UNIVERSITI TEKNOLOGI MARA

NATURAL DISASTER MITIGATION SYSTEM WITH AN IOT BASED TTGO T-CALL V1.3 ESP32 WIRELESS MODULE MICROCONTROLLER

MUHAMMAD FAREEZ ASYRAF ISTAS
FAHRURRAZI

Thesis submitted in fulfillment
of the requirements for the degree of
Diploma of Electrical Engineering

Centre for Electrical Engineering Studies
College of Engineering

FEB 2024

ABSTRACT

The Natural Disaster Mitigation System project employs the TTGO T-CALL V1.3 ESP32 WIRELESS MODULE MICROCONTROLLER to develop an advanced monitoring system addressing deficiencies in Malaysia's current disaster monitoring infrastructure. Real-time environmental data is collected and transmitted to an HTTP server for analysis through the integration of sensors like accelerometers and ultrasonic devices The project utilizes the ESP32-WROVER-B microcontroller and incorporates the LAMP (Linux, Apache, MySQL, PHP) stack for comprehensive monitoring and response capabilities. The prototype system involves input and output components, including sensors, LEDs, buzzers, and an LCD display, with software specifications using Arduino IDE. The methodology entails gathering sensor data, evaluating it with a decision-making algorithm, triggering alarms, activating output devices, and transmitting data to the server via HTTP protocols. The expected outcomes include continuous monitoring, accurate anomaly detection, and timely alerts based on predefined thresholds, all facilitated by the robust data management capabilities of the LAMP stack.

Keywords: TTGO T-CALL V1.3, Real-time, ESP32-WROVER-B, HTTP protocols, LAMP,

ACKNOWLEDGEMENT

In the name of Allah, the Most Gracious, the Most Merciful, I express my profound gratitude for the blessings that have enabled me to successfully complete my Final Year Project (FYP) report. I am immensely thankful to Allah SWT for His guidance.

I begin by extending heartfelt appreciation to my supervisor, Madam Fazlinashatul Suhaidah Zahid, for her unwavering support, valuable ideas, motivation, and guidance throughout the entirety of this project. Also, I take this opportunity to acknowledge and express my gratitude to all those who played a role, whether directly or indirectly, in the realization of this project. My deepest thanks go to my parents and other family members for their love, concern, and support during my academic journey in the Faculty of Electrical Engineering.

I also want to recognize the faculty members and esteemed lecturers whose direction, care, and support were indispensable to the successful completion of this significant endeavor. Last but not least, I extend a heartfelt thank you to myself for the dedication, hard work, and perseverance invested in this project. I appreciate the relentless effort and commitment that went into creating this masterpiece, and I am grateful for the journey as a whole.

TABLE OF CONTENT

CHAPTER ONE
INTRODUCTION

1.1 Project Overview

Malaysia, situated in Southeast Asia, faces unique challenges associated with its geographical proximity to seismic regions, notably neighboring Indonesia within the volatile "Ring of Fire" [1]. Although Malaysia doesn't contend with active volcanoes, it is not immune to the risks posed by natural disasters such as landslides and floods. Recent minor earthquakes in certain regions underscore the necessity for proactive planning to mitigate potential future calamities. Malaysia must prioritize investment in robust disaster preparedness and response systems to safeguard its people, infrastructure, and economy. Additionally, implementing strategies to diminish the likelihood of damage from landslides and floods is imperative.

Given the limitations of Malaysia's existing natural disaster monitoring systems, a compelling need exists to develop a more advanced and comprehensive solution. The proposed Natural Disaster Mitigation System responds directly to Malaysia's vulnerability to natural disasters, especially considering its proximity to seismic zones like Indonesia. This innovative system integrates the LAMP stack—Linux, Apache, MySQL, and PHP—with the TTGO T-Call V1.3 ESP32 IoT-enabled microcontroller, offering a multifaceted approach to address the intricacies of disaster management.

The LAMP stack forms the backbone of the proposed system. Linux provides a secure operating environment, ensuring the integrity of the overall system. Apache contributes robust web server functionality, facilitating seamless communication between the system and end-users. MySQL offers structured and efficient data management, crucial for handling vast amounts of information associated with natural disaster monitoring. PHP, with its dynamic web page generation capabilities, enhances user interfaces and overall system responsiveness[2].

In addition, complementing the software infrastructure, the TTGO T-Call V1.3 ESP32 microcontroller is pivotal in enhancing hardware capabilities. Functioning as the technological