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Safekeeping Safe Doors Using Arm Cortex-A53 Microcontroller By Android

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A R T I C L E I N F O

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ABSTRACT

Safeguarding the safe by adding a lock or layered security makes it take a thief a long time to break into a safe. In order to increase the security of the safe, that is by adding a key that is controlled by a microcontroller. The conclusion obtained from this research is that a solenoid that functions as an electric lock can increase the level of security on a safe door controlled by a Raspberry Pi 3 Model B through an Android smartphone by entering a password.

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1. INTRODUCTION

The increasing crime rate, especially theft crime rate, encourages people to think about how to protect valuable assets with multiple layers of security. The use of a safe is an alternative for security in storing valuables. Inside the safe there are valuables and safes are often the target of theft, so that it becomes a motivating factor for people to think more about how to secure a safe. Protecting the safe by adding a padlock or layered security makes it take a long time for thieves to break into the safe. To increase the security of the safe is to add a key that is controlled by a microcontroller.

Create multiple layers of security in the safe. Making a lock that can be controlled from outside the safe is by embedding an additional key, then the key is accessed from outside the safe. The use of an Android smartphone can be an alternative as an additional key to the safe, so that when the key breach in the safe is successful, the next security thief cannot open the next lock because the key outside the safe is on the safe owner's Android smartphone.

This safe can be called a smart door, where this door works using a password. smart door work according to given digital code. Smart doors besides being able to open and close according to the commands given, can also know the surrounding environment such as knowing foreign objects that enter and pass through the area. (Faiz & C, 2017).

Several studies that have been carried out on safekeeping using a microcontroller include The Design of Intelligent Automatic-Door Based on AT89S52 (Yan & Wang, 2016), the results of this research, the design of the automatic door sensor uses a modular program design, which is to obtain signals via infrared of the human body. Subsequent research Raspberry Pi-Based Intelligent Mirror Design (Sun, Geng, & Dan, 2018), Under

working conditions, the system with raspberry pi is connected to the network via WIFI, and obtains information about the weather forecast from the API network interface specified replace index, time, date and other information, and then through the information provided displayed on the plasma screen. Furthermore, the Password Based Door Lock System (Prabhakar, Oza, Shrivastava, Srivastav, & Wadhwa, 2019), in this study the system is controlled by a keypad and installed on the side of the user's door, this will provide a known password and the information will be stored in the database. When the passcode will be entered correctly, the microcontroller will give instructions to the servo motor. The servo motor will perform the door unlock action.

The purpose of this study is how to increase the level of security in the safe by designing and building a Raspberry Pi-based ARM CORTEX-A53 microcontroller with a Solenoid as an additional safe key and creating an Android-based application that can connect to a Raspberry Pi-based ARM CORTEX-A53 microcontroller.

2. RESEARCH METHOD

The single board computer that is as small as an ATM card and has many uses is the Raspberry Pi. Features ARM 64 bit quad-core Cortex A53 operates at 1.2GHz, contains 1 GB of RAM and it also supports graphics, provided by Video Core IV GPU includes onboard Wi-Fi 802.11n, Bluetooth 4.0 and has 4 USB Ports and an Ethernet Port. The Raspberry Pi needs to use the LINUX programming language to be able to communicate with the environment. Raspberry Pi performance can be achieved with optimal performance because it is based on LINUX. (Kumar, Kumar, & Kumar, 2019)

The place where the research was carried out was carried out independently by analyzing the Kozure KSB 20. In this study, the researcher divides the work into several stages, namely, project planning, which is the preparation of what is needed at the time of implementation later. At this stage the researcher carefully prepares what materials are needed to be able to run the experiment. After planning is done, the next step is to make a model in the form of a prototype that will be used as experimental material. The model is made as close as possible to the actual implementation later.

After the prototype model design is complete, the next stage is conducting experiments in accordance with the previously prepared plans. Experiments are carried out independently with complete equipment to support the success of the project.
After all is finished, the final stage is the experiment of experimental results. The experiment was carried out many times with all possible circumstances that would occur later In this section, an overview of the model that will be created and implemented will be explained. This picture of the design model to be made can be seen in Figure 1

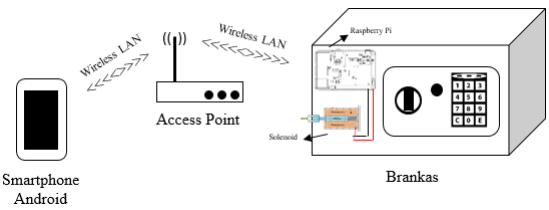

Figure 1. Android-based vault security design

2.1 Picture description

The Access Point provides an IP Address to the Android Smartphone, then the IP Address is used as access to the ARM CORTEX-A53 Microcontroller. The Access Point assigns an IP Address to the ARM CORTEX-A53 Microcontroller, then the IP Address is used to open access for the Android Smartphone to control the Solenoid. The solenoid receives commands from the ARM CORTEX-A53 Microcontroller to lock or open the safe door

3. RESULTS AND DISCUSSIONS

The working principle of the safe door security device using an ARM CORTEX-A53 microcontroller based on Raspberry Pi is controlled by Android. Android smartphones and Raspberry Pi are both connected to the access point, the Android application and the Raspberry Pi device have embedded a program or command in order to control the solenoid.

The solenoid here functions to lock or open the safe door. In the Android application, a login menu is created as a security to open the safe door. After successfully logging in, the user can lock or open the safe door by pressing the button on the Android application.

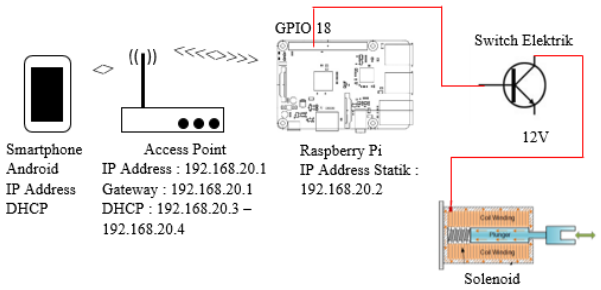

Figure 2. Android-based vault security design

In this study, researchers used the Raspberry Pi 3 Model B. The Raspberry Pi 3 Model B has blmany advantages, such as WLAN and Bluetooth module, usb port, lan card, operating system, remote desktop, and 40 gpio pins as input/output devices to be controlled. . This Raspberry Pi 3 Model B can work with a 5V voltage source. The micro usb port is a place to connect the voltage source.

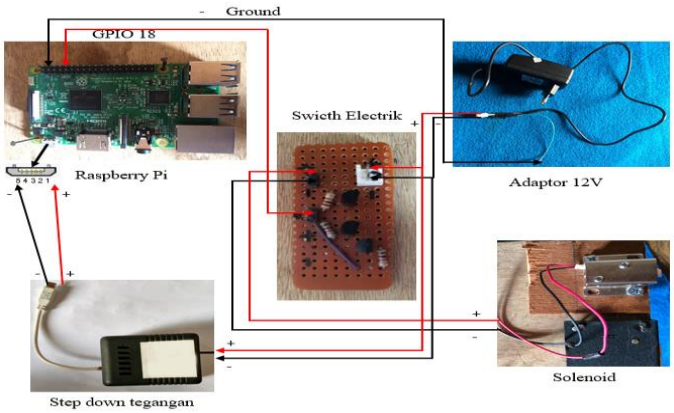

Figure 3. Components circuit design

Creation of vault security application using Android Studio. In making this application, the Raspberry Pi IP Address has been implanted and this aims to provide convenience to the owner of the safe. The application created will automatically connect to the Raspberry Pi when the Android smartphone is connected to the wireless LAN used by the Raspberry Pi. After making the designed application, the next step is to run the application. In Figure 4, the contents of the safe application display when it is connected to the Raspberry Pi.

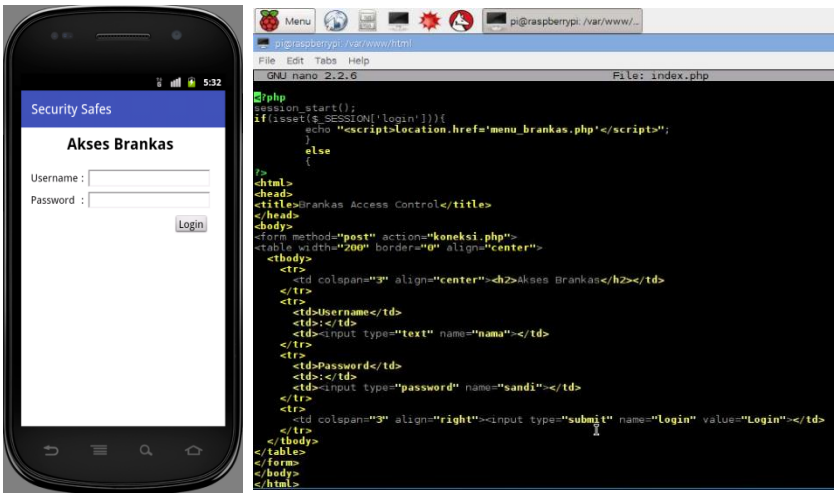

Figure 4. Components circuit design

At the login screen, enter the correct username and password. After successfully logging in, the menu will appear as shown in Figure 5

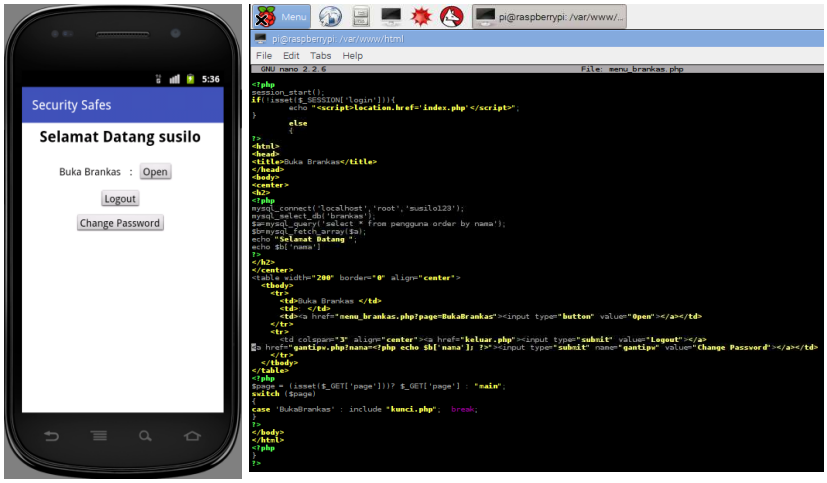

Figure 5. Components circuit design

The safe that was made contained a Raspberry Pi 3 Model B, Solenoid, Electrical terminals, 5V and 12V power supplies, and a switch. All the contents in the safe have been tested and the safe device made runs according to the researchers' expectations.

To open the safe, the Android smartphone must be connected to the access point. After successfully connecting, the next step is to open the safe door security application on Android. In the login menu, the owner of the safe must enter the username and password correctly. The menu opens when pressed, the solenoid will go in and last for 10 seconds.

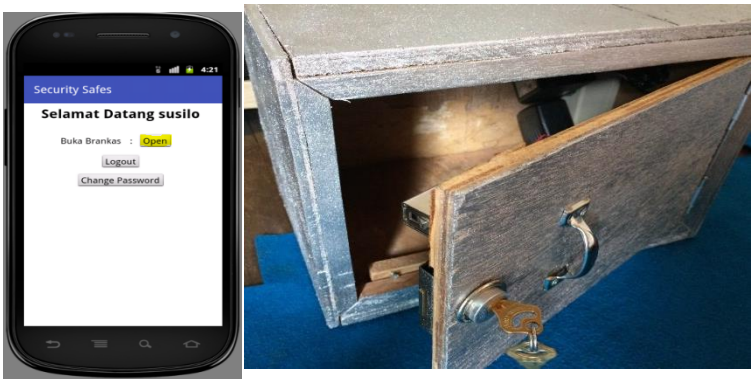

Figure 6. Use the open button

Looks like the solenoid is going in and can last for 10 seconds. This is intended to make it easier for safe owners to lock the safe door without pressing the button on the application and reduce owner errors when forgetting to lock the safe door

4. CONCLUSION

The conclusion obtained from this study is that a solenoid that functions as an electric lock can increase the level of security at a safe door controlled by a Raspberry Pi 3 Model B via an Android smartphone by entering a password. Accessing the basic security level to the safe and Android-based applications by entering a password can be used as access to open the safe door and must be connected to the same network (access point) as the Raspberry Pi 3 Model B. In order to increase the security level of the safe door security application, it is provided change password feature. This feature was created so that the safe owner can change the safe door application password to prevent other people from trying to enter the application. For further research, safe door security devices should use a UPS (*Uninterruptible Power Supply*) so that the safe can be opened when the electricity is off and provide information in the form of login history in the Android application.

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