

Enhancing System Security Through NFC (Near Field Communication) Technology

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Abstract: A safe is a tool used to store valuables such as money, jewelry, securities, and so on. The crime rate is increasingly high in this country, especially the crime rate of theft, which encourages people to create safes with extra security systems. To achieve a security system that has double or layered security requires sophisticated technology. The technology used in this safe security system uses NFC (Near Field Communication), keypad. By using NFC as a card reader, a special password has been given which can only be read by NFC. Meanwhile, using an Arduino Uno as a microcontroller and a password to access the safe door is very difficult to duplicate.

Keywords: NFC, Near Field Communication, Arduino Uno, Security System

INTRODUCTION

Technology moment This develop rapidly and has an impact on many aspect life moment This.Thing This seen from emergence Lots device very electronic different . Already very Lots method Which done for work man can made easier and also can save time workmanship but still get maximum results and time very good workmanship efficient Sudah sangat banyak cara yang dilakukan agar pekerjaan manusia dapat dipermudah dan juga dapat menghemat waktu pengerjaan tetapi tetap mendapatkan hasil yang maksimal dan waktu pengerjaan yang sangat efisien. Because the more fast development technology nowadays , a lot very technology new ones are emerging and there are also technologies that have been developed return become technology new .

Example utilization development technology is system security like security safe , place storage goods valuable.

Safe is a tools used For keep goods valuable like money , jewelry , letters valuable , and so (Sari & Syahwin, 2022). The crime rate is increasing high in this country , especially number crime theft push man For make a safe with system security Which extra . System Safe Which There is during This Still rated as low from aspect its security Because Still use key usual with easy can made duplicate and not equipped with announcement to owner safe about condition safe , Good announcement distance near or even notification distance Far (Duha, 2022).

Progress technology push man For create safe with extra security , such as using NFC and password as key For open hard safe For made duplicate . With use A scanning card on NFC system then system security only can open if safe read scanning card that has been own access . Then with use security like This can ensure A safe will accessible with safe by owner [4] . Maka dengan menggunakan keamanan seperti ini dapat memastikan sebuah brankas akan dapat di akses dengan aman oleh pemilik

In matter This researcher want to make a a system that can make it easier user safe For make it easier keep goods valuable to be more safe and avoid from theft .

Researcher previous Moh Muthohir and Sandi Prayoga (2021), entitled Prototype System Security Safe Use Arduino Uno Based RFID Technology , System This Already using RFID as system security safe but system This need security addition so that more guaranteed its security (Muthohir & Prayogi, 2021).

Based on problem Which There is from study previously so in matter This researcher want to make system security on the safe with using card scan (NFC) and adding password as security additional to avoid from theft or burglary safe . Then based on background behind the with This writer lift title that is “ System Security Safe Based on NFC (Near Field Communication)”. With existence system This made researcher hope system This can overcome safe break- in .

METHOD

NFC (Near Field Communication) is useful features to transfer data from One device to device other without use cable . NFC is features that are not only can used with smartphones but also with device electronic other . (Aisuwarya et al., 2023)

NFC (Near Field Communication) is technology wireless distance short as usual need distance 4 cm or not enough For communicate (Hadiatullah, 2023).

The advantage of NFC (Near Field Communication) lies in its role as technology that enables user open various form communication and transactions with very convenient . NFC allows user do whatever they are want only with touch device they or put it near the services they provide want (Musman, 2021). NFC works between two adjacent devices.After connection intertwined in count seconds , information can exchanged between second device via NFC or technology without cable other .

NFC (Near Field Communication) devices have two method communication . If initiator always enter energy radio frequency and target supported by the field initiator , then called communication mode passive . If target and initiator own source energy Alone they in mode communication active . Mode this is the same as RFID mode .

Arduino Uno is a microcontroller board based on ATmega 32. Arduino Uno has 14 digital input/output pins (6 of which can used as PWM output), 6 analog inputs , oscillator 16MHz crystal , USB port , socket power , ICSP header , and buttons reset) (Saptono & Sumbiaganan, 2020). Arduino Uno includes all that is needed For support microcontroller . Connect with easy to your computer using USB cable , power with AC-DC adapter , or use battery For do booting .

Arduino uno working control signal electronic through the input and output pins on the microcontroller board . The input pins can used For read mark from the sensor, and the output pins can used For control the motor or LED lights .

Following This is Arduino Uno image .



Figure 1. Arduino Uno

Arduino is prototype electronic based on flexible , open- source microcontroller , with device hardware and devices easy software used .

Arduino is board microcontroller based on Arduino Uno with 14 input pins from digital output, 6 input pins can be used as PWM output, 6 analog input pins, oscillator 16MHz crystal , USB port, power port, ICSP header, and reset button .

Arduino is A board containing microcontroller and a number of input / output (I/O) which makes it easier user For create various project electronic Which dedicated only handle objective certain .

As for component Supporter as following :

1. LCD (Liquid Crystal Display) is module the viewer who Lots used Because the look interesting . LCD functioning For display information What is done by the system control . Due to its affordable price , LCD is the most common used moment This is type M1632. LCD M1632 is LCD module powered low with 2x16 screen (2 rows x 16 columns). This module equipped with microcontroller designed special For control the LCD.

2. Servo motor is a DC motor equipped with series control with system integrated closed feedback in the motor . In a servo motor, the position The rotation of the motor shaft is reported to the circuit control inside the servo motor. This servo tool used For open and close door . Servo Motor is type of motor that has cable . Each used as one power, ground , and control . Cable control used For instructs the motor to turn the rotor to position certain . Usually , the rotor only turn up to 200°. However , there are also some that can rotate 360°.

3. Keyboard is buttons arranged in matrix (row x column) for reduce microcontroller input pin usage . Keyboard matrix This using 8 pins for displays 16 characters . This it is possible Because row keys arranged horizontally and vertically , forming rows and columns . Section keyboard This play a role as input and processed by Arduino Uno and the results displayed on the LCD. The keyboard used is keyboard 4x4 matrix used For enter code password into microcontroller .

4. Buzzer is used as an alarm and control the alarm on/off. Buzzer is one of the component electronics that can change signal electricity become vibration sound . This buzzer often used in alarm systems . It can also be used as indicator acoustic . Buzzer is component electronics that are classified as transducer . Simply put , a buzzer has two legs, the positive and the negative . Simply put , it can give voltage positive and negative from 3 to 12V. You can try this buzzer without use Arduino board that has been programmed . Therefore that , determine input voltage only between 3 and 12 V (voltage operation of the buzzer). The impedance value of the buzzer is the same with speakers. If mark its impedance not enough from 10 ohms, you can connect it direct to Arduino. If its impedance big , driver is needed for increase incoming current to the buzzer. You can use transistor circuit .

5. Step-down very useful in electronics . Transformer or normal called transformer is a tool static that changes energy electricity from a series to series other without need moving parts . Function step down transformer is change voltage and current without change frequency . Step down transformer is step -down transformer voltage output . The step-down transformer acts as dropper voltage Because amount winding more secondary A little compared to with primary winding . Transformer type This very easy found especially on the AC/DC adapter. The Buck function is used For change voltage tall with current low become voltage low with current height . Function the main buck is For lower voltage to be adjusted with need electronics .

6. Supply Power is a components used For give voltage and current to all over component so that all over block series can function . Source electricity moment This designed For change substance energy base like energy sun , energy wind , and energy chemistry become energy electricity (Raudiah & Elfizon, 2020).

During This the system that has been walk Still use manual system with how to open door Alone No with help system . Based on analysis results testing the system that has been walking , performance safe moment This walk Enough Good However Still need development more system effective and efficient .

From analysis the so writer look for solution For make it easier in storage goods , with to design tool storage like safe that has security Already use technology so that more streamline time . Where in safe there is Arduino as control center for to order LCD so that display order to user For do scan the id card on NFC (), then LCD will emit order furthermore For enter password . so that data that enter will processed by Arduino Then to rule Servo so that work For open door safe automatically .

The system that will built or developed using NFC (Near Field Communication) as system security and arduino uno ide as center controller logic and data processing both input and output. System This use scan card And password Which where is everyone system Thiswawe will connected to Arduino the idea . Arduino this idea that will be arrange all Work tools , then system will work in accordance the command that has been made .

Draft from design the system used For create system security safe which use scan card and password based NFC (Near Field Communication) is with consider a number of aspect technology that develop And Also For efficiency use system level Next . Next This is picture design the safe that will designed .

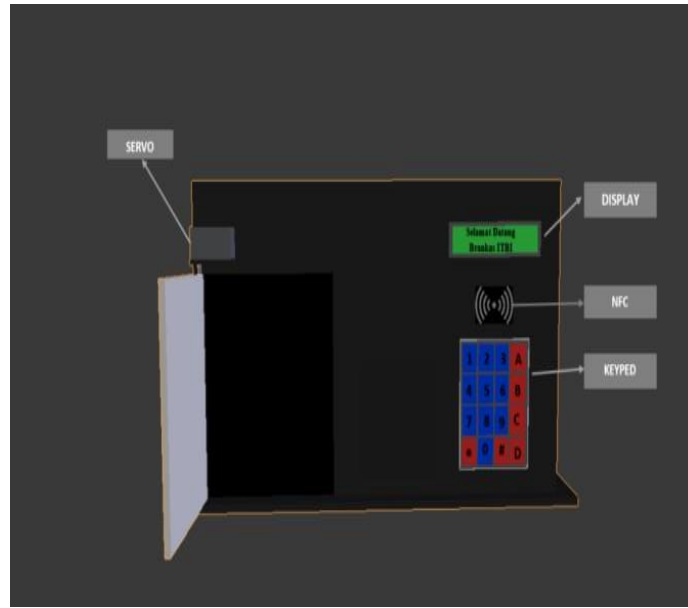


Figure 2 . Design safe

In design system device hard This will outlined using a block diagram which is description base from design the system that will built . Each block diagram have function each of them . As for diagram block from system device hard Which designed is as shown in the picture following .

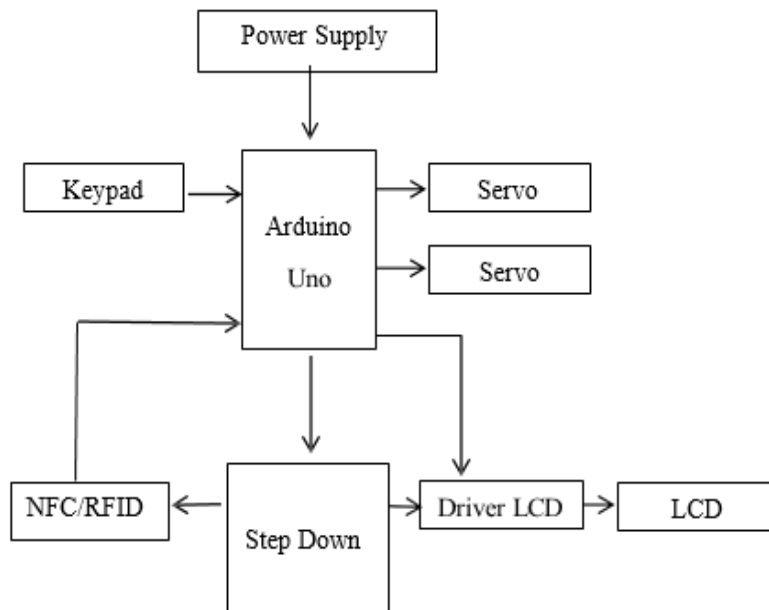



Figure 3 . Block Circuit Diagram

System security safe NFC (Near Field Communication) based designed use series the main one that has its function each .

In design system This device soft Which used is Software Arduino IDE, which is an IDE compiler for family microcontroller arduino , where language used is more C language easy understood and very suitable in need design hardware . This compiler is also very effective Because account give information message error If there is Language or list program Which wrong. Here This is appearance software Arduino IDEA.



```

sketch_oct04a | Arduino 1.8.12
File Edit Sketch Tools Help
sketch_oct04a
#include <LiquidCrystal_I2C.h>
#include <Keypad.h>
#include <Servo.h>
#include <SPI.h>
#include <MFRC522.h>
#include <Wire.h>

// inialisasi pin RFID
#define SS_PIN 10
#define RST_PIN 9
MFRC522 mfrc522(SS_PIN, RST_PIN);

Servo myservo;
int pos = 82;
//int pos = 190;

//deklarasi akan jumlah baris dan kolom
const byte ROWS = 4;
const byte COLS = 4;

//string pd;
//string password = "1*";
//char keypressed;

char key_pressed = 0;

char initial password[4] = {'1', '2', '3', '4'}; // Variable to store initial password
    
```

Figure 4 . Arduino IDE Program Display

Flowchart of designed system shown in the picture following This .

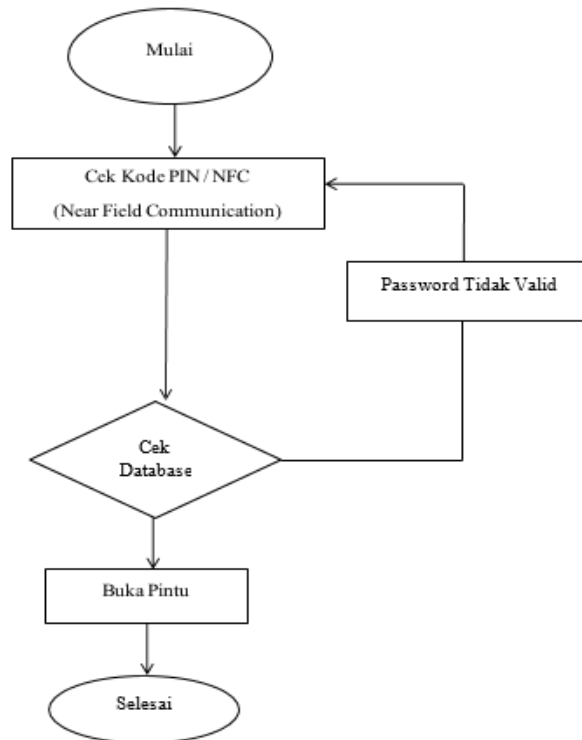


Figure 5. System Flowchart Security Safe

As for tools used in study making tool system security safe NFC (Near Field Communication) based , namely ; screwdriver , pliers , solder , tin , drill electricity , grinder , saw , brush , meter , bolts , mortar , washers , glue shoot , and ruler .

Besides that , as for materials used in the design process tool system security safe based on NFC (Near Field Communication) , namely ; Arduino Uno , LCD , keyped , step down , servo , acrylic , glue , spray paint , buzzer , plywood , NFC , power supply , cable , and paper sandpaper .

RESULT

As for results from design system security safe use password And ID card based on Arduino One as following . Following This is appearance front safe NFC based .



Figure 6 . View Front Safe

Following This is appearance side safe .

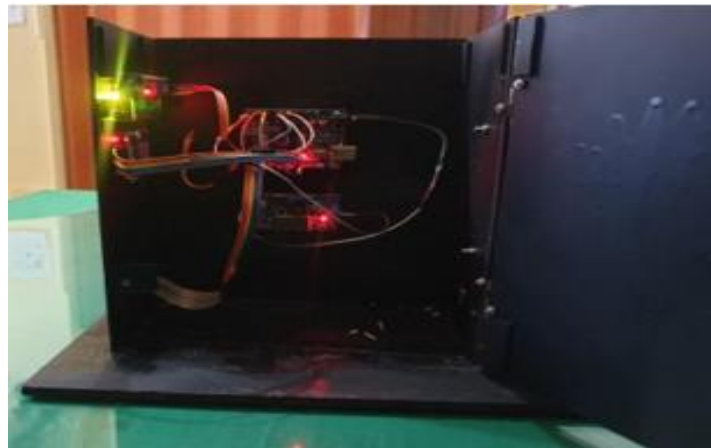


Figure 7 . Display Side Safe

Following is testing in a way overall System Security Safe Based on NFC (Near Field Communication) . When turned on so LCD will display as in the picture below This .



Figure 8 . Display LCD Beginning

When The scan reading of the card that appears on the LCD, then to stick ID Card in the NFC area then will appear card received , such as picture under This .



Figure 9 . Display Moment Attaching ID Card

After ID Card succeed so will appear reading card in accept , furthermore will appear enter password text , as in the image below This .



Figure 10 . Display When the ID Card is received

After card in accept , user will in ask for For enter password, can be seen in the image below This .



Figure 11 . Enter Password display

If enter the wrong password, then will appear wrong password writing on LCD like view below This .



Figure 12. Wrong Password display

If password has been readable right , then LCD will display password writing accepted , after That door will open in a way automatically , as in the image below This .



Figure 13. Correct Password display

From results process testing to system Which has obtained , so tester explain a number of advantages possessed system as following : (1) System This have two security filters , namely : password and ID card, when password Which entered Wrong so , alarm will sounds and If the password is wrong three times then Automatic password blocked . (2) System This more easy its operation and not need long time in operate it . (3) Change your safe PIN code with easy . The most important thing is use combination number unique difficult guessed .

Besides advantages , there are also lack from stem security safe This is as following : (1) Range to data theft : RFID can prone to to data theft because the signal can intercepted by appropriate device . Thief Possible can steal information access or clone tags RFID For to obtain access to safe . (2) Fees implementation system RFID in safe arguably expensive. This including cost software, hardware , and cost training For user . (3) Dependence to Power electricity : some big RFID systems require supply Power stable electricity . If happen blackout electricity , safe This No can in access or in use .

DISCUSSIONS

Programming using ISP (In System Programming) mode of the microcontroller must can programmed straight to the board series and series microcontroller must can be recognized by the downloader program. In testing This succeed done with recognized by him type microcontroller by program that is ATMega328. Here This is appearance behind safe .

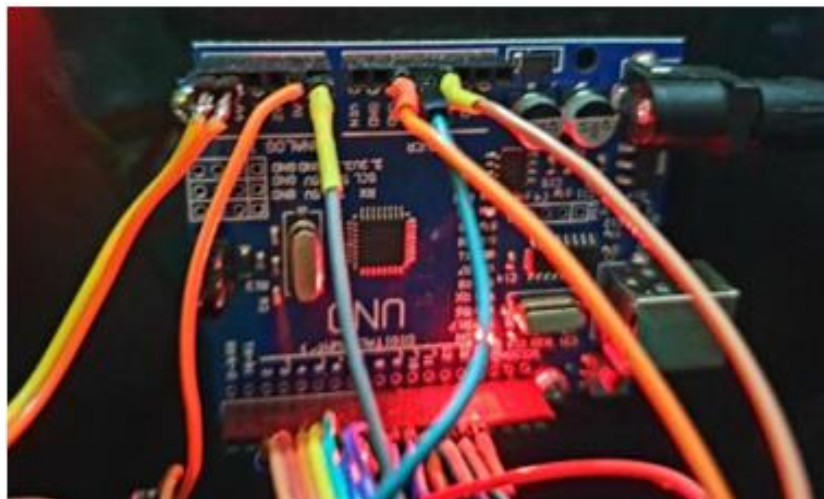


Figure 14 . Display Behind Safe

ATMega use crystal with frequency 8 MHz, if chip signature already recognized with good and deep time short , can it is said series microcontroller Work with Good with its ISP mode .

RFID Reader Module testing is carried out with method connect it with PC computer using RS-232 serial communication and Hyper-Terminal or serial terminal software. Function Hyperterminal This is For see the ID card owned by each successful RFID card (tag) read by RFID Reader. Here This is RFID (Id Card) display .



Figure 15 . Display RFID (Id Card)

At the stage LCD testing is done test For activates the system LCD . Activation LCD This done with how to display a number of character on the LCD.

LCD dots 2x16 character matrix can connected direct with Arduino Uno microcontroller , here The function of the LCD is as appearance results measurement and given a number of Description . LCD is connected direct through port 0 microcontroller Which functioning as sender data in form ASCII code , where the data is can translated by LCD per character . Following This is appearance LCD circuit .



Figure 16 . Display LCD Circuit

Testing on this servo motor circuit done with connect series with arduino and connect out out from series This with servo motor for move arm door so that the door can open . Following This is servo motor display .



Figure 17 . Servo Motor View

CONCLUSION

After do analysis And evaluation to study Which titled "System Security Safe Based on NFC (Near Field Communication)", with This researcher can take a number of conclusion n as following : (1) System security For safe This use RFID . (2) Process making door in the safe Still use in a way manual. (3) System security safe no use warning sign danger or u alarm . (4) System security safe Not yet effective And efficient

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