IOT-Based Home Security Using Magnetic Sensor

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Abstract: Security was very important, particularly in home security, because the house was a place to live and to store the valuable goods. The crime rate (e.g., theft) increases as homeowners left the house empty. They who wanted to travel and leave the house empty for along time needed their house to be safe. The Internet of Things (IoT) enabled the devices to communicate (e.g., sending and receiving data). The objective of this study was designing the home door security system consisting of Node Mcu ESP 8266, VC0706 camera, magnet sensors, and speakers. The telegram application was able to provide quick information to users so that they were able to find out the situation of the house door from the theft. When the door was forcibly opened, the magnet sensor sent information to node Mcu. The node Mcu ordered the camera to take a picture and it was sent to the homeowner's smartphone through the telegram application.

Keywords: Node Mcu ESP8266, Camera VC0706, Telegram Application

1. INTRODUCTION

Security is very important, at this time, especially for home security, due to the house is a residence as well as a place to saves the home owner's valuables. Someone sometimes leaves his house for a few days so that their house is empty unoccupied causing the theft rate increasing. The rate of crimes such as theft increases. A person who wants to travel and leave his house empty, especially for a long time, certainly wants his house to be safe. Security from theft in a house is important, but maintaining the security of a house from a thief is difficult and not easy to explain due to limited human senses.

Previous researchers have been conducted by **[1]**, including the design of automatic home door safety using a microcontroller, the purpose of this research is to be able to make electronic locks for house doors, which can then send a Short Message Service (SMS) message. if something goes wrong or is forced to open the door. This research uses the prototyping method with four main stages, namely, the stages carried out are data collection, rapid planning, prototype design, and prototype testing. The advantages of this research are being able to receive notifications via SMS when there is force to open the door when you are not at home, the weakness of this research is that the SMS system still uses prepaid credit, while this modern era has developed many applications such as telegram, WhatsApp and other similar applications. Microcontroller-based smart home design, where this system focuses on saving control of energy use in housing and / or offices based on the Atmega8535 microcontroller. This research method, namely, begins with a literature review of related research, followed by designing a smart home system and testing of the design results. The advantage of this research is that it can access home appliances such as turning on lights, fans and measuring room temperature. The drawback of this tool is that there is no room security which should be quite important, such as door security if there is an attempt to force open the door when the owner is not at home **[2]**.

Base on problems, this research wants to create a system that can be accessed by homeowners remotely and use the telegram application as a support.This system works by using magnetic sensor input which will be processed by nodeMcu so that it will produce output capture which will be sent to the telegram application. and turned on a warning sound.

2. LITERATURE REVIEW

Research on the design of a Home Security System using IOT-Based Magnetic Sensors has been conducted by several researchers. Several summary studies of the literature are used to determine the extent to which the research has been carried out. [3], entitled Home Security Using a Vc0706 Camera and Microcontroller-BasedSMS Gateway.The purpose of this tool is to design a microcontroller-based home security system which is expected to be especially useful for people who frequently travel outside the house. The application of the passive infrared (PIR) sensor is used to detect based on the

movement of objects, the Vc0706 camera is used to take pictures, the SIM800L V2 is used to send SMS notifications, the Micro SD Card Module is used as a medium for transmitting image data to the memory card, the buzzer is used as an alarm and light emitting diode (LED) red green and blue (RGB) as an indicator of the status of this system.

[4] Entitled Home Security Using IOT-Based Arduino. The goal is to minimize the possibility of theft in the house, a home security system is created that combines a microcontroller with an Android smartphone and a magnetic door switch sensor, the microcontroller used is the Arduino Uno equipped with a Sim808. Sim808 will generate notification in the form of sound, SMS and will send data to the database server, the results sent to the database can be seen through an application that displays when the door is open. With this home security system, it is possible to know when the door is open when you are not at home.

[5] Comparison of the Quality of Data Communication Protocol Services on Cigarette Smoke Detection Systems Based on the Internet of Things. The development of internet technology is currently increasing rapidly, one of the developments in internet technology today is the Internet of Thing (IoT). GDK (Campus Discipline Movement) is an effort by the Darmajaya Institute of Informatics and Business (IIB) Campus to create the most beautiful, disciplined, healthy, beautiful and clean learning environment. This provision applies to all IIB Darmajaya academicians, violations that are often committed by students or employees, namely smoking in places where smoking is prohibited. Therefore, it is necessary to build an appropriate monitoring system to control these violations. The cigarette smoke monitoring system still uses a wifi signal so that the maximum monitoring range is 25 meters. This study develops a cigarette smoke monitoring system using the internet so that the monitoring coverage becomes wider. This system uses the MQ 135 sensor as a smoke detector, the Arduino Uno will process the input from the sensor, the Arduino Ethernet Shield that is connected to the modem will send sensor input data to the Thingspeak web server and then display it to the smartphone. The internet is used as a transmission medium between smartphones and smoke detectors. The test results prove that this system can monitor smoke anywhere as long as the smartphone is still connected to the internet.

[6] Designing and Building a Monitoring Tool for Staple Needs Storage Through Microcontroller-Based Android. Storage tool is a place, media or space to put an object. Storage of basic necessities such as rice is stored in rice boxes and eggs stored in the refrigerator or other storage area. Less tools current storage is when the user wants to know the remaining inventory groceries are stored, so the user must look straight into the place storage, whereas not everyone is always at home. To To solve existing problems, we need a system that can find out availability of basic necessities from a long distance. This study uses a smartphone as a remote monitoring tool using wifi transmission media emitted by the access point and connected to the Arduino. This tool uses sensors a strain gauge to detect weights and a limit switch to detect the number of eggs. From The test results prove that this tool can transmit accurate data with a number in a storage area with a maximum reach of 25 meter. [7] with the title Designing Smart Home System Using NodeMcu Esp8266 Communication Based Telegram Messenger. In this study, a Smart Home system design was carried out, with a client-server system based on NodeMcu ESP8266 v3 with Telegram Messenger user interface that performs data communication via wireless. The design stage consists of designing the server, interface, and Smart Home control system. The final results of this test can be concluded that the Telegram Messenger application is very suitable for remote control and monitoring of Smart Home, based on the distance measured from 1.7 km to 151 km, the area difference is obtained an average delay of 20.66 seconds. Service in this data communication system, based on standard parameters, the test results work very well. In testing the indoor RSSI value, it is found that the strength of wireless communication is better than outdoor, so the RSSI is stronger. The highest RSSI value is at -28 dBm and the smallest is at -88 dBm. Based on testing the obstacle, with different attenuation characteristics of each obstacle, it has an effect on the RSSI of the wireless signal. The strongest RSSI obstacle is generated by a wooden door with a value of -33dbm dBm, and the smallest RSSI in obstacle 2 of a house building with a value of -78 dBm.

[8]Electricity Switch Using the Internet of Things (Iot). This control system makes it easier for owners to control lights via the web. By utilizing a reliable communication network, integrated with web technology as a user interface and devices that can be used to control devices via the internet network, MCU nodes are integrated with relays.

3. METHOD

This chapter will explain the research steps that will be carried out in a Home Security System Using

Magnetic Sensors Based on the Internet of Things. The research flow used is as shown in Figure 1.

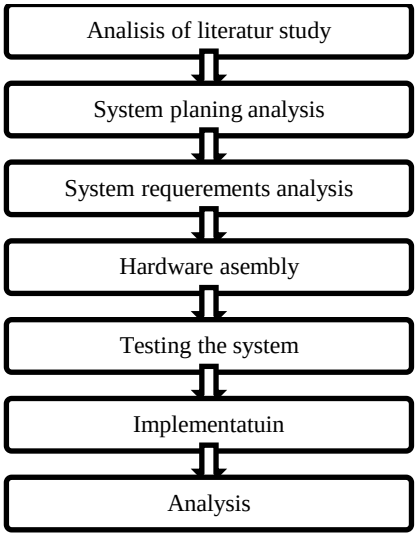

Figure 1 Research Stages

First, namely the Literature Study, the author is looking for thesis writing materials obtained from books, journals and websites related to the creation of a Home Security System Using Internet Of Things Based Magnetic Sensors. Furthermore, System Design Analysis, in designing a Home Security System Using IOT-Based Magnetic Sensors, includes designing hardware and software. Explanation of the system design in the form of a block diagram. Continuing on System Requirements Analysis, needs analysis includes the tools and materials needed in a Home Security System Using Magnetic Sensors Based on the Internet of Things, which is hardware and software for conducting research. Continue to Assembly, Assembly is the last step carried out to find out whether the whole series that has been made can work well. So that the system implementation can be done. Further Implementation of the Tool, after collecting the necessary tools and materials, the next step is to implement the device. At this stage the design that has been made will be implemented into a real system. Continue to System Testing, Testing of Home Security Systems Using Magnetic Sensors Based on the Internet of Things is carried out to ensure that the tool being made works in accordance with the design, and to ensure that there are no errors in the appliance. Furthermore, System Design Analysis, system design is something that is done to simplify the process of making tools. The concept of a IOT-Based home security using magnetic sensoris illustrated in the block diagram as seen in Figure 1. The block diagram provides an overview of how the monitoring system for the Home Security System Using IOT-Based Magnetic Sensors will work.

Before creating a Home, Security System Using Magnetic Sensors Based on the Internet of Things, there are several equipment that must be prepared. The list of equipment used in this study will be written in Table 1, the material so the table 2 and software in table 3.

Table 1. The Tools

No	Tool's name	Specification	Function	Quantity
1	Computer	Window 7-10 32/64bit	To create an application that will be used in hardware and software.	1 unit
2	Multitester	Analog/Digital	Used to measure voltage (ACV-DCV) and strong currents (mA-μA).	1 unit
3	Screwdriver	Screwdriver (+) and (-)	For stringing tools.	1 unit
4	Soldering iron	-	For gluing tin to components.	1 unit
5	Bor *Printed circuit board*	-	Untuk membuat lobang baut atau komponen.	1 buah
6	Cutting pliers	-	For cutting cables and component legs.	1 unit
7	*Lead*	-	Used as a series adhesive	1 Roll

8	*Power cable*	1	Used as a conductor of electric current	1 unit
9	*Jumper*	-	Used as a liaison / jumper all components.	30 unit
10	*Andoid Smartphone*	-	Used as owner access with home security tools	1
11	*Multitester*	YX360TRF	Used to measure the voltage on a component	1 unit
12	*Software arduino IDE*	-	Used to enter programs	-
13	*Software telegram*	-	As a command input tool and receive a Photo image	-

Table 2. The Materials

No	Name of Material	Specification	Function	Quantity
1	Node Mcu	Esp8266	As a process the command will be executed.	1 unit
2	*Magnetic sensor*	-	Used as input.	1 unit
3	*Module SD Card*	MiniSD Card	Digunakan sebagai output untuk membuka mengunci pintu.	1 unit
4	*Camera*	VC0706	Used to capture images.	1 unit
5	*Speaker*	-	Used as a warning sound output	1 unit
7	*Printed circuit board (PCB)*	-	Used as a circuit board	2 unit
8	*Relay*	FL-3FF-S-Z	Used as a switch or electromagnetic switch which is controlled by an electric magnet	2 unit
9	*Transformer*	-	Used to reduce tension	1 unit
10	IC	LM7805	Used to stabilize the voltage from the power supply	1 unit
11	IC	LM7812	Used to stabilize the voltage from the power supply	1.unit

Table 3. Software

No	Name	Specification	Function
1	IDE Arduino	Arduino 1.6.3	Create a program that will be downloaded by the Arduino device
2	Telegram application	-	As output to the user

4. RESULTS AND DISCUSSION

a. Design systems

The whole series is the last stage of the design that has been carried out. In this stage, all components are installed in accordance with the system that has been made, the whole series can be seen in the figure 2.

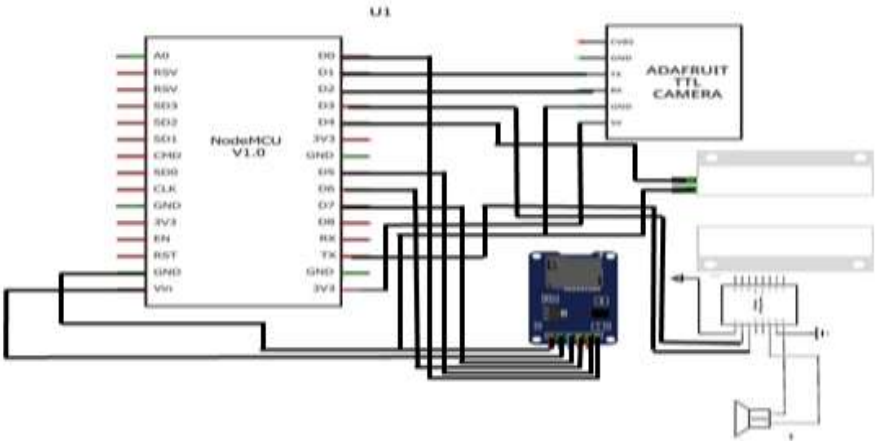

Figure 2. IOT-Based Home Security Using Magnetic Sensor.

Tests are carried out to ensure that the resulting circuit is able to work as expected. then first the test step is carried out and directly observes the circuit and components. The results of this measurement can be seen that the circuit is working properly or not, so that if there are errors and deficiencies it will be detected. Figure 2. below is a picture of the physical form of the tool that has been made.
This chapter contains the results of testing and analysis of the system. Testing begins by making sure each component (Telegram, Limit Swite, DF Player Mini, relay, Camera VC0706, Module Micro SD Card and power supply) whether the tools that have been made are in good condition can work properly according to the program that has been made, then check every line connected to the components used has been connected, where the circuit is adjusted according to the schematic drawing.

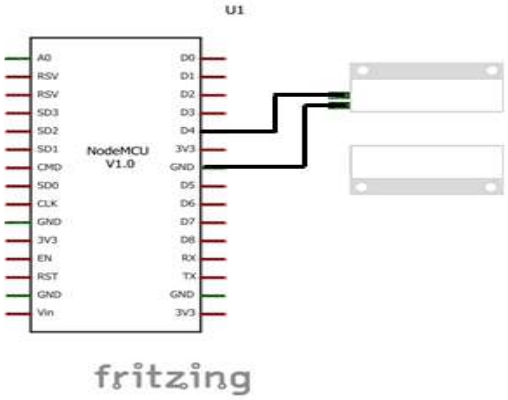

Figure 3. Magnet sensor

In a series of magnetic sensors, only a few feet are connected to the digital pin nodeMcu so that the process results on the nodeMcu can provide a capture output. The use of the nodeMcu PIN and the magnetic sensor can be seen, namely the digital pin D4 on the nodeMcu will be connected to the sensor output pin. Magnetic sensor script.

```
if (bacaSensor == HIGH ) {
  Serial.println("Pintu ada yang buka!");
  capture();
  delay(100);
  mp3_play (1);
}

else if (bacaSensor ==  LOW ) {
  Serial.println("Pintu TERKUNCI!");
}
}

if(statusMode==1){
if (bacaSensor == HIGH ) {
  Serial.println("Pintu ada yang buka!");
}
  else if (bacaSensor ==  LOW ) {
```

Figure 4. Physical Form

From the results of the assembly, the researcher can find out that the work system of the tool has worked in accordance with the program that has been made, namely. If the input / on is activated and the limite switch sensor is high, the relay and DF player will be active and the camera will capture then if the limit switch sensor is low and the relay is active, the camera and DF player will be inactive. Whereas the / OFF command can be detected if this command is a deactivating alarm command so if the swite limit is high then the camera, DF player will remain inactive. whereas with the command / home key is used as a door lock, the relay will be active and if the command / Turn off the house key is used then it will unlock the house.

System Telegram testing, Limit Swit, DF Player Mini, relay, Camera VC0706, Micro SD Card Module and power supply, power supply testing and the whole circuit. This test is carried out so that researchers can find out the advantages and disadvantages of the system that has been made, the test results are as follows:

b. Testing

In this test, it was carried out to determine the speed in sending the captured results from the camera on the device to the Telegram application using several network provider options, the test results can be seen in table 4.

Table 4. Network speed testing

Number	Network Provider Name	Speed / time
1	Telkomsel	3 minutes
2	XL	3 minutes 50 second
3	3 (THREE)	5 minutes 45 second

From the results of the table above, it can be seen that in the first trial to the third trial, it can be seen that the Telkomsel network and the XL network are faster than network Three.

Magneic sensor test to find out whether the the magnetic sensor is good at making input to find out the door is open and the door is locked. The test results can be seen as in table 5.

Table 5. The Magnetic Sensor Test Results

Number	Magnetic Sensor Status	Information
1	High	Someone opened the door
2	Low	The door is locked

From the results of the table 5, it can be seen that in the first trial to the second trial, it can be seen that if the magnetic sensor is high, someone opens the door, while if the magnetic sensor is low, the door is locked.

System testing is carried out to test the performance of the IoT-Based Home Security using Magnetic Sensor. Researchers will test the system starting from the user through the telegram application and a series of sensors on the security system, testing is carried out so that researchers can find out whether the system that has been created can work well. The following is a trial of the tool that has been made.

Table 6. System test results from users using the Telegram application

Number	Telegram Menu	Testing scenarios	System response
1	/mulai	Type /mulai on the telegram bot that has been created	Displays command information on the telegram
2	/ON	Type /ON on the telegram bot that has been created	Activate the security system
3	/OFF	Type /OFF on the telegram bot that has been created	Disable the security system
4	/pantau	Type /pantau on the telegram bot that has been created	Seeing the state of the house

5	/KunciRumah	Type /KunciRumah on the telegram bot that has been created	Lock the house
6	/MatikanKunciRumah	Type /MatikanKunciRumah on the telegram bot that has been created	Unlock the house

From the results of the system test from the user using the telegram application (table 6), it can be seen in test 1 if the command **/mulai** it will display the information on telegram, then on the second trial if the **/ON** command is written it will activate the security system, continue on the trial to 3 commands **/OFF** to turn off the security system, on the 4th trial command **/pantau** then the camera will take a picture and send images to the user via telegram, on the 5th trial the command **/KunciRumah** to lock the door, and on the 6th trial command **/MatikanKunciRumah** to unlock the house.

Table 7. Testing on Embedded System

Number	Telegram Menu	Magnet Sensor Status	Camera	DF Player Status	Information
1	/ON	High	On (take a picture)	On	Someone opened the door; the security system was active
2	/ON	Low	Off	Off	The door is safe
3	/OFF	High	Off	Off	Someone open the door; the security system is inactive
4	/OFF	Low	Off	Off	The door is lock

From the test results of the security system (table 7), it can be seen in test 1 that if the input /ON is activated and the magnetic sensor sensor is high, the camera and DF player will be active, then on the second trial the magnetic sensor is low, the camera and DF player are not active. Whereas in the 3rd trial the /OFF command can be detected if this command is a command to activate the security system so if the magnetic sensor is HIGH then the camera and DF player will remain inactive the same as in the 4th trial with the command /OFF if the magnetic sensor LOW then the camera and DF player will remain inactive.

The home security system has the advantage of being able to take pictures automatically from a distance and can make a sound if someone tries to enter the house. Equipped with a menu command door control, home alarm control and remote camera. Can anticipate breaking down the door of the house. This security system can activate the door alarm sensor with the / ON command and the / OFF command to turn off the alarm, so that if the door is left open during the day, the camera and DF player will not be active.

The home security system is a weakness that takes too long to transmit the catch to the telegram. There is no battery or backup power in the event of a power cut. The home security system in sending images to the Telegram application is still very long, which takes 3 minutes.

5. CONCLUSIONS

Based on the testing and system analysis IoT-based home security using macgetic sensor can minimize the loss of valuables in the house and can reduce the occurrence of burglary, the VC0706 Camera can perform well in taking pictures. The delay required by nodeMcu to send catches to the telegram application is 2 minutes, network speed greatly affects the speed of sending images on telegram and commands to deactivate the alarm via telegram can work fine.

This tool still has laxity so it needs development. The following suggestions for research development such as further researchers can develop by increasing the response of sending images to the telegram application so that it does not take long, researchers currently still need 1 minute to receive images and further researchers are advised to be able to add to the electrical backup system, namely by using a battery. or backup power in case of a power cut.

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