Designing IoT-Based Camera on the House Doors for Securing the House

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Abstract: Doors were the first access when entering a room or house. The access of the doors (e.g., office and house doors) should have been given only for certain people. The security system on the doors was very important because it was accessible only for the persons who had authorization. In this study, the security system was built through RFID as a substitute for a house key, a camera as a recorder around the front door of the house, and the camera canals as a controller to capture real time through the telegram application. In the remote-control system (IoT) application, there were several menus or commands with different functions that met the needs of the system and the user. Command "/start" was used to activate and connect security applications and systems, command "/portrait" was used to capture conditions around the door, command "/close" was used as a command to lock the door, and command"/open" was used to lock the door.

Keywords: Camera, RFID, Nod Mcu, Telegram, Home Security

1. INTRODUCTION

The door was the initial defense to secure the house and the room from unauthorized people. Door security was very important to ensure the safety of the house. Currently, there were still many house keys that used conventional ones so that it rose problems due to negligence of the home owner, starting from the key left on the door, forgetting not to lock the door when leaving the house, and theft was occurred. Many cases of theft due to the keys were left by the owner so that this was detrimental to the home owner.

The recent technological developments had been found and sold freely on the market with various kinds of door locks, but on average, the keys were only available to open and close the lock using a card or password. The use of electronic equipment that was controlled and monitored was a technology and services that were integrated in a home network so that it was accessed remotely as a solution to overcome existing problems. Where this technology was integrated, a lot of technologies including home networking and other technologies were able to improve the quality of human life. System integration at home made communication between electronic equipment connected to the system easy to control.

Many studies had been conducted, based on existing problems, technological developments, and researches. This study was conducted by designing the use of cameras to increase security and comfort and minimize theft when the house was empty. By using Rfid technology and other technologies such as cameras and telegram applications, the system was controlled remotely using the telegram application. It was expected that this research was a solution to help improve home security.

2. LITERATURE REVIEW

2.1 Camera VC0706

Camera VC0706 was a serial camera that supported microcontroller devices. One of them was Arduino. This camera was connected to the Arduino board via TX, RX, GND, 5V ports. The VC0706 had image quality at 640x480, 320x240 or 160x120 in JPEG format. In this system, the VC0706 camera was used to capture images when a movement was detected.

Figure 1. Camera

2.2 Control Systems and Design

Control Systems and Design An incoming gust of wind tips a plane. The plane's sensors measure orientation. The measured orientation feeds into the plane's control systems, which send signals to the plane's mechanical components. The mechanics reorient the plane.
An organism's sensors transform light and temperature into chemical signals. Those chemical signals become inputs for further chemical reactions. The chain of chemical reactions feeds into physical systems that regulate motion. How should components be designed to modulate system response? Different goals lead to design tradeoffs. For example, a system that responds rapidly to changing input signals may be prone to overshooting design targets. The tradeoff between performance and stability forms one key dimension of design. Control theory provides rich insights into the inevitable tradeoffs in design. Biologists have long recognized the analogies between engineering design and the analysis of biological systems. Biology is, in essence, the science of reverse engineering the design of organisms.

2.3 PE-905 Magnetic Sensor

Magnetic sensor PE-905 magnetic sensor was a switch that responded to magnetic fields around it. This magnetic sensor was like a limit sensor to provide an additional metal plate that was able to respond the magnets.

Figure 2. Magnetic Sensor

Magnetic sensors were commonly used for security on doors and windows. In its installation, this magnetic sensor was installed by implanting it in the door or simply sticking it to the window.

Installation was also be done on doors or windows with various materials. Furthermore, it was also attached to doors or windows made of wood or metal e.g., aluminum. Magnetic sensors used type PE-905, an automatic control device, particularly for the use in circuits up to a maximum voltage of 4 Volts and currents up to 100mA to 500mA.

2.4 Radio Frequency Identification (RFID)

One type of RFID reader was RDM6300. The physical shape and pin description of the RDM6300 was shown in Figure 3 and Figure 4 below.

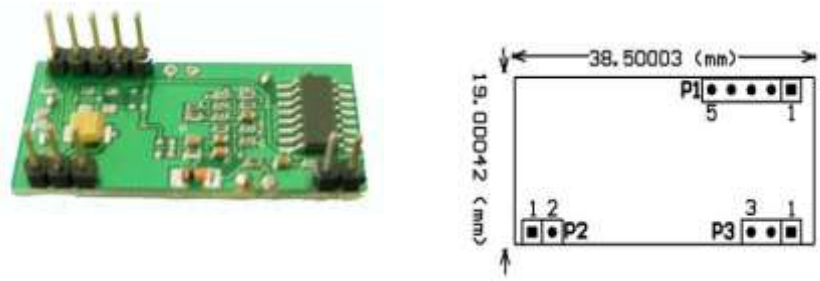

Figure 3: RFID Reader RDM6300

2.5 Relay

Relay was a form of resistance consisting of the bottom contact points with the unmoving spool coil and the moving upper contact point. The working principle of resistance was connecting the bottom contact points with the upper point where the spool coil was energized by an electromagnet. (Handy Wicaksono, 1996,1-12). Relay was a form of resistance consisting of the bottom contact points with the unmoving spool coil and the moving upper contact point. The working principle of resistance was connecting the bottom contact points with the upper point where the spool coil was energized by an electromagnet. (Handy Wicaksono, 1996,1-12). In simple terms, this electromechanical relay was defined as follows:

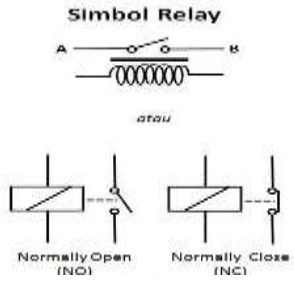

Figure 4: Relay

2.6 Node MCU ESP8266

Node MCU was an open source IOT platform and development kit that used the Lua programming language to assist in making IoT product prototypes or used the sketch with the Adruino IDE. This development kit was based on the ESP8266 module which integrated GPIO, PWM (Pulse Width Modulation), IIC, 1-Wire and ADC (Analog to Digital Converter) all was on one board. GPIO Node MCU ESP8266 was seen on Figure 2.1. Node MCU measures 4.83cm

long, 2.54cm wide, and weighs 7 grams. This board was equipped with WiFi features and open-source firmware.

2.7 Telegram with Telegram Bot and API

Telegram was a free chat application that originated in Russia. Telegram was very popular in the world because of its security that was very strong than competing applications. Telegram was also very famous for its friendliness to application developers / developers because of the API and open protocol it provides. Telegram was also cloud-based so it was able to be accessed from many tools, and telegram was available in various operating systems (Windows, iOS, Android, Ubuntu). The bot on telegram was a telegram account operated by software. Telegram account users were able to interact with the telegram bot by sending messages, orders, and requests in line (inline mode). Telegram bots were controlled through HTTPS requests (HTTPS Request) to the Bot APIs provided by telegram. Telegram bots were also able to be the artificial intelligence. An API (Application Programming Interface) or programming interface was a set of commands, functions, and protocols that were used by programmers when building software for a particular operating system. The API on http-based telegram bots was made to keep developers interested and made it easier to build bots.

3. RESEARCH METHODOLOGY

The type of this study was the action research. Action research was emphasized on activities (actions) by trying out an idea into practice or real situation on a micro scale which was expected to be able to improve quality and make social improvements. The research stages were shown in the following figure.

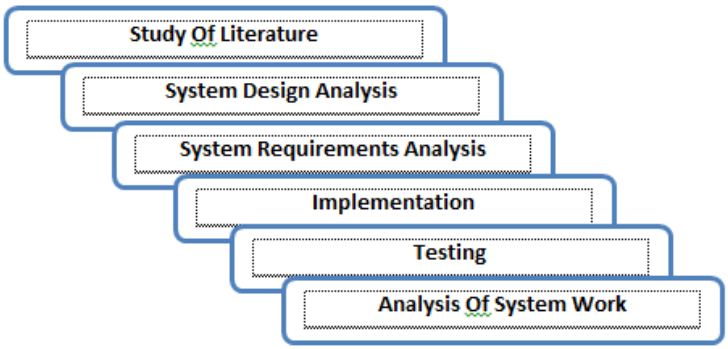

Figure 5. Research Stages

Hardware Design

The hardware design system was seen above. The input of the Rfid system was used to open and lock the door. If there was a failure in using Rfid, the camera automatically activated and took a picture then sent to the home owner via telegram. The next input was generated from the telegram application where the telegram activated the camera to capture the latest conditions of the house door conditions. Telegram was also used to unlock doors and lock doors**.**

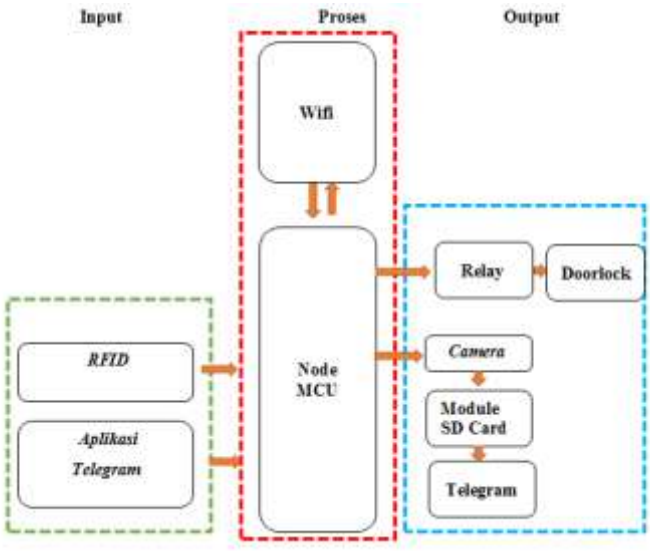

Figure 6. Block Diagram Of The System

System software design

Software was a device that was not separated in a system. The software that had been designed in this study was seen on the following figure.

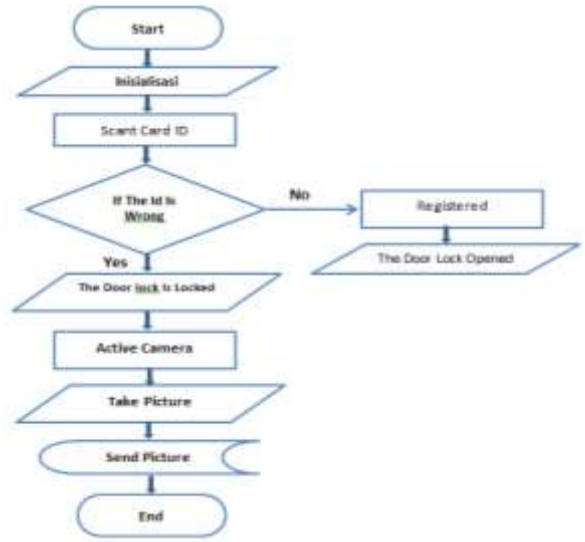

Figure 7. Flowchart of the system

4. RESULTS AND DISCUSSION

Testing the system was carried out to ensure that the system design had been assembled into a series of systems that were able to run according to the function of each component e.g., input, process, and output. The testing was also carried out to ensure that the system was developed according to the objectives and initial design of this study. It started from the input system (Rfid, telegram), the process system (nodencu), the output system (camera, doorlock, telegram). The results of the trial were shown in the following table.

Table 1. Results of Testing the System

No	Testing		experiment to			Description	Result
	Telegram	RFID	1	2	3		
1	**Off**	090072E3D0	√	-	-	Available	doors Locked
2	**Off**	090072E3D0	√	√		Available	Door Locks Open
3	On	090072D985	√	-	-	Not Available	doors Locked
4	On	090072D985	√	√	-	Not Available	doors Locked
5	On	090072D985	√	√	√	Not Available, Active camera	doors Locks 
6	**/start**		Telegram			Active	Connected
7	**/potret**	Telegram	Camera			Active	
8	**/close**		off			High	doors Locked
9	**/open**		off			Low	doors Open

The results of this study was that the Rfid input system was able to be used properly according to the function of Rfid (opening and locking the door) and if an error occurred or an attempt was forcedly carried out for 3 times, the system activated the camera and took the next picture sent by telegram to the owner. Telegram testing was done by sending the command "/ start" to activate and connect the security system with the Telegram application with a specific ID. After connecting the Adri application, menu appeared on the application screen window. If you were connected via the application, you were able to carried out commands according to the menu or instructions. The command menu "/ portrait" was used to take a picture, the command menu "/ close" was used as a door lock, and the menu command "/ open" was used as a lock door.

5. CONCLUSION

The design of this house door security system can function in accordance with the design and function of each system. The RFID input system can properly distinguish registered and unregistered IDs, and can also provide results to activate the camera if there is a failure or unregistered ID. Likewise, the input system using the Telegram application can run properly according to the commands given. However, this system design system still has many shortcomings, including the time in telegram communication and the system is still long, namely 3 minutes on average, especially in the command to take pictures.

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