, and wireless communication. This innovation represents a leap forward in industrial inspection tools. uniting multiple functionalities gas detection, temperature monitoring, and data reporting into one device, the robot simplifies processes and eliminates the need for multiple separate. The mobile robot addresses critical needs in industries such as oil and gas, chemical processing, and environmental monitoring, creating substantial market demand and opening new business opportunities. Entrepreneurs also adopting this technology can reduce operational costs associated with manual inspections, worker safety measures, and accident recovery, making their businesses more competitive. This product encourages collaboration between researchers, engineers, and businesses, fostering a culture of innovation and entrepreneurship in the industrial sector.

6. Potential commercialization

The mobile robot can be marketed as a key tool for industries like oil and gas, chemical processing, and manufacturing to ensure safety and compliance during tank inspections. It addresses critical needs for hazardous environment monitoring. The robot's modular design makes it suitable for different industrial sectors. Customizing its sensors and features for specific gases, temperatures, or tank conditions expands its potential customer base. The robot can be marketed for use in detecting leaks and monitoring environmental hazards, aligning with global trends toward sustainability and green technologies. By addressing critical industrial needs and aligning with emerging trends like automation and sustainability, the mobile robot has significant potential for widespread commercialization and adoption across various sectors.

7. Acknowledgment

We would like to express our sincere gratitude to all individuals and organizations that have contributed to the development and successful realization of the mobile robot for gas and temperature detection inside tanks. First and foremost, we would like to thank Faculty of Engineering, Universitas Riau Kepulauan for providing the resources, expertise, and infrastructure necessary for the completion of this project. Their ongoing support has been invaluable throughout every stage. Our sincere thanks go to the development and engineering teams, particularly the team, for their dedication, hard work, and collaboration in bringing the robot to life. Their expertise and perseverance were fundamental to overcoming technical challenges and ensuring the success of this project. This project is the result of collective effort, and we are immensely grateful to everyone involved for their contributions. Without their help and dedication, this achievement would not have been possible.

8. Authors' Biography

Toni Kusuma W, M.SI is a Senior Lecturer and Researcher at the Universitas Riau Kepulauan, specializing in Electronic and Renewable Energy. With over 17 years of experience, he has design and built for IoT system. He has published several papers in renowned journals on topics such as IoT and Robotic. In addition to his academics contribution, she has collaborated with both industry and goverment organizations on projects aimed the use of technology Robotic.

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