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Research Paper

New Method for Turning and Shutting Power Flow Light with Voice-Based Command Arduino Uno Using Smartphone

Y Yusmartato[1], Zulkarnain Lubis[2], Abdurrozzaq Hasibuan[3], Oris Krianto Sulaiman[4], Mhd. Asaad[5]

[1]*Department of Electrical Engineering, Faculty of Engineering, Universitas Islam Sumatera Utara Indonesia*
[2]*Department of Electrical Engineering, Faculty of Engineering, Institut Teknologi Medan Indonesia*
[3]*Department of Industrial Engineering, Faculty of Engineering, Universitas Islam Sumatera Utara Indonesia*
[4]*Department of Informatics Engineering, Faculty of Engineering, Universitas Islam Sumatera Utara Indonesia*
[5]*Department of Agribusiness, Faculty of Agriculture, Universitas Islam sumatera Utara Indonesia*
**Corresponding author E-mail: yusmartato@uisu.ac.id*

Abstract

Android provides an open platform for developers to create their own applications for use by a variety of devices, the purpose of this thesis to produce tangible results in providing comfort or ease of turning on the lights at home everyday without touching the switch, especially for physically disabled or difficult parents to stand. In making this thesis turn on the lights with arduino uno based voice command using smarthphone. The results achieved are to improve the comfort and convenience aspects for physically disabled or elderly people, difficult to stand or reach the light switch, where this tool can work after bluetooth device available dismartphone android. Basically the principle of user use this tool the user should be able to operate smartphone based on android operating system.

Keywords: *Arduino, Android, Lighting Controller, Bluetooth*

1. Introduction

The current technological developments encourage people to continue to think creatively, not only to explore new inventions, but also to maximize the performance of existing technologies to ease human labor in everyday life[1]–[3] such as the control of home lights or other electronic devices. Therefore, if all the lights in a house are controlled without having to switch the switch in the house then the role of microcontroller[4], smartphone android[5], and Bluetooth facility is very important to provide comfort and convenience in particular, for people with physical disabilities or people who are old. Utilization of android smartphone as a means of communication and smart phone has been a lot of development today, such as a tool to control home lighting that combined with microcontroller components and utilize existing Bluetooth facilities on android smartphone. From the ease and mushrooming of android smartphone among the community[6][7].

2. Literature Review

A. Microcontroller

Microcontroller is a microprocessor devoted to instrumentation and control. A microprocessor is a digital electronics device that has input and output and control with programs that can be written and deleted in a special way. Microcontrollers are computers in chips that are used to control electronic equipment, which emphasizes efficiency and cost effectiveness. Literally called "small controller" in which an electron system that previously required many supporters such as TTL and CMOS ICs can be reduced and ultimately centered and controlled by this microcontroller[8].

B. Arduino Uno

Arduino is an electronic kit or an open source electronic circuit board in which there is a main component, a microcontroller chip with AVR type from Atmel company[9]. Microcontroller itself is a chip or IC (Integrated Circuit) that can be programmed using a computer. The purpose of embedding the program on a microcontroller is so that the electronic circuit can read the input, process the input and then produce the output as desired. In general, Arduino consists of two parts, namely:

a. Hardware is an open source input/output (I/O) board.
b. Arduino software is also open source, including software Arduino IDE, to write programs and drivers for connection with the computer.

C. Arduino Programming Language

Arduino programming language is C language. This language has been simplified using simple functions so that beginners can learn it quite easily[10]. Arduino also simplifies the process of working with a microcontroller. Some of the reasons why C language is widely used include:

a. C language is available in almost all types of computers.
b. The C language code is portable.
c. Language C only provides a few key words.
d. The C language program executable process is faster.
e. Larger library support.
f. C is a structured language
g. In addition to high-level languages, C is also considered a medium-level language

D. Bluetooth Module HC-05

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Bluetooth Module HC-05 is a wireless communication module at 2.4GHz frequency with connection options can be as slave, or as master. Very easy to use with microcontroller to create wireless applications. Interface used is serial RXD, TXD, VCC and GND[11]. Built in LED as an indicator of bluetooth connection. Input voltage between 3.6 ~ 6V, do not connect with power source more than 7V. Current is unpaired around 30mA, and when paired (connected) is 10mA. 4 pin 3.3V interface can be directly connected to various microcontrollers (specifically Arduino, 8051, 8535, AVR, PIC, ARM, MSP430, etc.). The effective range of a range of 10 meters, although it can reach more than 10 meters, but the quality of connection is decreasing.

E. Relay Module 4

Relays are electrically operated Switches and are Electromechanical (Electromechanical) components consisting of two main parts namely Electromagnet (Coil) and Mechanical (a set of Switch Contacts / Switches)[12]. Relays use the Electromagnetic Principle to drive the Switch Contacts so that a small electric current (low power) can conduct higher voltage electricity. For example, with a Relay using 5V and 50mA Electromagnets capable of moving the Armature Relay (which acts as a switch) to conduct 220V 2A electricity.

F. LED light

LED light or extension Light Emitting Diode is an indicator light in an electronic device that usually has a function to show the status of the electronic device[13]. For example on a computer, there are LED power lights and LED indicators for the processor, or in the monitor there are also LED power and power saving lights. LED lamps are made of plastic and semiconductor diodes that can be lit when powered by low voltage (about 1.5 volts DC). Various colors and shapes of LED lights, tailored to the needs and functions.

G. Basic 4 Android

Basic 4 Android is a tool RAD (Rapid Application Development) is used to create Android-based applications, where Android is an operating system for smartphones or tablets are growing rapidly and so popular today. Basic 4 Android consists of frameworks, libraries, and IDEs that are integrated with JAVA and Android SDK[14], [15].

3. Research Method

Plan or research design in the narrow sense interpreted as a process of collecting and analyzing research data. In a broad sense as the research design includes the process of planning and implementation of research.

The steps of preparation in the manufacture of the tool to turn on the light using voice commands are as follows:

1. Literature Study
   The author examines the reference in the can from several scientific papers such as journals thesis.
2. Library Studies
   The literature method, which is collecting data and information by reading references, websites, documents including the research ever raised, articles and journals related to the object of research.
3. Consultation
   Conducted in consultation with a supervisor to solve the problems encountered at the time of making software and hardware manufacture.
4. Testing Tools
   Performed by conducting experiments, testing modules and integrating the module with a program to control the system to be a unified whole and obtain the maximum possible results.

A. System Analysis

System analysis activities hold an important key in providing direction directives and determine the next stage of workmanship in terms of policy determination.

B. Problem Analysis

The old system uses manual control by means of direct physical contact between the user and the lamp switch as a connector or an electric circuit breaker to turn on the lamp. Such manuals are less effective for physically disabled or elderly people hard to reach the home light switch. So the authors designed a system that can control the lighting of home lighting using android smartphone as a media control on/off the lights.

C. Needs Analysis

Needs analysis is done to know the specification of the application needs to be built. At this stage will discuss about the hardware and software used in the manufacture of prototype control of home lights based arduino microcontroller using android smartphone.

D. Hardware Requirements

The needs are made to build this device is as follows:

1. Laptop
2. Smartphone Android
3. Arduino UNO
4. Bluetooth module HC-05
5. LED light
6. Cable Jumper
7. Relay Module

E. Software Requirements

The software used to build this device is as follows:

1. Arduino IDE 1.6.5 Windows
2. Operating System Windows 10 Pro 64-bit
3. Basic 4 Android 5.02

F. Feasibility Analysis

Not all requirements defined in the requirements analysis phase are feasible to be developed on this device. There must be a mechanism to justify whether the needs made are feasible to continue or not. There are several eligibility criteria that can be reviewed, among others, the feasibility of technology and operational feasibility.

G. Feasibility of Technology

Technically, this device is feasible to use because the technology of this device is the development of switches that already exist in the market are combined with android smartphone as a control medium through the bluetooth network. This device also uses Arduino Uno Microcontroller as the controller's brain. This technology is also innovative because its use can be controlled from a distance of approximately 9 meters. Not only that, the control of home lights arduino-based microcontroller using this android smartphone can also control more than one light.

H. Operational Feasibility

In terms of operational feasibility, this made tool has a user friendly operational that is by using android smartphone as a controller of the switch, which helps the user in deciding or turn on the home lighting. Users also do not need to do special exercises to operate this device because this device is very easy to use.

I. Block Diagram

The hardware design using the block diagram of the system designed as shown in the block diagram below:

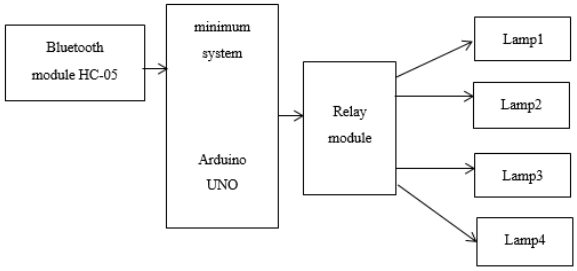


Fig.1: Block Diagram of the System

J. Software Designer At Arduino

Before the next stage, then first made a flowchart process of uploading program code or sketch to arduino board, with flowchart as follows:

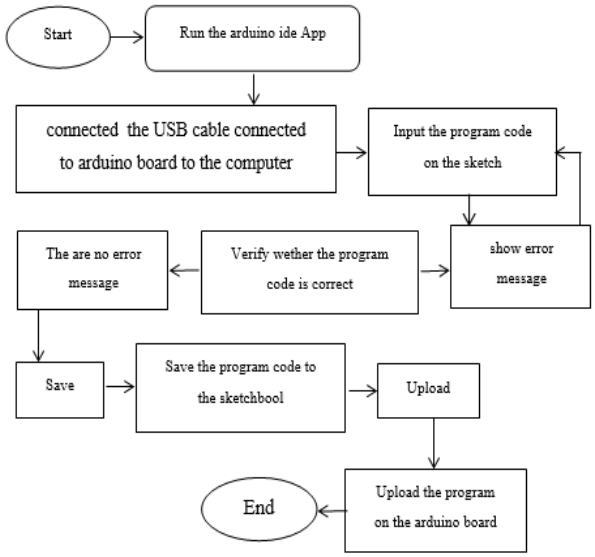


Fig.2: Flowchart Process Arduino Board

The first step to do is to determine the logic that will be applied to the lights to be controlled, then create algorithms that are then implemented using Arduino IDE.

Table.1: Table Lamp Logic Truth

INPUT		OUTPUT
A	B	LAMP
opened	opened	Out
closed	opened	Out
opened	closed	Out
closed	closed	Flame

From the logic, then made flowchart input command from software to be planted in Arduino Uno microcontroller, which is as follows:

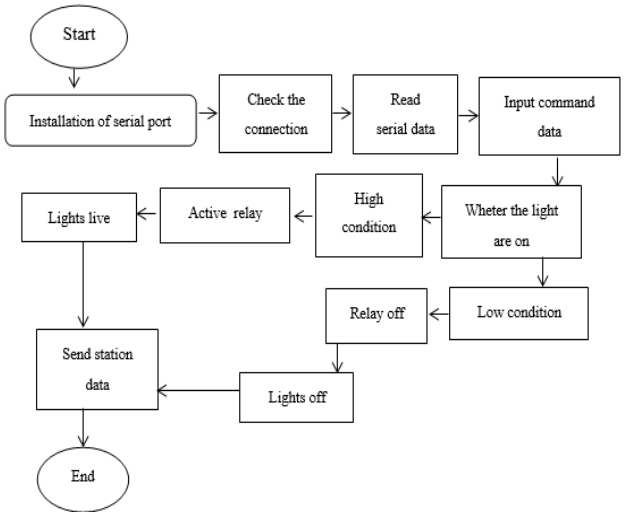


Fig.3: Flowchart input command voice on the Arduino

K. Diagram Software On Android

The design of software on android smartphone in this system is a form of display of programs that appear on the screen android smartphone with aims to provide an overview of the application to be built, so it will facilitate the implementation of the application in accordance with the screen size and simplify the making of the application. Here is a screen design on android application that will be used to control the lights.

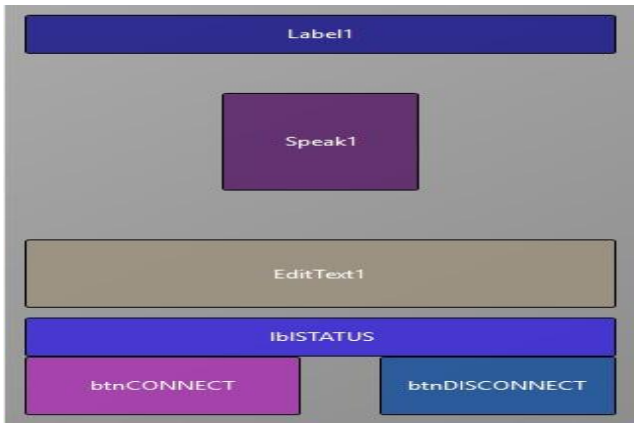


Fig.4: Design of the Controller Screen on Android

4. Results

Testing the system intended to test all the elements of software that is made whether it is in accordance with the expected. A system will run optimally if the system is run with minimum hardware and software. This is because on every system designed to require different hardware and software specifications in order to work optimally. The hardware and software requirements to be able to run "Turning on lights using voice commands" are as follows.

After all required system that has been prepared has been met then the next stage is to apply and build the system to be created.

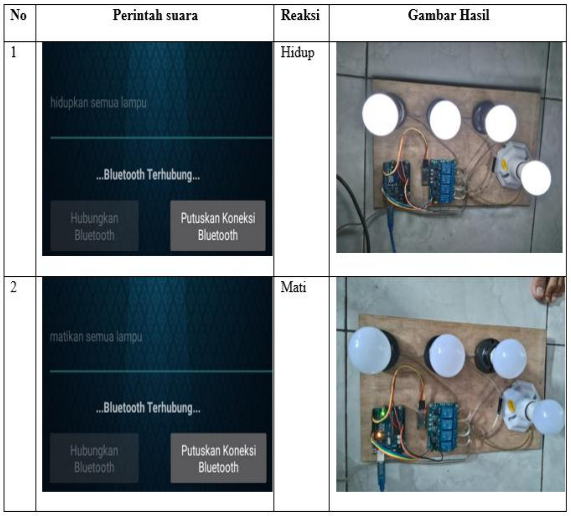


Fig.5: Test with Voice Commands

5. Conclusion

a) To turn on the light then use voice commands by connecting bluetooth to android smartphone and no need to reach the switch.
b) Lamp used does not depend on how much Watt is used.
c) Light control will not work if android smartphone outside the range of bluetooth wireless range from the bluetooth module because the bluetooth connection will be disconnected automatically.
d) To turn on the Lamp we just need to say keywords already in the program.
e) Speech recognition feature available on android smartphone can be used to control the light using voice command. This is done by initializing the voice command spectrum of a string into a character code that has been recognized by the microcontroller.

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