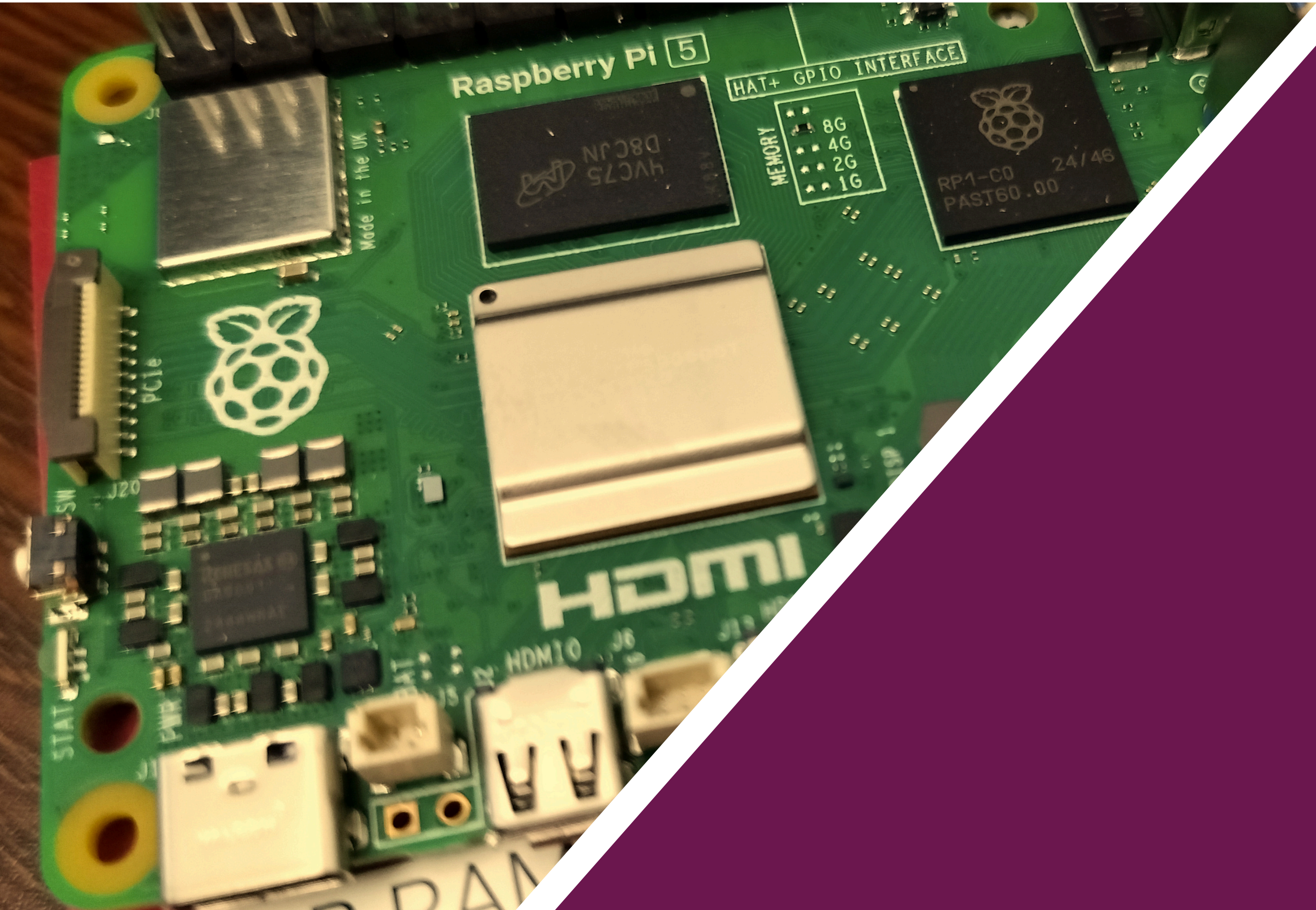




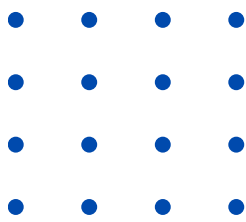
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EESEE 2025

10TH ELECTRICAL ELECTRONICS SYSTEMS
ENGINEERING EXHIBITION 2025
VOLUME 1



FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
JOHOR BRANCH
PASIR GUDANG CAMPUS



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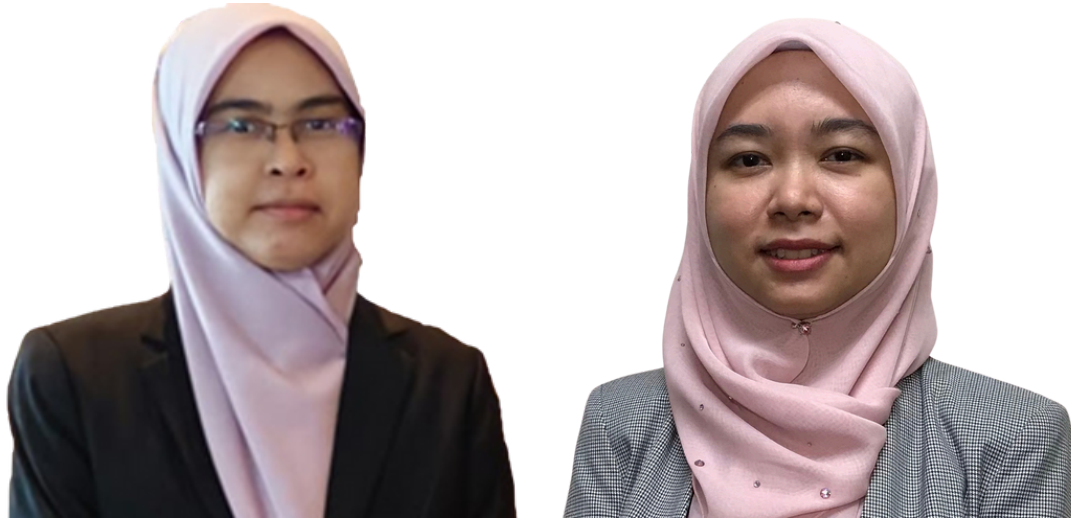
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FOREWORD BY THE PROGRAM CHAIR



Greetings from the Electrical, Electronics, and Systems Engineering Exhibition 2025 (EESEE 2025).

As the Program Chairs, it is our great pleasure to present this compilation of extended abstracts, showcasing the remarkable projects developed by our final-semester students from the Diploma in Electrical Engineering (Power) and Diploma in Electrical Engineering (Electronics) programs at Universiti Teknologi MARA, Cawangan Johor, Pasir Gudang Campus.

This exhibition marks a significant milestone in our students' academic journey, representing the culmination of years of dedication, perseverance, and learning. It also serves as an essential step toward the successful completion of their diploma studies. The projects featured this year are centered on the theme *Engineering Excellence: Bridging Technology and Life*, reflecting current trends and innovations in the engineering field.

This extended abstract book highlights not only the students' technical expertise but also their creativity, problem-solving skills, and ability to engage meaningfully with peers and industry professionals. Within these pages, you will find a diverse range of projects that embody a unique blend of knowledge, innovation, and practical application.

We warmly invite you to explore this collection, which celebrates the achievements of our aspiring engineers. Welcome once again to the Electrical, Electronics, and Systems Engineering Exhibition 2025. May the insights shared here inspire and pave the way for the next generation of innovative engineers.

Warm regards,

Dr. Fatimah Khairiah binti Abd Hamid

Dr. Atiqah Hamizah binti Mohd Nordin

Program Chairs

Electrical, Electronics, and Systems Engineering Exhibition 2025 (EESEE 2025)



RFID Energy Efficiency: Optimizing Office Room Security and Power Consumption

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ABSTRACT

The Smart RFID Security and Energy Management System deals with the design and simulation of an RFID-based office security system for energy efficiency. The system handles the security of access effectively along with conserving energy by making use of components like Arduino Mega, RFID module, servomotor, IR sensors, and LCD display. The RFID module, therefore, controls entry-opening up for valid cards and sounding an alarm on invalid attempts. The availability of motion sensors and the tracking of occupancy enables dynamic energy management as the lights and fans automatically switch off in unoccupied rooms. The proposed system simulated on the Wokwi platform, can exhibit how real-time monitoring and intelligent control improve security while reducing energy costs. This solution links occupancy to energy use for sustainable living with reduced operational expenses with a low carbon footprint but will ensure that all essential services are not disrupted.

KEYWORDS: RFID module, Arduino Mega, Servomotor, IR sensor, LCD Display, energy efficiency

PRODUCT DESCRIPTION

The Smart RFID Security and Energy Management System is a completely new idea that enhances office security and develops energy consumption. This project integrates advanced technologies, including an RFID module, Arduino Mega, servo motor, IR sensors, and LCD display, for smooth access control with energy efficiency. The system allows access only through secure ways using RFID cards to unlock the doors, wherein valid cards allow the servo motor to open the door, and invalid attempts sound a buzzer for added security. It also monitors the occupancy of rooms using a motion sensor and automatically switches off light and fans in case a room is unoccupied, saving energy to a huge extent. It also shows real-time updates of the status of doors and any motion detection on an LCD screen, with a WiFi module for remote monitoring. The system not only reduces electricity costs by tailoring energy usage according to the actual occupancy of rooms but also minimizes the carbon footprint, therefore being sustainable for modern offices. The system is ideal for use in offices, conference rooms, and other areas needing secured access and efficient energy management. It offers a user-friendly experience, enhances security, and supports a greener, cost-effective workplace.

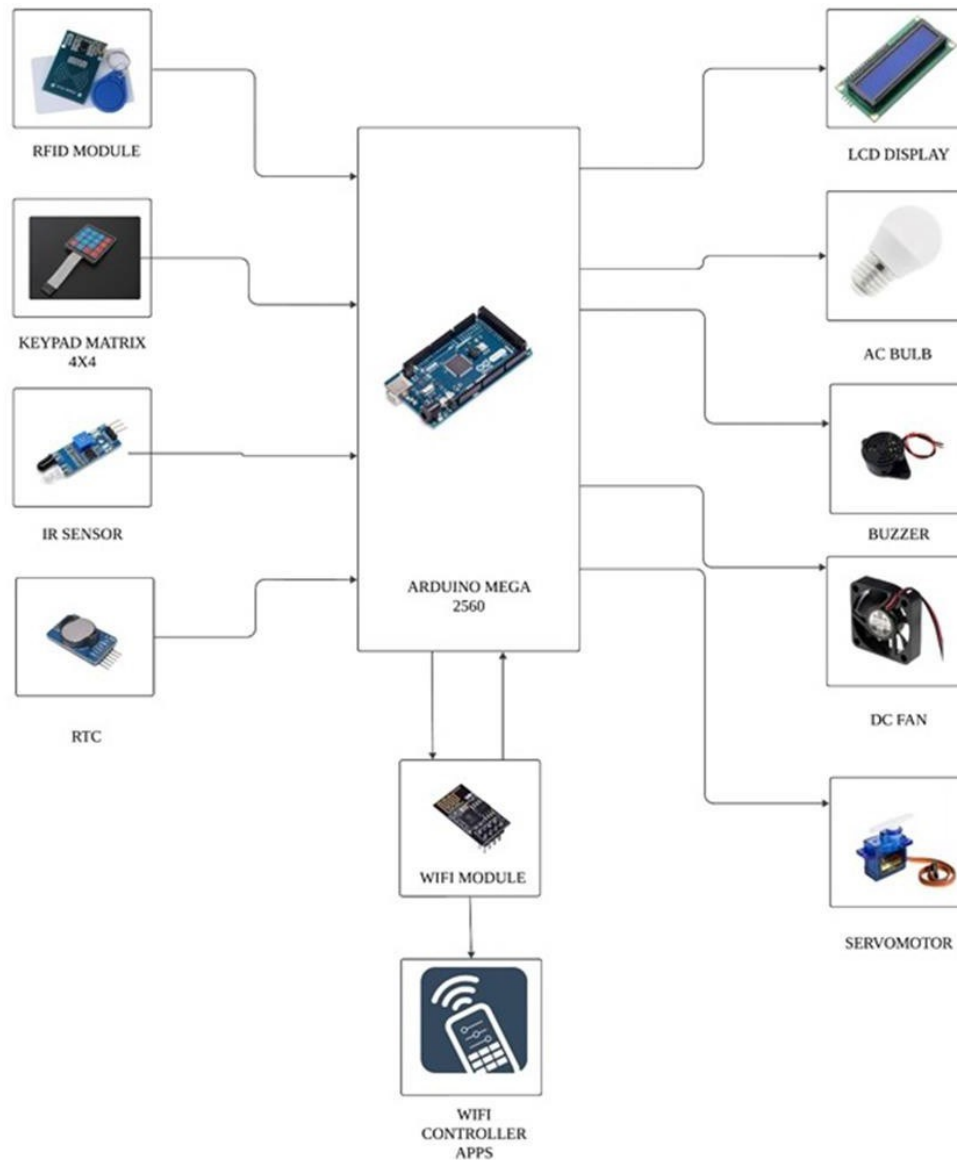
BLOCK DIAGRAM

Figure 1: Block Diagram of the RFID Energy Efficiency : Optimizing Office Room and Power Consumption.

FLOWCHART

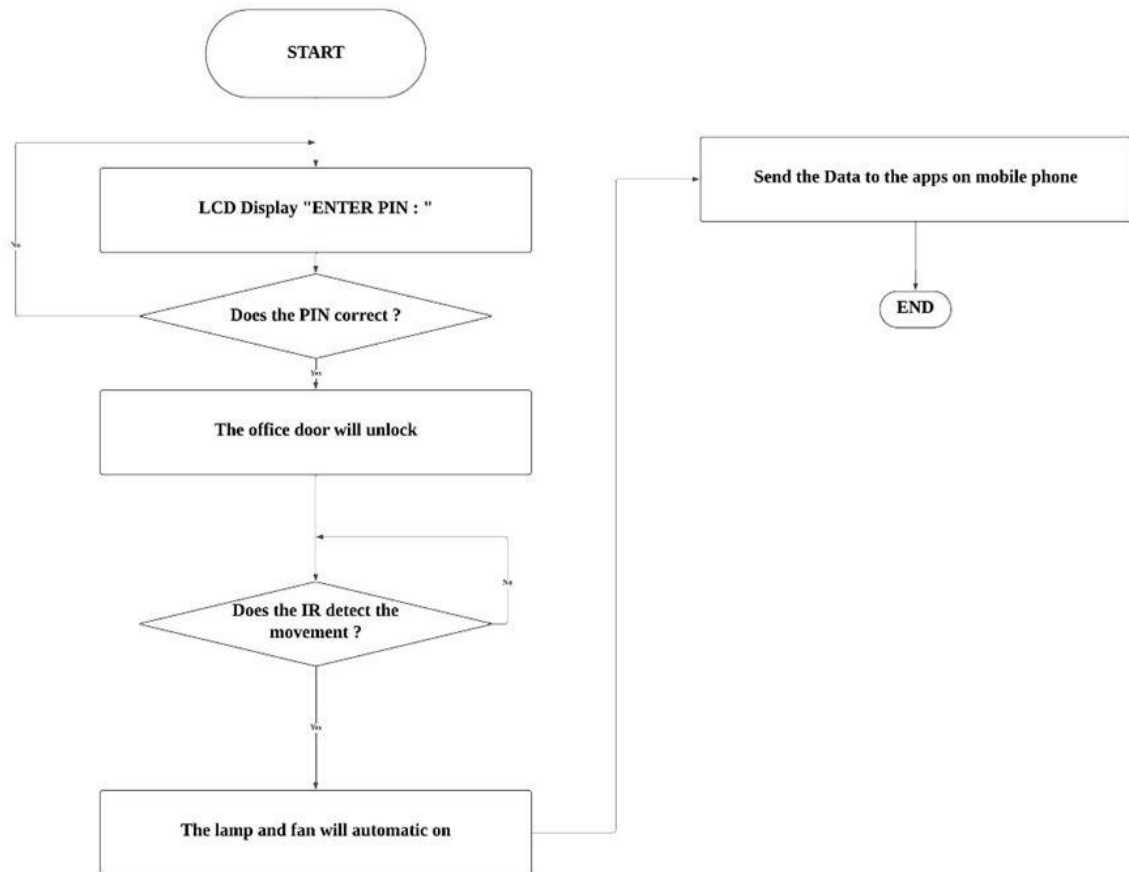


Figure 2 : Flowchart of the RFID Energy Efficiency: Optimizing Office Room and Power Consumption for Keypad Function

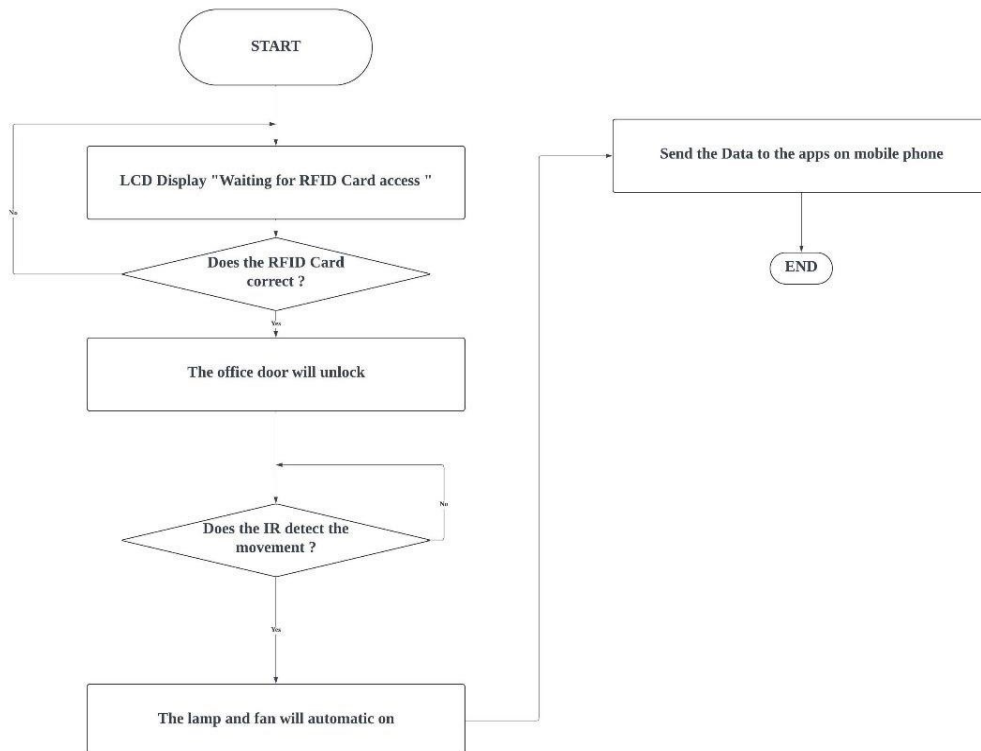


Figure 3: Flowchart of the RFID Energy Efficiency: Optimizing Office Room and Power Consumption for RFID Card Function

SCHEMATIC DIAGRAM

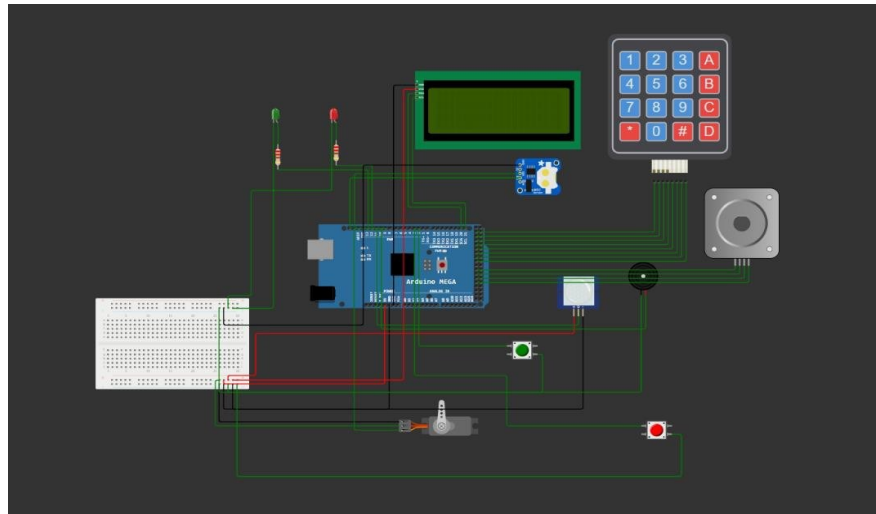


Figure 4 : The Schematic Diagram of the RFID Energy Efficiency: Optimizing Office Room Security and Power Consumption.

The schematic shows the strategic connection of each component to the Arduino Mega. Each input and output components has been connected with the corresponding pins on the Arduino Mega. The LCD Display connected to communication pin at SDA and SCL. After that, the LEDs are tied to digital pins 12 and 13. The stepper motor that tied to digital pins number 40, 42, 44, and 46 acts as a DC Fan. The 4x4 Keypad Matrix is linked to digital pin 22, 24, 26, 28, 30, 32, 34, and 36. Besides that, the buzzer only connect on VCC and GND while the PIR Sensor is same as buzzer component but the PIR Sensor has connection with digital pins 10. The PIR sensor acts as an IR sensor because in this software there are no IR sensor. The pushbutton that acts as a RFID Module and the pushbutton function for exit the office room using 2 and 3 at the digital pins. The servomotor pins has connection with 9 at digital pins and the rest of the pin connect at VCC and GND. Besides that, the RTC connect at SDA and SCL pin. All this arrangement highlights the important of each component to the microprocessor that can make a good projects call RFID Energy Efficiency: Optimizing Office Room Security and Power Consumption.

PCB LAYOUT

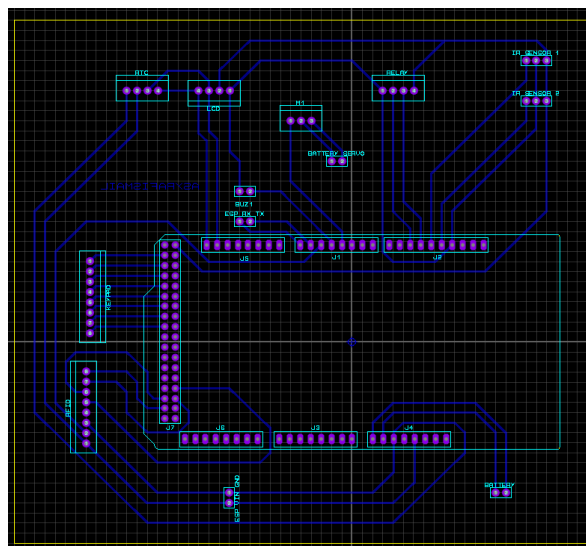


Figure 5: The PCB layout of the RFID Energy Efficiency: Optimizing Office Room Security and Power Consumption.

NOVELTY AND UNIQUENESS

The Smart RFID Security and Energy Management System combines RFID access control with dynamic energy optimization in a unique manner. It utilizes motion sensors that track occupancy and further switch off lights and fans in unoccupied rooms to reduce unnecessary wastage and conserve energy. It consists of an Arduino Mega, IR sensors, and an LCD display for immediate feedback, which can be monitored using Wi-Fi, hence making it secure and sustainable. This is an innovative solution with the best balance between security and energy efficiency for offices in modern times.

BENEFIT TO MANKIND

The Smart RFID Security and Energy Management System offers bountiful benefits to humanity through higher security using RFID access control, saves wasted energy by automatically switching off lights and fans in a room when it is unoccupied, and reduces electricity bills. It contributes toward promoting efficiency and sustainability for reducing carbon footprints that lead toward a greener, eco-friendly future. It offers long-term cost efficiency for businesses and organizations, while making building management much easier through automation. Ultimately, the system contributes to global efforts toward energy conservation, reduced environmental impact, and the creation of safer, more sustainable workplaces.

COMMERCIALIZATION POTENTIAL

Due to its dual focus on security and energy efficiency, corresponding to the growing demand for sustainable and cost-effective solutions in commercial and office environments, the Smart RFID Security and Energy Management System holds a great potential for commercialization. Indeed, with companies trying to increasingly reduce their carbon footprints and operational costs, this system is sure to offer an added advantage by catering to both needs at once. Its scalability allows the system to suit all application needs, from small offices to large commercial buildings, thus making it appealing to property managers, office managers, and facility maintenance providers. Advanced technologies integrated into the system, such as RFID, motion sensors, Wi-Fi connectivity, and real-time monitoring, position the system to be among the latest solutions in the smart building and IoT growing market.

CONCLUSION

The advanced features of security and energy efficiency combine in the Smart RFID Security and Energy Management System, hence presenting a very feasible solution for modern offices. The system, with RFID access control, motion sensors, and real-time monitoring, reduces energy waste, cuts costs, and carbon footprints. Its innovative approach to safety and security makes it a perfect fit for businesses willing to increase their security and sustainability credentials. This system thus provides an intelligent, eco-friendly solution for the future of workplace management, considering its strong commercialization potential.

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