Design Smart Door Control System Using Iot Method

Mardiana[1], Zumhari[2], Akbar Fauzi Lubis[3]
Electronic Engineering Study Program, Politeknik Negeri Medan
Medan, Indonesia
mardiana@polmed.ac.id

Abstract— **The integration of microcontroller and sensor technology has revolutionized door security systems, especially in the context of the Internet of Things (IoT). This report explores the development and implementation of Microcontroller and Sensor-Based Door Security Systems that aim to improve residential security. By leveraging IoT principles, the system uses a network of sensors strategically placed at the door of the house to detect unauthorized entry or suspicious activity. These sensors are connected to a microcontroller unit, which serves as the main processing center, capable of analyzing incoming data and triggering appropriate responses. The design of this system emphasizes efficiency, reliability, and ease of use, offering homeowners a comprehensive solution to maintain their property. By utilizing microcontrollers and sensors within the framework of IoT, these security systems are a significant advancement in residential protection, contributing to the peace and safety of homeowners around the world.**

Index Terms— **internet of things, home security, security systems.**

I. INTRODUCTION

In every big city, most daily activities are done outside the home. As a result, during working hours, it is certain that many houses will be empty without occupants. In addition, during holidays such as Eid, Christmas, and New Year. Thieves like to take empty houses, especially houses that do not have adequate security systems. Thieves use various strategies to carry out their actions. Start by knocking on the door of the house and pretending to ask for the address. If no one answers and is sure the house is empty, they will break down the door and take all the valuables inside. There are also people who pretend to be PLN officers, internet network provider technicians, gas stove checkers, gardeners, and other roles. (2) because the number of criminal crimes or thefts that can occur in the surrounding environment is increasing. The rampant house thefts in our country are an example. Thieves who often steal homeowners' belongings by breaking into the door of the house, usually damage the lock. If there is an automatic door security system, the Internet of Things (IoT) system allows real-time monitoring of home doors from anywhere and at any time. (2)

In addition, modern security systems are still rarely able to notify homeowners directly if there is an illegal entry or suspicious activity. I offer an Internet of Things (IoT) based home security system that is too cheap compared to existing security systems because the price would definitely be high if there was such a system.

Home security is very important for homeowners, both with access codes based on the ESP32 WiFi Module and with mobile devices. Many cases of theft begin with breaking or passing through the door, because one of the home's security is the door. A better system is expected to solve this problem. (7)

II. LITERATURE REVIEW

This IoT-based door security system using telegrams was created to improve the safety and comfort of homeowners. In addition, the author also explored Final Project information in order to obtain previous information about theories related to the title used to obtain a scientific theoretical basis.

The following is previous research that the author used:

1. IoT-based door security system that facilitates homeowners to open and close doors and lock and unlock doors via the internet network. This system is also equipped with a real-time video streaming feature so that owners can observe the environment around the door and make sure the person in front of the door before opening it. Raspberry Pi is used as the main controller of the system that provides a web page for users and a control signal to the Arduino Uno board. Arduino Uno controls the servo to control the door. The camera used in this study is a Raspberry Camera with a resolution of 5 MP. From the results of the tests carried out, it was obtained that the system that had been realized could work well. Servo control works as expected and the servo response to changes in user input on the web page is also quite fast. Video streaming runs smoothly at 30 fps with a resolution of 640x480. (Arnes & Mardiana, 2018)

2. Entitled Home Door Security System Model Based on the Internet of Things. The research conducted obtained results, the development of a home security system that uses internet of things technology is more practical to use, especially for people who are in a hurry. The system processes data from the solenoid doorlock component that detects the condition of the door lock. The data is sent in real time to the database, and the system processes the data into binary values. (1)

3. Entitled Layered Security System on Doors Using RFID, Fingerprint and Keypad with Voice Output Based on Internet of Things ESP32. The ESP32 microcontroller is used as control processing center or controller of the input used. All input data will be stored and processed in the ESP32 microcontroller according to the program that has been used, RFID (radio frequency identification) as the first security input whose output displays the user ID data to continue the security process via fingerprint with output

in the form of a code on the fingerprint and ends with keypad security via a password that responds to the output in the form of active DFPlayer mini by playing google sound in MP3 files to the speaker. (9)

4. Entitled Home Door Security System Based on Internet of Things Based on NodeMCU ESP32 and Telegram. (3)
5. Design and Construction of Door Security System Using Fingerprint Sensor Based on InternFAet of Things (IoT). This tool uses a fingerprint sensor and keypad menu on the TFT LCD as its security system. This tool uses 2 microcontrollers, namely Arduino and ESP32. Arduino functions as a tool to control the operation of the TFT LCD and fingerprint sensor. (5)

The ESP32 WiFi module is a microcontroller introduced by Espressif System and is a development of the ESP8266 WiFi module. This module has complete features and high performance, including two computing processors that can manage WiFi and Bluetooth networks and run applications. The ESP32 is equipped with a capable RAM memory for storing data and features such as TCP/IP, HTTP, and FTP. This module is also supported for analog signal processing, sensors, and digital I/O devices, as well as great multitasking capabilities and low power consumption, making it very suitable for use in IoT projects and other applications that require fast and efficient wireless connections and data processing. (6)

A Smart Door Control System is a system designed to prevent theft, security, and other crimes. This system usually consists of various components such as locks, alarms, cameras, and sensors, which work together to monitor and control access to the home. Prevention is done by monitoring people near the door, detecting suspicious movements, and sending notifications if there is suspicious activity or illegal entry. A door security system, which usually consists of modern hardware and software that work together to detect and prevent crimes against property or goods. A door security system that uses an Android-based ESP32 Wifi Module. RFID is used to detect illegal entry and issue an alarm warning. (4)

Internet of Things (IoT) is a technology that connects various smart devices and hardware through the internet network, allowing them to communicate and share data in real-time. Thus, IoT can improve efficiency, security, and convenience in various aspects of life, such as homes, offices, and industries. For example, IoT can be used to monitor and control home devices such as air conditioners, lights, CCTV cameras, and monitor the health and activities of home occupants.

The concept of the Internet of Things (IoT) refers to technologies such as sensors and software that control, connect, and share data with other devices connected to the internet. IoT is closely related to the term machine-to-machine (M2M), and is becoming increasingly popular in today's digital era. (8)

Internet of Things (IoT) software is an application used to collect, process, and manage data from various Internet of Things (IoT) devices. Telegram is an instant messaging application used as a medium to control the Internet of Things (IoT) system. The IoT system, it connects IoT devices with users via the internet network and allows users to control IoT devices, such as cameras and LED lights, through messages sent via the Telegram application. In addition, Telegram can be used to send data from sensors to devices. (PUSPARINI & Handayani, 2017)

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RFID has two main components, namely RFID Tags and RFID Readers. RFID tags are small devices that have electronic chips that can store important information about identified objects. This chip is capable of storing various data, ranging from unique serial numbers to other detailed information about the object. On the other hand, RFID Readers are tools that function to read information from RFID Tags. When the Reader is activated and directed at the Tag, it will send a signal that is received by the Tag, which then activates the chip inside. The chip then sends the stored information back to the Reader, which processes and displays the data as needed. This process allows for efficient and effective identification and tracking of objects without requiring physical contact between the Tag and the Reader. (superadmin, 2021)

Fig. 1. Radio Frequency Identification (RFID)

Description of the tools used are:
1. Voltage source: 12 Volts, 3 Amps
2. Microcontroller: Esp32 Wifi Module
3. Software: Arduino IDE version 1.8.19
4. Input: Piezo Electric Sensor, RFID, and Magnetic Switch
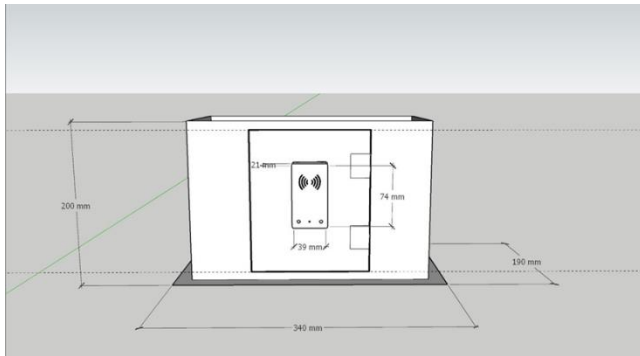5. Output: Telegram notification, Solenoid door lock

Fig. 2.   Design of the tool

Data on suspicious activity and illegal entry will be wirelessly transmitted to the internet via a wireless router network, allowing homeowners or interested parties to access the data in real-time via the Telegram application. Based on the research stages that have been described previously, there are three phases that will be discussed, including hardware design, software design, hardware and software integration

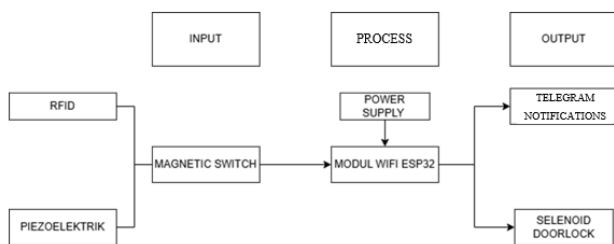The stages of the control system are as follows

Fig. 3.   Smart Door Control System block diagram

Software design is the design of the flow and program that will be run on the system. Software design begins with the creation of a flowchart, then synchronization of the Esp32 Wifi Module port as a microcontroller that will be used
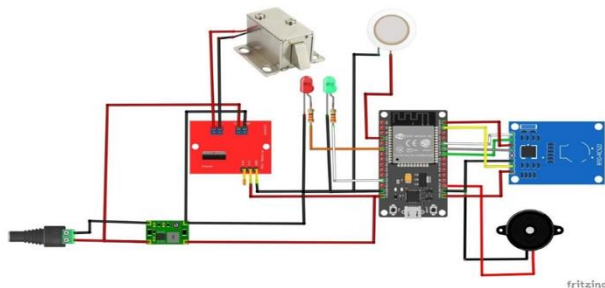

Fig. 4.   Smart door control system module circuit

In this method, testing is carried out on the components of the door security system after all hardware and software preparations have been completed. Component testing includes testing the output voltage of the power supply, testing the piezo electric sensor, RFID, and magnetic switch, testing the

microcontroller, testing the solenoid doorlock as a door security. Testing to determine the function of the component so that it is in accordance with its duties. In addition, testing on programming using Arduino IDE software by monitoring data from the serial monitor via the UART / USART (USB) communication line. After being successfully uploaded and passing the component check, testing of the entire tool is carried out.

Processing Method / Analysis of Tool Test Results

Data analysis techniques are techniques used to manage research results in order to obtain conclusions. Data is processed and analyzed based on measurement results to obtain final conclusions. The analysis carried out includes:

1. Analysis of testing of values read or obtained from sensors and other components involves several important steps to ensure the accuracy and reliability of the data produced.

2. Analysis of the accuracy of piezo electric and rfid in ensuring the accuracy of knocks and card frequency synchronization in the door security system involves several important aspects to ensure that this system can maximize door security at all times.

3. Analysis of information sent via Telegram when the sensor successfully detects something, which involves several steps to ensure that the data received by the Telegram platform is accurate and useful.
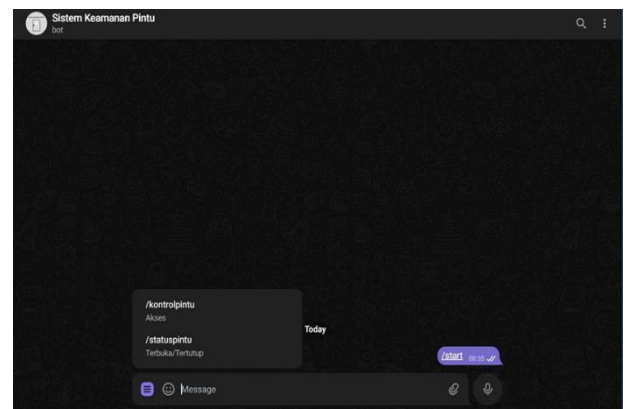

Fig. 5.   Telegram View

As for propulsive speed, it is seen from Fig. 13 that the improved manta robot can swim with less power consumption, compared to the conventional Manta robot. From this result, it is considered that the improved Manta robot has high propulsion efficiency, compared to the conventional Manta robot. Thus, it is considered that the improvement of the body shape of Manta robot is effective for improving the propulsion performance.

TABLE I.   TELEGRAM NOTIFICATION DELAY

No	testing	Delay(s)	Status
1	(1)	4.51	Succeed
2	(2)	5.36	Succeed
3	(3)	7.17	Succeed
4	(4)	6.43	Succeed
5	(5)	8.01	Succeed

6	(6)	4.70	Succeed
7	(7)	5.55	Succeed
8	(8)	6.10	Succeed
9	(9)	7.30	Succeed
10	(10)	8.12	Succeed
Average		6,325	100%

Average	6,325

From the above test, the average delay value for Telegram notifications was obtained 6,325 seconds/response.

III. CONCLUSION

Based on the results of the design and testing that have been carried out, several conclusions can be drawn as follows:

1. The Telegram application was tested with a display that includes 2 menus for access and status monitoring. This system is equipped with a buzzer as an alarm and an LED as an indicator.

2. The performance monitoring system for the IoT esp32 door security system with telegram notifications is well designed. The tests that have been carried out can be concluded where the door security system can function as a door control system. The accuracy of the electric piezo and RFID sensors and the fast response range can be the key to an optimal door control system. The speed of wifi connectivity is also a driving force for the door control system, so that users can receive notifications in a short time.

Suggestions
Here are some suggestions for development:

1. An Uninterruptible Power Supply (UPS) can be made to keep the power source uninterrupted when the electricity is not working as usual.

2. A camera module can be added to the control system to increase security..

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