

Smart Door Lock System Design using Rfid Cards on android-Based Home Security

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Abstract—In this modernization era, many people carry out their life activities outside the home, for which humans are required to often leave their homes which contain many assets and valuables. To provide a sense of security for homeowners to the threat of theft and robbery when they are outside the house and therefore with technological advancements today is very marketable so that it raises an innovation in making a sophisticated security system. From the reality, in this study the author tried to use an Arduino microcontroller that is supported by the internet of Things to be made a security system that can protect and prevent things that homeowners don't want by using the Prototype method. The design of this security system can produce solutions to problems in the threat of home security. With this system, it is expected to help improve home security

Keywords—Security System, IoT, Microcontroller, Prototype

I. INTRODUCTION (HEADING I)

The environmental security system is a system of protection for residents in the environment and surrounding areas from criminal disturbances, whether coming from outside the environment or from within the environment itself. A good environmental security system must start from the smallest environment and then continue and be integrated between small environmental security systems and larger environmental security systems. The smallest environmental security system is a home security system.

Table 1.1 The Crime of Theft

Tindak Kejahatan Pencurian di Provinsi Jawa Barat	
Tahun	Jumlah
2014	11620
2015	9984
2016	10227
2017	10402

According to the Central Statistics Agency (BPS) in West Java Province, theft is a crime that ranks second on a national scale, the table below shows the incidence of theft crimes in West Java.

In the data recap above, the theft crime rate increased in 2015-2017 and will continue to increase if the environmental security system is not improved. So an environmental security system will be good, if every house in the neighborhood already has a good security system. This will

reduce the space for crime in the environment, so that any crimes that arise can be detected early.

Technology makes everything we do easier. Humans always try to create something that can facilitate their activities, this is what encourages the development of technology which has produced many tools as tools to facilitate human activities and even replace the role of humans in a particular function. Technology plays an important role in the modernization era as it is today, where technology has become an inseparable part of everyday life. Current technological developments have penetrated into all aspects of life so that at this time we seem to be spoiled by the existence of tools that can provide convenience.

In this modernization era, humans do a lot of life activities outside the home, for that humans are required to often leave their homes which contain many assets and valuables. To provide a sense of security for homeowners against the threat of theft and robbery while outside the home, one solution is that homeowners must have a security system that can protect and prevent things that are not desired by homeowners such as theft, robbery and fire. One of the security systems offered is the use of electronic media (PH Oktaviani, 2015).

With the rapid development of technology, especially in the field of electronics, home security can be monitored anytime and anywhere by utilizing internet facilities and can be monitored through cameras that can be accessed via smartphones equipped with Android OS. In addition, smartphones equipped with Android OS can be used to monitor home security systems and to make home security more secure from crime, conventional door locks are replaced with smart door locks. Smart door lock itself is a house key that uses today's technology, using an Arduino microcontroller as a smart door lock device controller, RC522 sensor and an RFID card as an input device to open the door which has its own registration number so that it is difficult to duplicate. can feel calm and safe to leave the house, because we can monitor the state of the house anywhere and anytime by using a smartphone that is already connected to the smart door lock.

II. METHOD

The research method that will be used in this research is the prototyping. According to Dwi Purnommo (2017), there are 4 prototyping , namely;

- Illustrate, generates sample reports and screenshots.

- b. Simulated, simulating some system workflow but not using real data.
- c. Functional, simulating some real system flow and using real data.
- d. Evolutionary, produces a model that is part of the operational system.

Purpose of making a prototype for system development is to collect information from users so that users can interact with the prototyping, because prototyping describes the initial version of the system for the continuation of the actual system. so that in this study the prototyping used is prototyping functional of the security system with the following stages.

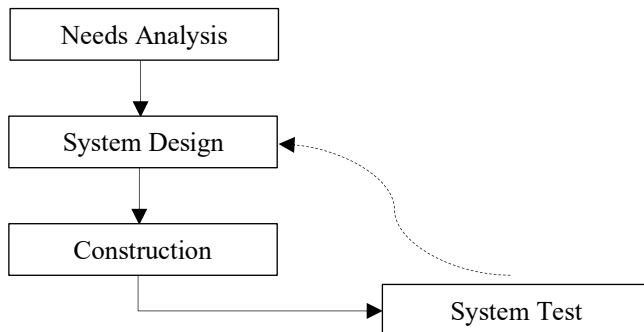


Figure 2.1 Prototype Method Drawing

The process begins with analyzing the need to collect the required information related to hardware, software and network requirements. Followed by system design which consists of activities in designing the result of which is a specification of the system. Part of the system design is in the form of architectural design concepts, interfaces, workflows, device schematics with the aim of producing system specifications that meet needs. After the design, the next stage contains system specifications, operational procedures, implementation plans and the results of the evaluation of the device experiments. Then testing the system. It is expected that the system can run in accordance with the initial planning and design made by system testing which aims to find errors that occur in the system and revise the system. This stage is important to ensure that the system is error free.

III. RESULT AND DISCUSSION

3.1 Needs Analysis

This door lock system will work when the activation that occurs when the door is used.

- a. The door lock system can function in two ways manually using an RFID card and a button on the blynk
- b. The door lock system using an RFID card can be activated by bringing the card closer to the RC-522 sensor according to the sensor reading distance, there will be two results, if the card matches then the door lock will open so that the green LED lights

up, the buzzer sounds once and the door notification opens to blink. If the cards do not match then the door lock will remain locked so that the red led light will flash on, buzzer will sound twice and the door closed notification to blink

- c. The door lock system can be actively opened and closed by pressing the button on the blynk application on a smartphone that is connected to the internet.

3.2 System Design

Software design is a description of a process of software that will be made. At the software design stage, it explains the main program flow diagram and supporting routine flow diagrams consisting of Flame sensor flowcharts, Arduino flowcharts, and buzzer flowcharts.

3.2.1 Hardware Design

In general, the block diagram of the security system using the ATmega2566 microcontroller can be seen in Figure 3.1.

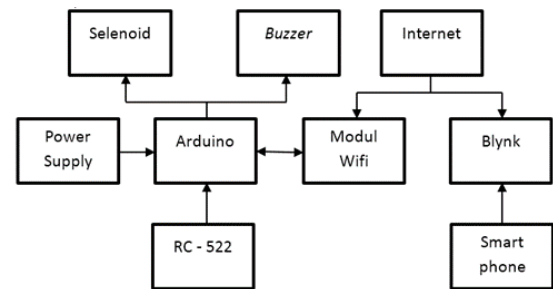


Figure 3.1 Block Diagram

Based on the block diagram above, the workflow of the security system is that the first power supply provides voltage to power the Arduino. After the arduino is turned on, the arduino will connect to the internet via the wifi module to be able to connect to the blynk application installed on the smartphone after the arduino is connected to the blynk arduino will send the sensor results from the RC-522 sensor periodically.

If there is data input through the installed sensor. Arduino will process the input. The results of data processing on the Arduino will activate the door lock and buzzer. Then provide the latest status notification to the blynk.

3.2.2 Software Design

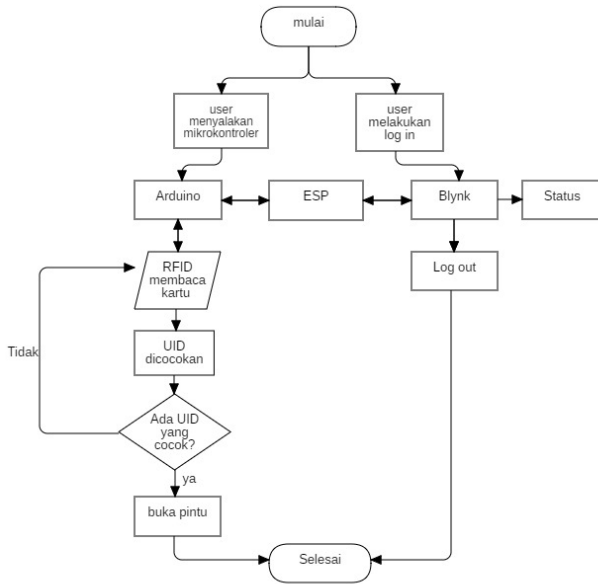


Figure 3.2 Main Program Flowchart

3.2.3 Blynk Interface Application

Design Blynk application interface design has been customized by blynk inc itself so that users only need to add the desired widgets to be displayed. widgets are linked to the modules on the Arduino board. each widget is set to function according to the pins that are paired. Once connected, the widget will display the desired data or command.

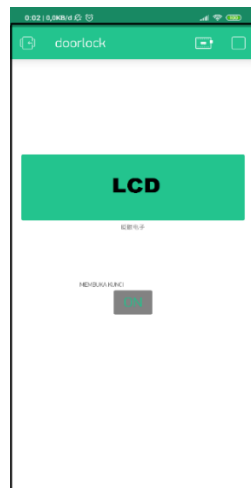


Figure 3.3 Interface on The Blynk Application

3.3 Prototyping

3.3.1 Hardware Specifications

1. Board Arduino Mega 2560
2. RC-522 Sensor
3. Solenoid Doorlock
4. Buzzer
5. LED light
6. ESP8266-012 Sensor Module
7. Jumper Cable Male To Male And Female To Male
8. USB cable type A to type B
9. Breadboard
10. Adapter Power Supply 12V
11. Smartphone OS 4.3 Jelly Bean or above

3.3.2 Software Specifications

1. Arduino IDE 1.8.9
2. Blynk Library
3. ESP8266 Library
4. Serial Library Software

3.3.3 Network Specifications

To run this security system, an internet network connection is needed as protocol that connects the microcontroller with the blynk application, the internet connection used in this research is an internet network connection via a mobile hotspot.

3.4 System Testing

Functional testing of the system is carried out to determine the function of the tool as a whole, the system's functional test. Functional testing of the system is carried out by carrying out the function of the tool as a whole, namely by operating the door lock system with the following test results:

Table 3.1 System Functional Test Results

No	Komponen	Hasil
1.	Microcontroller ATmega2560	Able to process data well and able to execute
2.	ESP8226 - 012	Data communication between the ATmega 2560 microcontroller and the blynk application via the internet can function properly

3.	Sensors RC-522	Can function properly reading RFID cards with the program created
4.	Solenoid Doorlock	Can function properly as the output of the system with the program that has been made
5.	Buzzer	Can function properly as the output of the system with the program that has been made
6.	LED light	Can function properly as the output of the system with the program that has been made
7.	Blynk	Can function properly as input and output of the system that has been made

Functional testing of the system found that overall the RC-522 sensor can work well reading RFID cards and forwarding activity change signals to the microcontroller. The microcontroller is able to operate properly in processing input data from the sensor and forward it to the ESP8266-012 module to send sensor data to the blynk application via the internet network which is then displayed on the blynk application interface and the blynk application can function properly in giving commands to the microcontroller through the application interface blynk and internet which are then received by the ESP8266-012 and forward the received commands to the microcontroller for processing.

IV. CONCLUSION

Based on the analysis of the design of hardware (hardware) and software (software), the following conclusions can be drawn:

1. Stages of making a security system using the Atmega2560 microcontroller based on the internet of thing containing the implementation of board hardware, ESP8266-012, RC-522, Selenoid Doorlock, Buzzer and LED Light with Blynk application and microcontroller programming. Testing the door lock system, namely RC-522 which was carried out on the mockup that had been made.
2. The results show that the RC-522 sensor can work well reading RFID cards that occur on doors that have a door lock system installed and forward the activity change signal to the microcontroller. The microcontroller is able to operate properly in processing input data from the sensor and forward it to the ESP8266-012 module to send each sensor data to the blynk application. The blynk application can function

well in receiving data from Arduino via the internet and then displaying it in the application interface and giving commands to Arduino. In the implementation of the internet of things on a security system using the ATmega2560 microcontroller, there are several factors that affect the performance of the security system, namely an unstable internet network, activation on the server, the distance of the device connection to the server and the quality of the blynk server.

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