

## Keypad Passcode Design Analysis on Smart Lock Door System IoT Based

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### ABSTRACT

Along with the rampant crime lately, people are always wary of the valuable assets they have. This study discusses the security system, especially at the door of a building. The automatic door security system uses a solenoid lock door with a keypad as input and a vibration sensor as a detector if there is vibration. When the passcode input via the keypad is high or true, the microcontroller in the form of Arduino Uno will give an order to the relay and will activate the solenoid, so the door will open automatically and send a message via telegram. The automatic door system using the keypad works well. This is evidenced by Arduino Uno, which gets input from the keypad, goes according to orders with the password code that has been programmed before, thereby activating the solenoid which receives input from the relay that the entered passcode is correct, and the door will open automatically by giving a notification.go to telegram. As well as a vibration sensor that detects if there is vibration at the door going well.

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## 1. INTRODUCTION

Along with the rapid development of technology, it certainly provides convenience and efficiency in every field and aspect of life. This convenience certainly spurs every human being to always be vigilant and careful about the valuable assets they have. The important thing that must be maintained and the center of attention is the security system. However, the security of IoT-based entry systems is still a major concern, mainly due to several drawbacks related to passcodes used as access keys. Therefore, the analysis of the

design of the keypad passcode on an IoT-based smart lock door system is very important to ensure the security of this system[1].

The entrance is most important part of the security system of a building. Entrance security has also undergone a significant transformation, one of the increasingly popular security technologies used today is the Internet of Things (IoT) based smart lock door system. This system allows the user to open the door using a smartphone or other device connected to the internet network. One of the main features of this system is the keypad which is used to enter the passcode as an alternative way to open the door.

This final project is carried out to discuss the analysis of the design of the keypad passcode on an IoT-based smart lock door system using dual authentication technology. This system is implemented on a single-board circuit, namely the Raspberry Pi. The system will save the passcode data that has been created, and the door will open if the passcode is entered correctly. Apart from password-based smart lock doors, they also use a facial recognition security system and vibration sensors which have better security than other security locks. It can be said that this system is an automatic electronic lock.

This security system will provide information and early warning through Notification of incorrect passcodes or other oddities that occur. The system will correct the passcode that has been set in the database, where if the passcode is entered incorrectly, the system will assume the person is unknown, then sends a notification to the Telegram messenger application.

## **2. THE COMPREHENSIVE THEORITICAL BASIC**

### **2.1. Sandi Keypad**

A keypad password is a type of passcode that is used by entering a combination of numbers via a keypad or the number pad on a device. Keypad passwords are widely used in various types of security systems such as gates, safe boxes, ATM machines, and smart lock door systems[2]. The advantage of the keypad password is that it is easy to use and remember because it is only a number. In addition, keypad passwords can be designed with long combinations of numbers, making them harder for others to guess and more secure[3].

### **2.2. IoT**

IoT is short for Internet of Things, which is a concept where various devices or objects that are not normally connected to the internet can connect and communicate with each other via the internet network[4]. Internet of Things (IoT) is a concept that discusses how devices or objects can connect and communicate via the internet network. Devices connected in an IoT system can interact and share information automatically, collect data, and make intelligent decisions based on the data collected. Overall, the IoT system is a very

promising concept in creating a more intelligent and efficient environment, although it still faces various challenges and issues that need to be addressed. However, with continuous innovation and collaboration, we can overcome these challenges and reach the full potential of IoT systems[5],[6].

### 2.3. Arduino Mega

Arduino is an open-source platform for prototyping electronics. Furthermore, the Arduino Mega 2560 is also a microcontroller board based on the Atmega 2560. The Arduino Mega 2560 has 54 digital input/output pins, of which 15 pins can be used as PMW output, 16 pins as analog inputs, and 14 pins as UART (Hardware serial port), besides the arduino mega also has a 16 MHz crystal oscillator, a reset button, an ICSP header, a USB connection and a power jack.[7],[8]. This is all that is needed to support a microcontroller in a variety of jobs. Furthermore, to start activating the device, it is enough to connect it to the computer via a USB cable or power supply or battery[9].

### 2.4. Solenoid Lock Door

Electronic locks (door locks) generally use solenoids. Solenoid door locks are electronic devices whose working principle is electromagnetic[10][11]. Solenoid door locks generally use a working voltage of 12 volts. Under normal conditions this device is in a closed condition (locking the door), when it is given a voltage of 12 volts the lock will open. To control the Solenoid door lock from Arduino, an interface or driver circuit is needed. One of them can use a 5 volt relay. By using this relay, the Solenoid door lock can be controlled by the Arduino microcontroller[12].

### 2.5. NodeMCU

Function as the main controller of the circuit as well as the monitoring systems that is connected directly to the smartphone. NodeMCU can access WiFi, for example, the ability to connect to WiFi that is within range and this device can also create that can be used by other devices[13],[14].

### 2.6. Telegram

Telegram is an instant messaging application that allows users to communicate quickly and easily with other users via the internet[15]. The Telegram application can be accessed via various platforms, such as PCs, laptops, tablets and smartphones. The Telegram application is widely used by users around the world, both for personal and business purposes. Telegram is also often used to organize communities or work groups, or to communicate with users abroad because Telegram has the ability to connect easily via a VPN[16],[17][18]. In addition, Telegram is also a popular choice for communication between

software or application development teams because Telegram offers open API (Application Programming Interface) features. This feature allows developers to integrate their applications or services with Telegram, such as creating custom bots, sending messages, or managing content [19],[20].

### 3. RESEARCH METHOD

The methodology is using waterfall methodology which is suitable for projects with clear and specific needs, and does not have significant changes during the development process. However, this methodology tends to lack flexibility and it is difficult to handle changing requirements that arise during the development process. By studying the literature on security on smart lock door systems on keypad passcodes and research related to this topic. After that, a design analysis is carried out, identifying security holes and system vulnerabilities, designing solutions to improve security, implementing and testing the system, after that the results tested are analyzed by testing the existing system for further system development. The stages of the research can be seen in Figure 1 below.

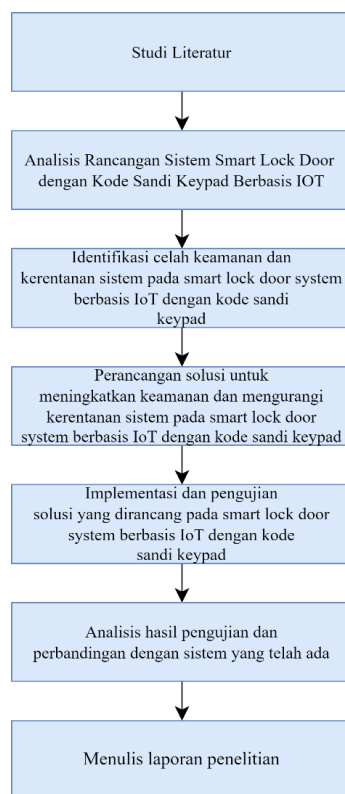


Figure 1. Research Flow

### 3.1. Blok Diagram

The design and design of this system is made to provide an overview of the system to be made so that it becomes a parameter for researchers in the process.

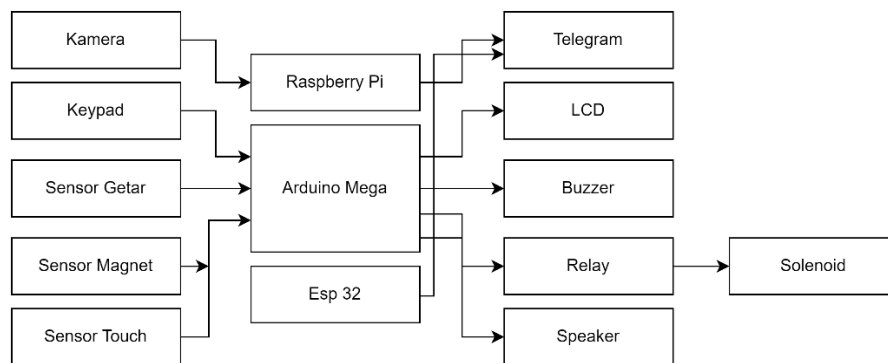


Figure 2. Block Diagrams

### 3.2. FlowChart

Software design of how the house door security system works on the keypad passcode.

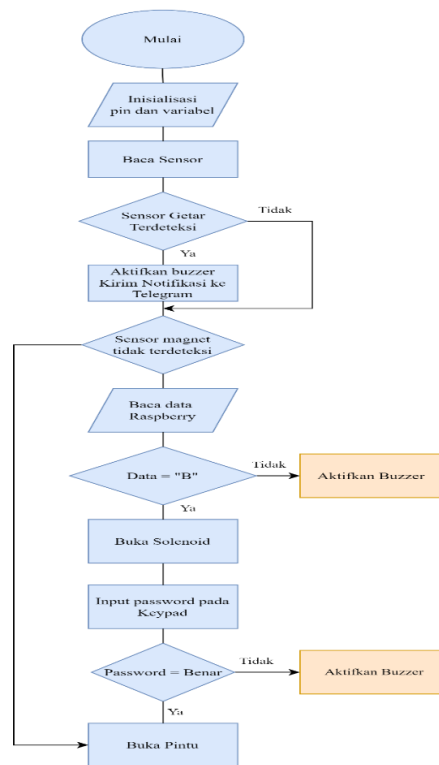


Figure 3. Flowchart

### 3.3. Perancangan Elektrikal

Electrical design is needed in order to know the components, sensors, and what is used in the smart door lock. Electrical design is also used to determine the wiring connected to each component or sensor to make it easier to install.

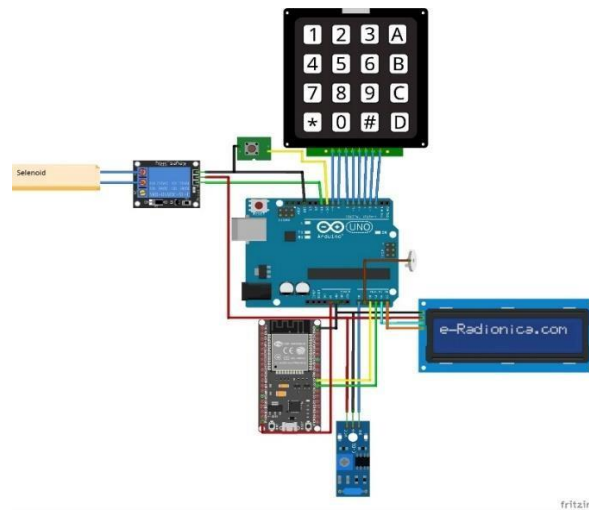


Figure 4. Electrical Design

## 4. RESULT AND DISCUSSION

### 4.1. The assembly process for the whole tool

In the tool assembly process, it can be seen that the Arduino pins have been connected to each component pin. It can be seen in Figure 5 and 6 the assembly process for the keypad pins, relays, LCD, and sensors in the smart lock door system passcode design.

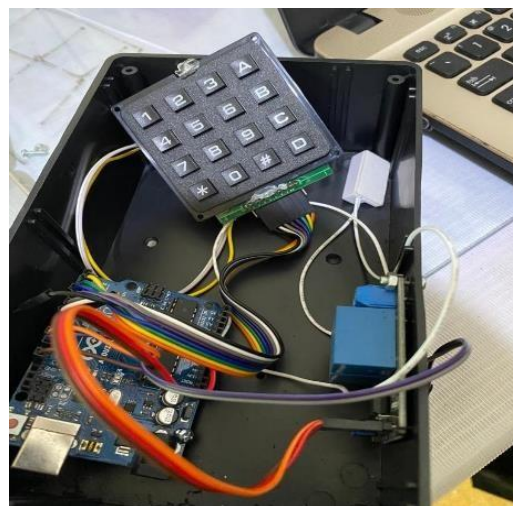
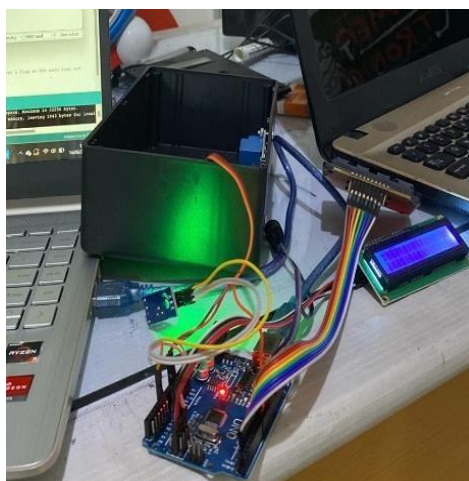


Figure 5. Assembly of tools on components



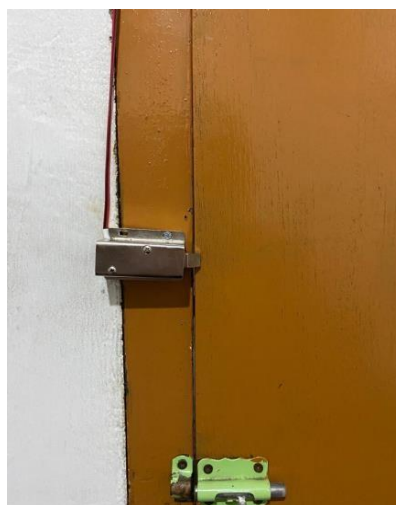
**Figure 6.** Tool assembly on Arduino

#### 4.2. Implementation process on the door

In this process the tools that have been assembled and have been tested before, are implemented at the door of a room as well as by testing the solenoid.



**Figure 7.** Door implementation



**Figure 8.** Solenoid Implementation

#### 4.3. Passcode Testing and Vibration Sensor on Telegram Notifications

In this process, a test is carried out to input the passcode and vibration indication on the vibration sensor. If the passcode entered is correct, the door will open automatically and a telegram will send a message that the password is correct. Vice versa if the passcode is entered incorrectly then the door remains locked and a message will be sent to the telegram that the password is incorrect. After that, if the door is indicated by a loud vibration and it

looks like someone wants to break it down, the vibration sensor will activate the buzzer and send a message on the telegram that it is indicated that someone has broken the door. Vice versa if there is no vibration, the buzzer will not turn on and no message will enter the telegram.

#### 4.3.1. Testing On Password

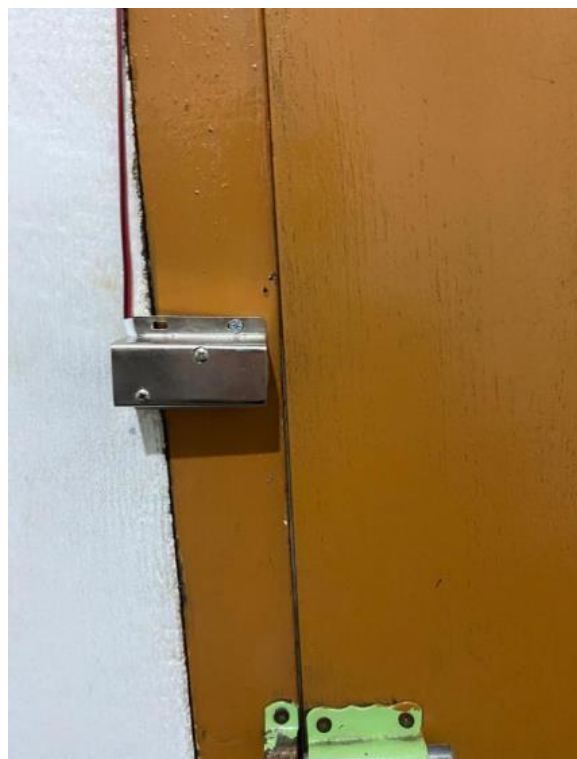
**Table 1.** Testing Passwords on Keypads

No	Input Keypad	Passcode (True)	Status	LCD Display	Solenoid
1	12496	4601	False	No Entry	Closed Door
2	4601	4601	True	Please Come	Open Door
3	20872	46e01	False	No Entry	Closed Door
4	12469	12469	True	Please Come	Open Door
5	16999	12469	False	No Entry	Closed Door

1) The Password Entered is correct



**Figure 9.** Message on Telegram



**Figure 10.** Open Solenoids



- 2) The password entered is incorrect



Figure 11. Message on Telegram

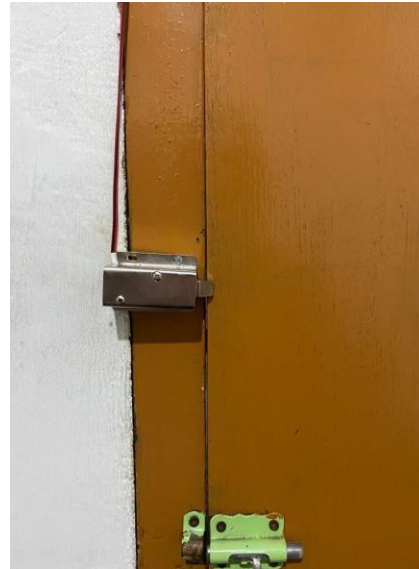


Figure 12. Closed Solenoid

### 4.3.2. Vibration Sensor

Table 2. Tests on Vibration Sensors

No	Testing	Indicator	Telegram
1	Vibration Sensor with Strong Knock	Buzzer On	"Indicated Broken"
2	Vibration Sensor with weak knock	Buzzer Off	No Notification
3	Vibration Sensor at a Rest	Buzzer Off	No Notification



Figure 13. Vibration Sensor

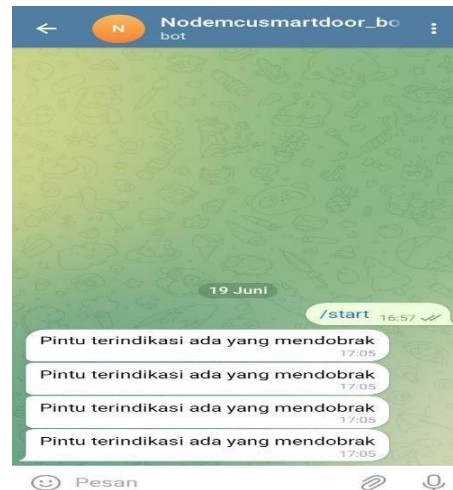


Figure 14. Message on telegram

#### 4.4. Display On LCD

The results of the LCD screen display show the words "Please Enter" and "Entry Is Forbidden". This means that if the password has been entered according to what has been programmed, the relay will work to activate the solenoid lock door and the LCD will display the words "Please Enter" and "Entry is Forbidden". Figure 16 shows the display on the LCD.

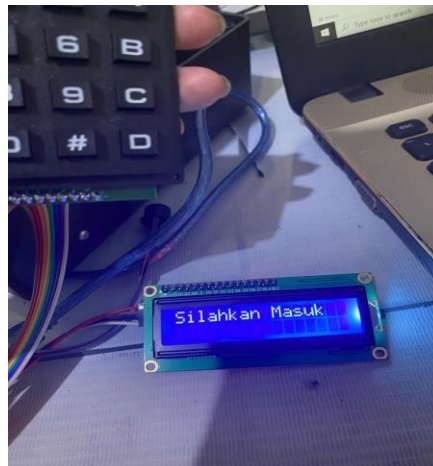


Figure 15. Results display on the LCD screen

#### 5. CONCLUSION

The conclusions that can be drawn from the design of the keypad passcode on the smart lock door system are:

- the 4x4 matrix keypad module as a password on a home door security system is more flexible and secure, with the addition of a buzzer which can be considered as an alarm if the password is entered incorrectly
- The message system that goes to Telegram is more anticipated if the home owner is away. Because it can monitor the user if the password entered is correct or wrong.
- A vibration sensor that will turn on if there is a strong enough vibration, for example there is an indication that a door has been broken into.
- This tool is designed from a combination of a 4x4 matrix keypad as a password and a vibrating sensor in anticipation of the door being forced into force.

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