

CONTROL SYSTEMS OF LEVEL BUILDING LIGHT BASED ON ARDUINO AND ANDROID VIA BLUETOOTH WITH MIT INVERTOR

Winarno Fadjar Bastari¹, Hardi Anto Efendi²

Electrical Engineering Department, Faculty of Industrial Technology^{1,2}
University of PGRI Adi Buana Surabaya
email :winarnobastari1218@gmail.com

ABSTRACT

The automatic home control system is currently one of the interesting discussions to be developed, there are many innovations that can be done to facilitate human work in controlling the tools contained in the house. One of them is the use of android for controlling the tools that are inside the house and MIT Invertor is a software for making android applications with a design designed according to the design of the house. The control of home appliances / electronic devices that are often used nowadays are many that are integrated with mobile / smartphone devices. This study aims to design an automated home control system that can facilitate human activities in the home such as turning on and off lights and other electronics by using Android devices as a controller and using the HC-05 bluetooth module as a communication tool. The results of this study can show that the Android application can replace the function of the switch for controlling home appliances.

Keywords: Automation System, HC-05
Bluetooth Module, Android

1. INTRODUCTION

The current access control system is one of the most important aspects in everyday life. One form of electronic access control system that is currently being developed is a remote control system (Baskoro, 2014). This can be seen on a

wireless switch of an electronic device such as a remote control on a TV.

Mobile as a means of communicating with the advantages that can be carried everywhere. The development of mobile phones that is happening now is equipped with all the functions that and Mobile becomes the leading mobile device, which will replace the PC (Mulyadi, 2010). This smartphone (smart phone) has been equipped with technologies such as infrared light, bluetooth and even wifi as wireless communication media (Warangkiran, 2014).

Android is a smartphone operating system that is so popular lately. The main advantage of this operating system is the application support is very much free. The Android operating system is open source that can be modified or developed according to needs (Anonim, 2010). One application that can be developed is an application that is capable of being used effectively and easily to control other devices, one of which is an application that is able to replace a conventional switch into an electronic switch such as a home light controller.

Arduino is an open source electronic circuit board with an AVR microcontroller chip from Atmel company. Microcontroller is a "brain" that controls the input, process, and output of an electronic circuit. The software uses the C language programming language (Syahwil, 2013).

By utilizing the development of Android and Arduino-based smartphone

applications, a controller can be made such as an electronic switch that can be used to control lights inside the house. Power supply needed by Arduino is 7-12VDC which is obtained from the power supply or battery. The output from the digital pin is forwarded to the relay to turn on the 220VAC lamp.

This home light controller has advantages such as being easy to maintain because it is not checked every day, is fast in repair because the electricity source in the center lamp and electronic circuit is simple, and safe from the reach of children because this tool is placed in a box that can be mounted on the wall higher.

This study intends to combine Mobile devices with Arduino Uno that have been programmed as desired.

The program created on the Android-based MIT Inventor Visual Framework programming is related to the Scratch programming language from MIT, which is specifically the implementation of the Open Block distributed by MIT Scheller.

Teacher Education Program is taken from research conducted by Ricarose Roque. App Inventor uses the Kawa Language Framework and Kawa dials dialect developed by Per Bothner

and distributed as part of the GNU Operating System by the Free Software Foundation as a Compiler that translates visual block programming to be implemented on the Android platform. The visual appearance of the block programming app inventor can be seen in Figure 2.1. This research is not successful, namely the connection between bluetooth handphone and the HC-05 bluetooth module is different, and must be paired first.

App Inventor does not have to have a basic programmer, who understands codes or is involved in the world of information technology. Even App Inventor is not only used to create applications, but can also be used to hone logic, such as compiling a puzzle.

2. RESEARCH METHODE

Automation Control System Products Arduino Based And Android Home Lights Via Bluetooth With MIT Inventor designed for multi-storey homes, shop houses, buildings, and others. This product is intentionally made by using handphone as a device to turn on or give an on-off command on electronic equipment with a distance of 20-30 meters, by using bluetooth on mobile phones as a network connection.



Figure 2.1 Display visual block programming inventor app

This product consists of hardware namely Arduino Uno, Bluetooth module, and relay module and software using custom MIT Inventor for automatic on-off control systems. The application made by MIT Inventor is an application that will be installed on an Android mobile phone, with menus and commands according to the program that will turn on or turn off electronic equipment commands. The following is a block diagram design drawing.

The way the block diagram works is as follows:

- Mobile Hand phone As a communication device (device) that

is used to set the automatic switch command from human to home / building / shop. Of course with custom applications that have been installed on mobile phones by programmer.

- Bluetooth Module HC-05 Bluetooth module is used as a connection between the mobile phone and the brain from the microcontroller (Arduino Uno) to send data or coding programs. The Bluetooth module must be paired first, usually by entering password 123.

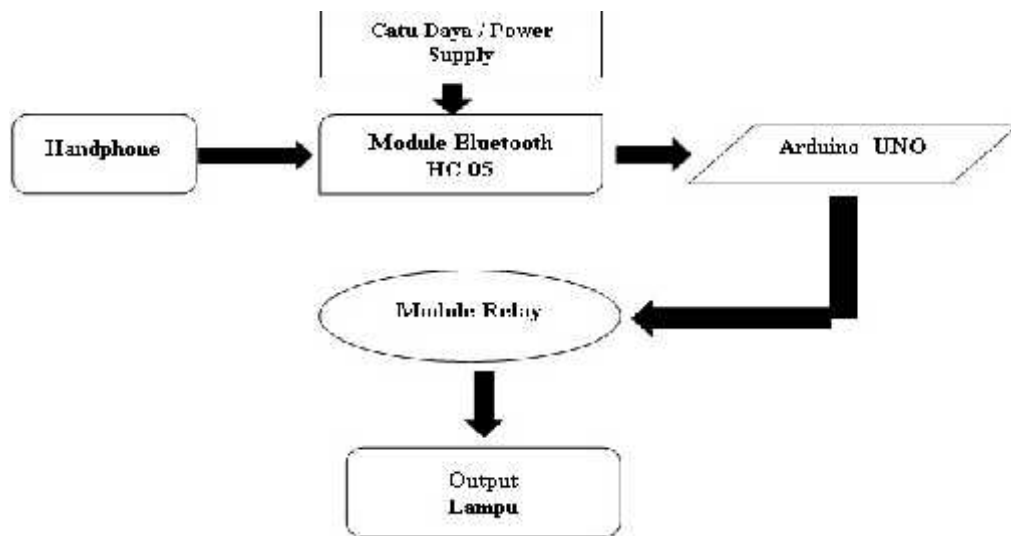


Figure 2.2 Product design BlockDiagram

- Arduino Uno functions as the main brain of an automated work system. Arduino Uno contains a program that has been uploaded by the programmer as desired. Arduino requires input voltage supply 3-5 volt DC.
- The Relay Module Works as a substitute for a manual switch, and the relay module works on the orders of Arduino Uno and later the relay module will control the on-off output.
- Lamp Light Output as the output of Arduino Uno which is controlled via cellphone.
- Power supply is used as a voltage source for Arduino Uno board, bluetooth module. And the voltage from the power supply must be adjustable from a range of 3-5 volt DC.

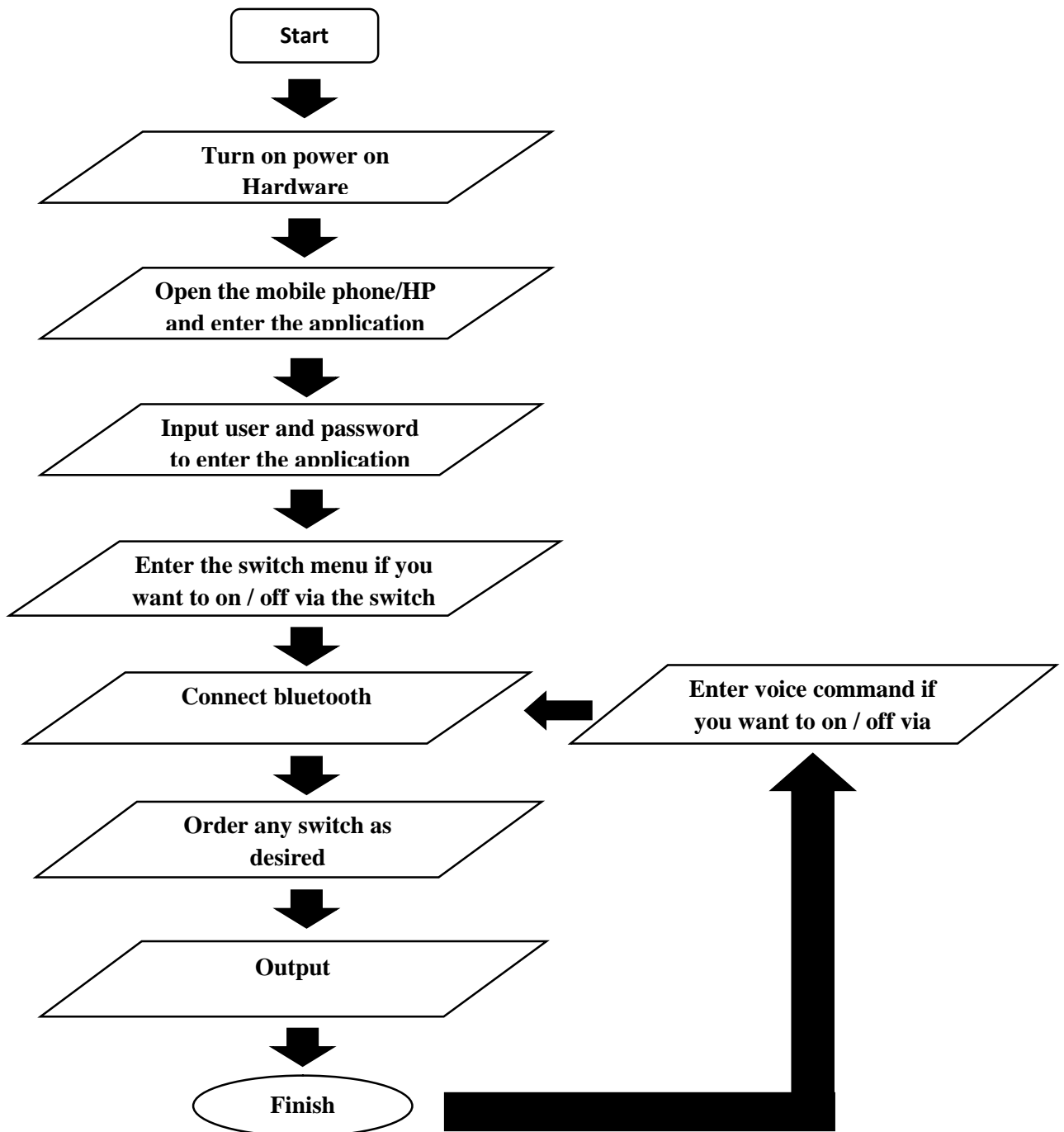


Figure 3.2 Flowchart the process of how the tool works

3. RESULT AND DISCUSSION

a. Product results and evaluation

1. Results of Software Research

The results of the implementation of the design

of a light control application made using an inventory app of 1.6 MB. There are six screens consisting of a login menu screen, main menu

screen, on / off switch screen, sound switch screen, application usage screen and screen for Logout. The controller application is installed on the Android smartphone brand OPPO type F1S version Android 5.1 Lollipop.

The next stage is testing the installed applications including testing the display of each screen, testing the function of each button both the login button, the bluetooth button, the light control button, and the bottom menu button. Testing the application requires a bluetooth connection with modules hc-05 and arduino uno. The display of the light controller application icon after being successfully installed on an android smartphone can be seen in Figure 3.1

The testing is as follows.

- a. Implementation and testing of the login menu screen.
 - b. Implementation and testing of the main menu layer.
 - c. Implementation and test the switch layer on / off
 - d. Implementation and testing of sound switches
 - e. Implementation of the usage instructions screen.
2. Hardware Research Results

The results of the implementation of the hardware design carried out need to be tested for the function of all the circuits. The circuit testing is carried out

separately and data and evidence is obtained that the system that has been made can work well..

- a. Power supply circuit testing.
 - b. Arduinoboard testing.
 - c. Pengujian rangkaian modul Bluetooth hc-05.
 - d. Testing relay module circuit.
- b. Data analysis

Based on the results of the research that has been conducted, the results of the study are presented in the form of presenting data that is in accordance with the results of measurements previously made. This study was carried out because of the sample used as respondents to retrieve data about the command switch response from mobile phones to Arduino output, and how fast the voice command response reaches the Arduino output.

1. Presentation of switch command data.
2. Presentation of Voice Command Data.
3. Discussion of the whole system

After testing the software and hardware of several circuits, the next step is to combine all the required parts into a lamp control prototype.

- a. Testing the system for controlling the on / off switch
- b. System testing controls the sound switch.

Based on the results of testing, it can be concluded that the results of Bluetooth communication tests on each mobile brand can run smoothly.

The farthest distance is as far as 17 meters with unobstructed space and 30.8 meters without obstacles with the brand Smartphone android brand Advan layer 7 inc., While the closest distance in the room as far as 13 meters and 20 meters in open space with brands of brands of Android smartphones Ever Cross.

4. Discussion of the application program

At this stage a program discussion was conducted on the application of the control of the lights that had been made.

App inventor merupakan tool untuk membuat aplikasi android berbasis visual block programming, maka pembahasan program aplikasi dilakukan dengan menampilkan gambar program visual block program.

- a. Discussion of the login menu screen program.
- b. Discussion of the main screen program.
- c. Discussion of Bluetooth command visual block program
- d. Discussion of the visual block program below the menu button.
- e. Discussion of the on / off switch screen program
- f. Discussion of the sound switch screen program.

5. Discussion of Arduino program code.

At this stage explain the code of the light control program that has been created using the Arduino IDE.

4. CONCLUSIONS AND RECOMMENDATIONS

a. Conclusion

Based on the results of the implementation of the design and testing of home lighting control systems with Android and Arduino via Bluetooth, several conclusions can be made.

- The light control application on an Android smartphone has been successfully created using the Inventor app tool of 1.6 MB. The light control application consists of an on / off switch and a sound switch. Each control switch displays buttons like a real switch and a light indication is displayed based on the condition of the lights on or off. The user must turn on and connect bluetooth on the smartphone to the bluetooth module hc-05 to control. All types of control switches succeed in controlling lights according to their respective functions.
- The lamp control device has been successfully built which consists of a power circuit, relay circuit, bluetooth circuit, light circuit. The control device is made to resemble a house with a size of 45x12x50 cm from a wooden board consisting of four rooms with 2.5W lights, and one box to combine all the control circuits.
- Merging between applications and devices utilizing Bluetooth from Android smartphones and Bluetooth HC-05 modules

installed on Arduino boards for Wireless serial communication. Making it easier for users to control lights with a maximum distance of 37.6 meters in open space.

b. Recommendation

From the testing and analysis of the light control system with Android and Arduino via Bluetooth, the writer tries to give suggestions for further research and development.

- This lamp control prototype can be developed with long-distance communication using WiFi, internet or SMS gateway communication media.
- Turning off the speech recognition feature in controlling the voice switch uses a library or other means so as not to depend on the internet connection.
- Users and passwords should be changed to be more secure and

there is help to reset the password if you forget the user and password.

5. REFERENCES

1. Arduino, 2011. Datasheet Arduino UNO.
2. H Safaat Nazruddin. 2015. Pemrograman aplikasi mobile smartphone dan tablet PC berbasis Android. Bandung: Informatika.
3. Kadir Abdul. 2017. Pemrograman Arduino dan Android Menggunakan APP Inventor. Jakarta: Elex Media Komputindo.
4. Kurnia Agung Pamungkas, T.N. (2016). APLIKASI ANDROID DAN MIKROKONTROLLER ARDUINO PADA KONTROL SMARTHOME DENGAN KOMUNIKASI BLUETOOTH. *Jurnal Ilmiah NERO*, 197.
5. Saputra, Z.R. (2015). PERANCANGAN PROTOTIPE SMART HOME BERBASIS ARDUINO, 45.