Design And Construction Of Safe Security System Using Microcontroller-Based Magnetic Sensors

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Abstract

The title of this research is the design of a safe security system using a microcontroller-based magnetic sensor. The purpose of this study is that the use of a security system when opening and closing a safe requires increased security, to make a safe using a microcontroller-based electronic circuit application, because technological advances, especially in the field of security in the detection of safes, will provide enormous benefits in general for make a safe at the grocery store. Safes are one of the targets of theft. introduces a tool that can prevent and prevent these crimes by using keypad code securitythat uses a password that is able to secure the safe and can set the password as desired. and this tool can work quite easily, by entering the pin on the keypad according to the password that has been set, when the password is entered correctly then it successfully opens the safeand if the password is entered incorrectly, the buzzer will sound. The advantage of this tool is that it can detect a burglary by force using a magnetic sensor equipped with a buzzer in the Telegram application on Android, which will make a sound or sound if the safe is broken into or is being infiltrated by unauthorized parties, and a notification message will also appear in Telegram on Android.

Introduction

Nowadays, the crime rate in Indonesia is getting higher. Advances in equipment are increasingly enabling humans to make increasingly sophisticated equipment, especially in the field of electronics-based technology and communication. To overcome theft created a tool called a safe detection.

Safe is a tool used to store valuable items such as money, jewelry, or valuable assets and papers. Safe is a practical storage place but has a high risk, because it allows the safe to be broken without the knowledge of the owner. So a sophisticated security is needed in accordance with technological advances. Advances in technology, especially in the field of security in the detection of safes will provide enormous benefits.

This tool is designed using Arduino Based on Android. People who are close to the safe will then enter a notification message on the safe owner's smartphone. And we need to connect to the network first in the safe so we can give a notification message when there is a burglar close to our safe. The application that we will use later is the Telegram application which is designed using Arduino. With this telegram application a notification message will appear. The use of a security system when opening and closing a safe requires increased security, including using a microcontroller-based electronic circuit application.

Literature Review

According to Erinofiardi (2018) a closed loop control system is "a control system whose output signal has a direct influence on the control action performed". The characteristic of a closed control system is the presence of a feedback signal. The feedback signal is an output signal or an output function and its derivatives, which are fed to the control element to minimize errors and make the system output close to the desired result.

According to Amar, Reza Juliansah. 2015. With the development of cellular technology that is not only used as a telephone and sms, but can also be used as a device to control a robot, such as an Android smartphone that has computer features embedded. So that robot technology can be controlled remotely and according to what the user wants. Robots are also one of the technologies that can help human work, such as work processes that drain human

energy, and have a high risk. So that the robot function is made to minimize the big risks associated with heavy physical tasks, positioning an object, and moving goods from one place to another.

According to Andi. 2017. Android is a word that is quite popular in the world of gadgets. Many devices that use Android applications, ranging from smartphones, tablet PCs, and even game consoles have used the Android operating system. However, do you know how to create applications in the Android operating system? Talking about applications for experienced programmers, the Java language is Object Oriented Programming (OOP). It takes a lot of time to learn the programming language. However, if you use App Inventor, the time it takes to create an app is only a matter of hours. This also applies to ordinary people who do not know the basics of programming.

According to Ivan C. Melalolin. 2016. Automatic safety safe is a type of automatic safe which is designed to work to secure every valuable item with reliable security devices. This safe uses a motion sensor as a detector of human activity in the front area of the safe. Magnetic sensor to detect the presence of a safe when it is opened or closed with a solenoid as an automatic lock. This safe is designed differently by having two safes where the second safe is inside and serves as a security if the first safe is broken into. The second safe is equipped with an electric shock circuit. Access to this safe uses two types of passwords that can be changed by the owner himself. Another advantage is, using a GSM modem as a liaison between the safe and the owner. Every execution in the safe will be notified to the owner via a short message to the owner's cellphone. The destination number can also be changed as desired. Each character password and destination number will be displayed on the LCD. The safe is also equipped with an alarm and LED indicator.

According to Sulindawati and Fathoni, 2010. Systems are elements that are integrated with each other and carry out their respective functions to achieve the goals that have been set. System characteristics consist of: (1) System Components; (2) System Limitations; (3) External Environment of the System; (4) System Liaison; (5) System Input; (6) System Output; (7) System Processor; and (8) System Objectives. Information is data that is processed into a form that is meaningful to the recipient and useful in making decisions now or in the future. Information

systems analysis is a phase of information systems development which essentially focuses on the problem of business requirements.

According to Syahwil, Muhammad. 2013. The Arduino microcontroller is one of the most popular microcontroller boards and its advantages have been recognized. Ease of programming, relatively cheap price, open-source software and hardware make this microcontroller the most widely used in the world. This microcontroller is very suitable for beginners who want to start exploring microcontrollers but are constrained by programming language skills and time to make circuits, as well as for those who are advanced, this microcontroller is quite flexible.

This book is intended for beginners and for anyone who wants to learn the Arduino microcontroller from scratch, either by virtual simulation with Virtual Breadboard software or practically. The presentation and discussion of this book is made in detail and step by step, starting from the steps for installing the Virtual Breadboard simulation software, installing the Arduino IDE software, installing the Arduino USB Driver, describing the types of Arduino hardware, explaining the program code and explaining each component. used in each project.

This Android-Based Safe Locking System Using Arduino was successfully realized with some of the hardware contained in the system. The hardware in the system consists of a series of Android-Based Safe Locking Systems Using Arduino as a system controller, a dc motor driver circuit that functions to control a dc motor to drive the lock on a safe, a relay driver circuit that functions to turn on the siren, and a power supply circuit. which acts as a voltage source.

This study designed an Android-Based Safe Locking System Using Arduino on the Arduino UNO module. The result of the design of the tool is a miniature room safe that can be controlled based on the ATmega 328 Microcontroller, which works with a power supply ranging from 5 Vdc and 12 Vdc.

Safety in a safe is very important for humans. not infrequently the safe acts as access to places or items that are private. Therefore, the key as a security plays an important role in the security system. With the rise of crime rates and increasingly sophisticated systems in breaking into or damaging security systems in the form of conventional keys, it is imagination to develop a security system that is more private in nature.

By using the EasyVR sound processing sensor, it is hoped that it can be a security in the form

of a more profitable password. From testing, with the EasyVR module tested with different people, the success rate was quite low with a percentage of 10.4%. From the results of these tests, it can be concluded that the EasyVR sensor module itself is not good at capturing sounds given by different people. But from the weaknesses that exist in the module can be an advantage in this tool because it requires a high level of privacy security. Based on the journals above,

Research Methodology

a. Design Steps

The design step of this tool is electronic design which includes all

tstages of work that are directly related to the circuit, including:

1. Circuit Design or in other words analyze the required circuit

    to support the system work.

2. Making the layout on the PCB is the step of making the circuit schematic skema

    comelectronic components into a PCB board circuit.

3. Then the next step is to install the components on the PCB board that has been made and install

    in the designated safe section.

4. The next step is to test each circuit that has been made.

b. Block Diagram Design

The system design consists of 3 parts, namely input, process and output. The input consists of a keypad that functions as a lock button on the safe. And the process consists of a series of arduino nano and also nodeMCUESP8266, which is used as a system control in the safety of the safe. While the output consists of a solenoid which functions to lock and unlock the safe, the buzzer is used as a warning if the safe is forcibly opened, while the telegram is used as a medium to give a warning message if the safe is opened by force.

picture 3.1 Inagram Block Security Safe System With Magnetic Sensor
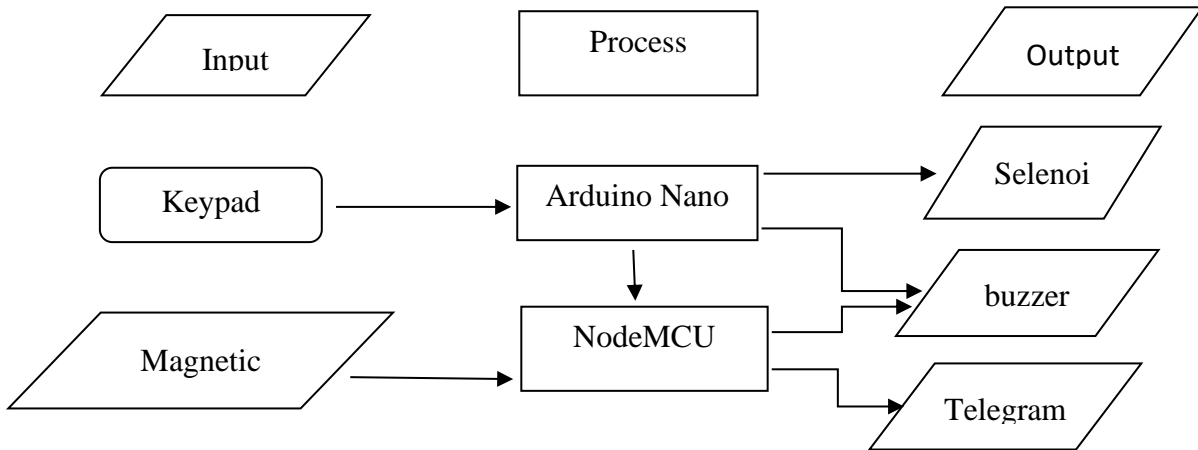
c. How the System Works

*Keypad*used as access for code scanning, after the scanning process is complete, the results will be saved into the Arduino nano memory. At the time of enrollment or checking the code, if the data that has been saved matches, Arduino Nano will send data to nodeMCUESP8266 and the previously programmed solenoid and will work to open the safe.

But if there is a mismatch in the keypad code data, the buzzer will sound indicating that the data is not registered. And if the safe is opened forcibly, the magnetic sensor will open and give a notification message "someone broke the safe".

d. System Flowchart

The workflow diagram of this safe is first setting the password where the password is set via the keypad and then the password is saved. After getting the desired password, the safe can be opened according to the password set. When the password is entered correctly, the solenoid of the safe door can be opened. When the password entered does not match, the solenoid door

cannot be opened and if the door is forced to open, it will activate the alarm, the buzzer will

sound and the safe will send a warning message to the owner of the safe via telegram.

Picture 3.2*Flow chart*Security System Safe With Magnetic Sensor
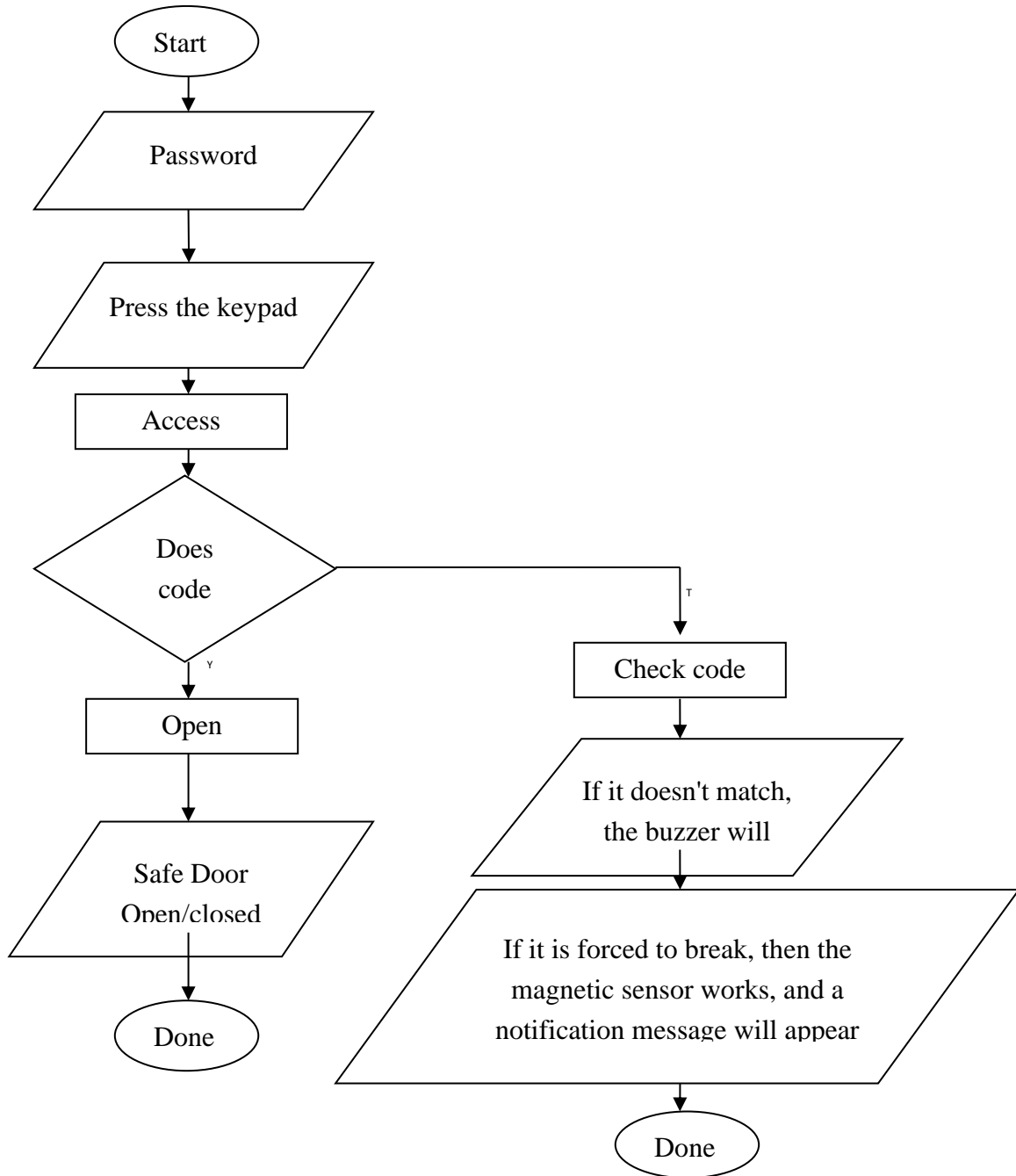
4. Design and Analysis

Overall system testing is a point that describes system testing based on tools that have been assembled and then neatly arranged in a safe. The safe is provided with holes for the Arduino usb power cable, the extended jumper cable to the keypad, the extended jumper cable to the magnetic sensor, the extended jumper cable to the nodeMCU, the extended jumper cable to the door lock solenoid, the extended jumper cable to the buzzer and the usb power cable.

The whole series of tools in the safe can be seen in Figure 4.1

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Modify existing equipment by installing magnetic sensors on the back of the safe and Arduino nano microcontroller devices, buzzer, nodeMCU solenoid door lock and mosfet driver in the safe and keypad mounted on the front of the safe.

The magnetic sensor on the safe is used to detect a break in the safe. The magnetic sensor circuit can be seen in Figure 4.2

Figure 4.2 Results of the design of the magnetic sensor behind the safe

The solenoid doorlock on the safe serves to close and open safe safe. The doorlock solenoid circuit can be seen in Figure 4.3

Figure 4.3 Design Results of a doorlock solenoid in a safe
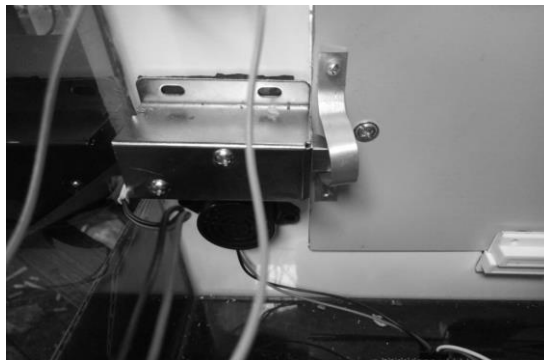
Arduino Nano functions as a controller for this safe burglary detection device and the Buzzer functions as an alarm when entering the wrong password code and will sound when the safe safe was broken into.

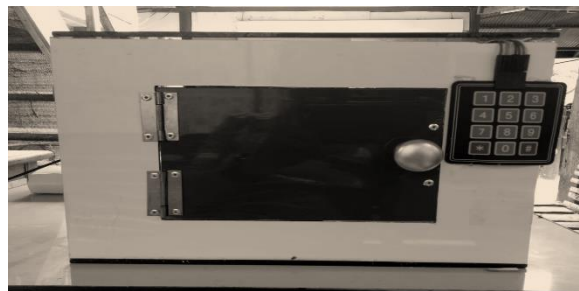Figure 4.4 Design Results of Arduino nano and buzzer in the safe
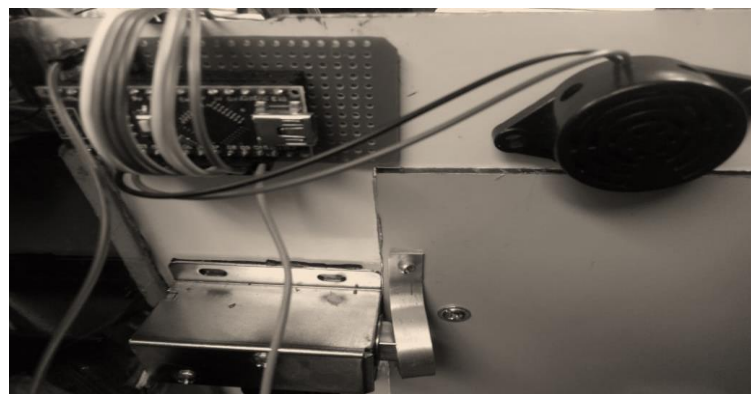
The 3x4 keypad on the safe serves as a security code to be able to open the safe. The series of 3x4 keypads on the safe can be seen in Figure 4.5

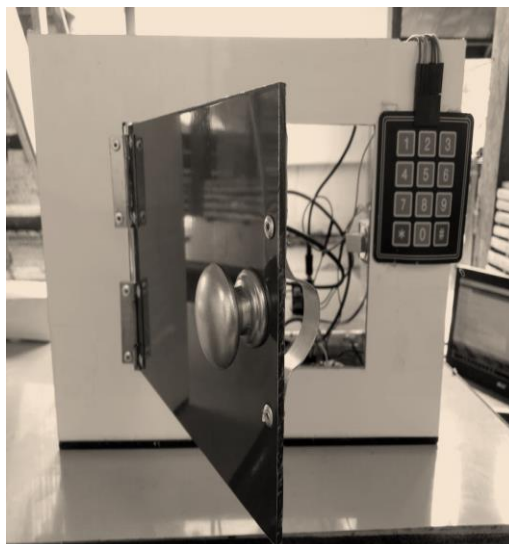Figure 4.5 Results of the keypad design in front of the safe

Figure 4.6 The design view of the safe when the safe is closed

The design view of the safe when the safe is open can be seen in Figure 4.7

Figure 4.7 The design of the safe when the safe is open

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Overall System test results

The design of the device is carried out by compiling a safe burglary detection system by entering the program on the Arduino nano microcontroller and on the NodeMCU via a computer. The program code is written using the Arduino 1.8.3 IDE software which functions to run and operate the microcontroller circuit. This program will later read data from the keypad and magnetic sensor if the code entered is correct, then the safe can be opened and if the code is entered incorrectly, the safe will not open and an alarm will sound when the safe is broken then the magnetic sensor will work and will send a notification message to Telegram bot application.

The message notification display on the application can be seen in Figure 4.8:

Figure 4.8 Display of message notifications on the telegram application bot

Conclusion

Based on The design of an android-based safe security detection system using Arduino Nano, then some conclusions can be drawn as follows: (1) This magnetic sensor based safe is very safe because it is equipped with a keypad where the keypad is set to enter a password that is designated for those who have access rights, so that only people who have access rights can control this tool. (2) Unlocking the safe using the keypad by entering the correct password will open the safe lock and if the password is entered incorrectly, the system will give an alarm notification in the form of sound. (3) The alarm system uses a magnetic sensor to detect the

safe, when the safe is forcibly opened, it can function properly and gives alarm notifications in the form of sound, and provides message notifications to users via the telegram application.

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