UNIVERSITI TEKNOLOGI MARA

JOHOR INTERNATIONAL INNOVATION, INVENTION COMPETITION AND SYMPOSIUM 2024

PROCEEDINGS OF JOHOR INTERNATIONAL INNOVATION INVENTION COMPETITION AND SYMPOSIUM 2024 (JIIICaS 2024)

"Flourish and Nurturing Sustainable Innovation for a Prosperous Nation"

JOHOR INTERNATIONAL INNOVATION, INVENTION COMPETITION AND SYMPOSIUM

Editorial Board

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Preface

In the name of Allah, the Almighty who gives us the enlightenment, the truth, the knowledge and with regards to Prophet Muhammad (peace be upon him) for guiding us to the straight path. We thank to Allah for giving us guidance and strength to write this e-book.

This e-book compiles the extended abstracts that submitted to Johor International Innovation Invention Competition and Symposium 2024 (JIIICaS2024), where JIIICaS2024 is a virtual platform for all creative minds to share and present their invention and innovation. Each abstract gives a brief background on the innovation or project.

We hope that this e-book will help the readers to get to know the innovation done by the students and get some ideas to develop future innovation products.

Foreword Rector

Assalamualaikum warahmatullahi Wabarakatuh, Salam Sejahtera, Salam Malaysia MADANI and Salam UiTM Dihatiku.

In the name of Allah, the Most Gracious, the Most Merciful.

It is a great honor to welcome you to the Johor International Innovation, Invention, Competition, and Symposium 2024 (JIIICaS 2024). This event connects various disciplines, focusing on education and engaging educators, students, researchers, and innovators from all walks of life.

Innovation is not just about ideas; it demands perseverance, creativity, and determination to turn those ideas into reality. The remarkable projects showcased today highlight the dedication and spirit of all participants. Initiatives like this not only explore new technologies but also cultivate skills and leadership among our youth. At Universiti Teknologi MARA (UiTM) Johor Branch, we are fully committed to fostering a dynamic culture of innovation, promoting the commercialization of new products, and encouraging meaningful collaborations with industry and society.

As we celebrate this event, I would like to extend my heartfelt gratitude to all sponsors, judges, the College of Computing, Informatics and Mathematics, UiTM Pasir Gudang Campus as the event organizer, as well as to the researchers and participants for their hard work in making this event a success. Let us continue striving for innovation and excellence. May the ideas presented today inspire us and lay the groundwork for future achievements.

Thank you.

Associate Professor Dr. Saunah Zainon
Rector
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(A-ST008) SMART MAILBOX NOTIFICATION SYSTEM

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ABSTRACT

Even in this day of technology, the postman still delivers mail, packages, and messengers to our homes. Due to certain factors, such as courier services, packages cannot be sent via email or by any other electronic means. In place of the more conventional method of checking their mailbox, many find it convenient to be aware of the messages the user receives. Customers are searching for a better option that will keep them alert every time a mail delivery arrives because official letters are growing in popularity as a corresponding tool worldwide. Modern electrical technology is incorporated into these conventional mailboxes as a better solution. The Smart Mailbox Notification System integrates advanced technology to provide users with real-time alerts upon the arrival of new mail. The system operates through an IR sensor as the input, detecting infrared radiation emitted by mail within the mailbox. Upon detection, the Arduino UNO R3 microcontroller processes the data and triggers three outputs: an LED indicator, a buzzer for audible alerts, and a GSM module for mobile notifications. The system's functionality is orchestrated by Arduino's program, using the Arduino IDE. Communication between the Arduino and GSM module is facilitated through AT command codes, ensuring efficient SMS alerts to the user's mobile phone. The result is an immediate "Mail Detected!" notification from the GSM module when the IR sensor detects the mail. This system provides information on an automated notification system that is effective and efficient, incorporating cutting-edge technology to improve user comfort and communication effectiveness.

Keywords: Smart Mailbox, Arduino, Notification System, GSM module

1.0 INTRODUCTION

In a world where convenience and security intersect, the Smart Mailbox Notification System offers a reliable solution for managing mail deliveries. This innovative system alerts users as soon as mail arrives, providing real-time notifications and peace of mind. By incorporating sensors and alerts, it minimizes the risk of missed deliveries and unauthorized access to mailboxes.

Mailbox notification systems have become essential tools for enhancing mail delivery services' ease and security. These systems typically include a sensor to detect mail delivery, an alert mechanism to notify recipients, and a power source, usually a battery. They deter theft by promptly alerting households to mail deliveries and ensure timely retrieval of time-sensitive packages and documents. This is especially beneficial for those in rural areas or with distant mailboxes, as well as for communal housing complexes and businesses with outdoor mailboxes.

The primary goal of installing a mailbox notification system is to improve mail delivery's convenience and security. This project aims to notify individuals immediately when mail is placed in their mailbox, reducing the need for frequent checks. The system also allows users to monitor their mailbox status remotely, preventing missed obligations like utility bills. As technology advances, integrating mailbox notification systems with smart home technologies will provide even greater functionality and control for businesses and households.

2.0 OBJECTIVE

The objectives of the Smart Mailbox Notification System are:

i. To detect the presence of mail using an infrared (IR) sensor.
ii. To inform the user of the arrival of mail by sending a notification message to their phone via a GSM module.
iii. To notify those inside the house of the mail in the mailbox using a buzzer.

3.0 METHODOLOGY

This chapter delves into a comprehensive exploration of the methodology adopted for this project, with a primary emphasis on elucidating the hardware and software utilized to enhance user convenience within the system.

Figure 3.1 illustrates the utilization of the Arduino UNO R3 in this project, highlighting the use of the 5V Output, Ground, and Digital pins 4, 5, 6, and 7. The GSM module, equipped with a SIM card, sends SMS alerts when the Arduino detects mail via the IR sensor. The module's Tx and Rx pins connect to Arduino pins 5 and 6, while Vcc and Gnd connect to power and ground. The buzzer, connected to pin 4 and ground, emits a sound to alert users, ideally placed near the front door. The IR sensor, connected to the 5V supply, ground, and pin 7, detects mail and signals the Arduino.

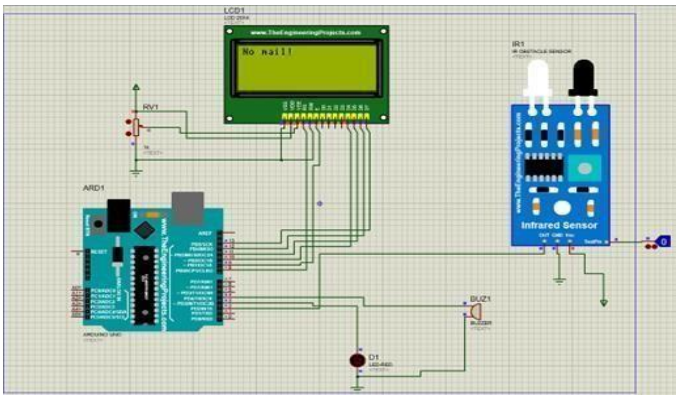

Figure 3.1: Circuit diagram of Smart Mailbox Notification System

Figure 3.2 shows the block diagram of the system, which includes one input and three outputs. The IR sensor detects infrared radiation from mail and sends this signal to the Arduino UNO R3, which processes the data using C++ code written in the Arduino IDE. The Arduino then triggers three outputs: an LED that lights up, a buzzer that

sounds to alert those inside the house, and a GSM module that sends notifications to the homeowner's mobile phone.

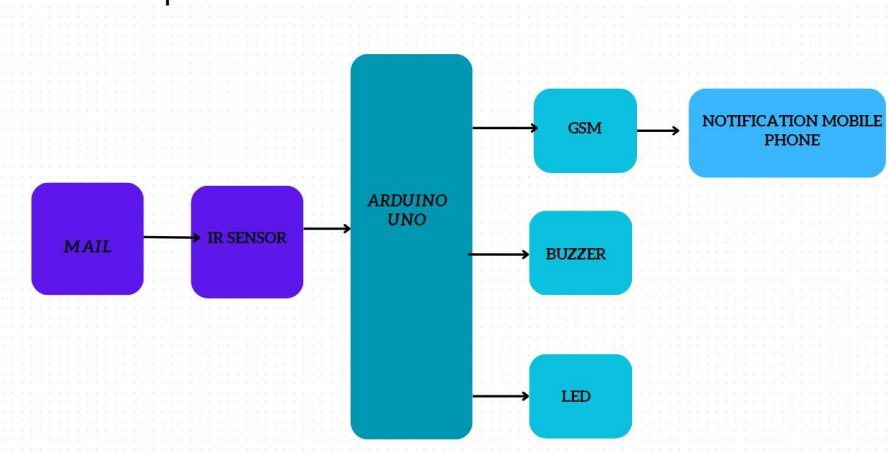

Figure 3.2: Block diagram of Smart Mailbox Notification System

4.0 RESULTS

4.1 Simulation Result

In this system, an infrared (IR) sensor detects the presence of mail and triggers three outputs: an LED, a buzzer, and a GSM module. The IR sensor, with its VCC, GND, and analog pins, signals the Arduino UNO R3 upon mail detection. In the "mail detected" state, the Arduino processes the signal and activates the GSM module to send a notification to the user's phone, illuminates a green LED, and sounds a buzzer. In the "no mail detected" state, none of these outputs are activated. Figures 4.1 and 4.2 illustrate these two scenarios: the system's response when mail is detected and when it is not. In this system, an infrared sensor acts as the input, detecting mail presence. The sensor has three pins: VCC, GND, and analogue. This input triggers three outputs an LED, a buzzer, and a GSM module. The system operates in two states which is mail detected, and no mail detected.

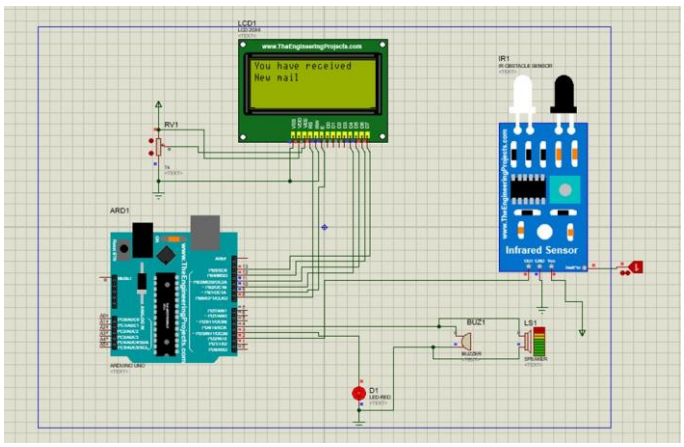

Figure 4.1: Simulation when the mail is detected.

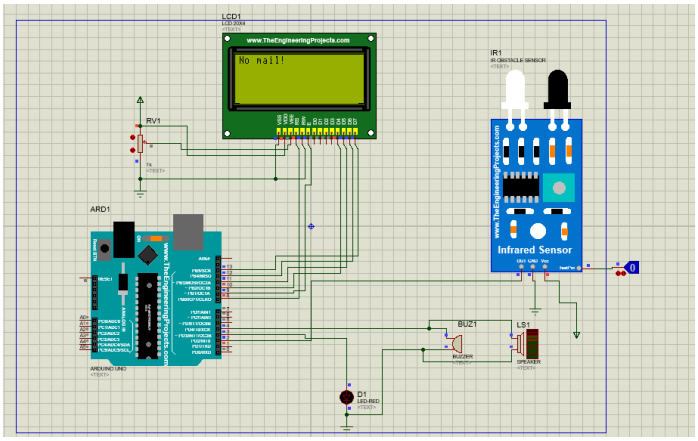

Figure 4.2: Simulation when there is no mail detected.

4.2 Hardware Result

When a letter is inserted, the IR sensor detects it and triggers the system to send a "Mail Detected!" message to the user's phone via the GSM module, as shown in Figure 4.3.

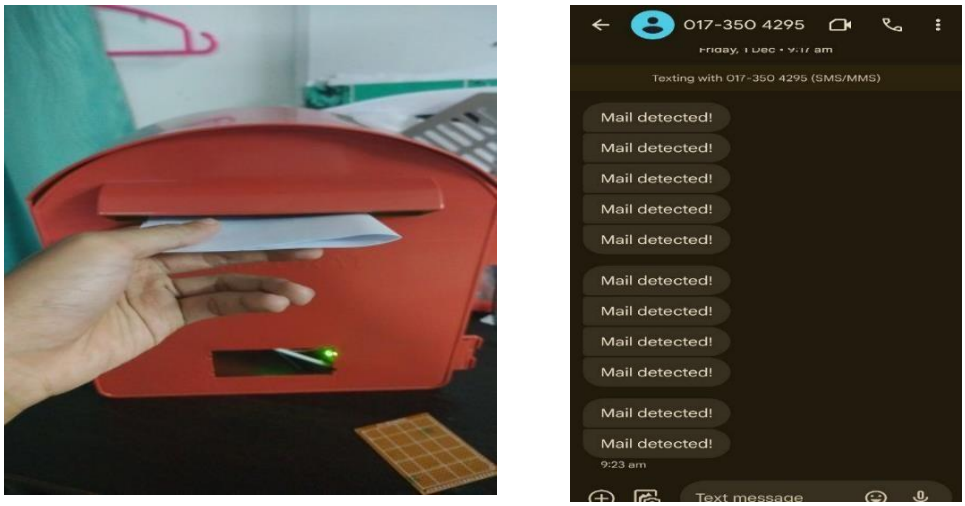

Figure 4.3: Hardware result

Table 1: Data analysis simulation and hardware result

Simulation				Hardware			
IR sensor	LED	Buzzer	LCD Display	IR sensor	LED	Buzzer	Actual Incoming Notification
1	ON	ON	'Mail detected'	ON	ON	ON	Notify
0	OFF	OFF	'No Mail'	OFF	OFF	OFF	Not notify

1	ON	ON	'Mail detected'	ON	ON	ON	Notify
0	OFF	OFF	'No Mail'	OFF	OFF	OFF	Not notify
1	ON	ON	'Mail detected'	ON	ON	ON	Notify
0	OFF	OFF	'No Mail'	OFF	OFF	OFF	Not notify
1	ON	ON	'Mail detected'	ON	ON	ON	Notify
0	OFF	OFF	'No Mail'	OFF	OFF	OFF	Not notify
1	ON	ON	'Mail detected'	ON	ON	ON	Notify
0	OFF	OFF	'No Mail'	OFF	OFF	OFF	Not notify

Table 4.1 Shows further information which contains all the gathered data after doing 5 tested results simulation and hardware data. The objective for this project is sending out the notification to the user when the letter is inserted. In theory of simulation when the mail inserted IR sensor will detect the mail as input, LED and Buzzer will turn ON and the LCD will display "Mail Detected". Next, for the no mail inserted the IR sensor, LED and Buzzer will turn off and LCD will display "No Mail". For the Hardware result, IR sensor will detect the mail when mail inserted, LED and Buzzer will turn ON, GSM Module will send message to the user phone.

5.0 CONCLUSION

In conclusion, the integration of both software and hardware in the Smart Mailbox Notification System successfully meets all the project's objectives. The IR sensor effectively detects incoming mail, triggering alerts through a buzzer and an LED for immediate household notifications, and sending SMS alerts to users' phones for remote updates. This system proves to be a valuable technological solution, especially for residents in high-rise buildings or those with distant mailboxes, by offering enhanced convenience, security, and the ability to monitor mail remotely for prompt responses.