Stop Contact Controlled By Android App Via Bluetooth

Benny Agus Simanungkalit

Electrical Engineering, Efarina University

A R T I C L E I N F O	ABSTRACT
	Sockets are electrical equipment that has been used to connect and disconnect electricity from a power source to electrical equipment. Rapid technological developments encourage people to create a reliable and easy-to-operate socket. So far, the operation of the socket is done manually by pressing the socket. The very rapid development of technology has encouraged people to create electrical plugs with greater capabilities and ease of use. Therefore, designed an electrical plug that can be controlled by an android smartphone. For operation through the android application, sensors are needed that can be used to detect all the parameters needed in the use of sockets, there are several sensors used, namely current sensors, voltage sensors, and bluetooth. This sensor is connected to the Arduino UNO. By using the android application, we no longer need to walk to the location of the socket, simply by giving an order via android then the task of the socket can be carried out.

Corresponding Author:

Benny Agus Simanungkalit,
Electrical Engineering, Efarina University,
Griya Hapoltakan Kav. 1-10, Jalan Sutomo, Pematang Raya,
Bahapal Raya, Kec. Raya, Simalungun Regency, North Sumatra 21162.
Email: benyagus@gmail.com

1. INTRODUCTION

In the current era of technological development, electrical equipment that used to be simple in operation has now become more sophisticated. Along with technological developments, especially the development of communication technology, which is marked by the development and sophistication of mobile phones starting from generation 1 (1G) to now generation 5 (5G) which includes video conferencing technology. In addition, Bluetooth technology is also added which is already looking for active features on Android phones. So that wireless communication becomes easier. Through the Bluetooth feature we can access other equipment so that we can control other equipment through the Bluetooth feature.

Besides, the increasing need for electronic goods, people are also increasingly dependent on electrical energy sources. The socket is the last installation that can be directly connected to the public's electronic equipment. But in reality there are still many obstacles encountered in the connection between the socket and electronic equipment at this time. And if you forget to turn off the socket, there will be a potential short circuit that can cause a fire. One of the things that most often causes fires due to electrical short circuit is the habit of users who do not remove the plug from the outlet after using electronic devices such as cellphone chargers, televisions, irons and other electrical equipment. In addition, if you forget to turn off the socket, there will be a waste of electrical power. This is because even if the electronic device is not used, it is still connected to the socket, there will still be power supplied.

To minimize these risks, we need a way to control the outlet so that its use can be safer. Generally, outlets sold in the market can only be controlled using an on/off switch and are less efficient because the user

has to be near the outlet to turn it on/off. There are also several design innovations to control the outlet, namely the use of Bluetooth to control electronic equipment.

A.   Android Smartphone

Smartphone is an electronic device which is a development of telecommunication technology. Currently, smartphones or what are often referred to as smart phones are not only used as telecommunications tools. That's because smartphones have several features or functions that users can use for various things such as entertainment and business.

Just like on a computer or laptop, a smartphone requires an Operating System (OS) in order to work properly. Android is a smartphone operating system created by the Google.Inc company that gives its users the freedom without any special fees or free. In Indonesia, currently the Android operating system is the operating system that is widely used and the most familiar in the community. This is because of the ease and freedom of installing applications on the operating system.

B.   Bluetooth

Bluetooth connects and can be used to exchange information between devices. The specifications for this Bluetooth device were developed and distributed by the Bluetooth Special Interest Group . Bluetooth operates in the 2.4 GHz frequency band by using a *frequency hopping transceiver* that is capable of providing voice and data communication services in *real time* between bluetooth *hosts* over a limited distance. The disadvantages of this technology are its short range and low data transfer capability. The characteristics of Bluetooth can be seen in the following table.

Table 1. Bluetooth Characteristics

Parameter	Spesifikasi
Transmiter	
Frekuensi	ISM band, 2400 – 2483.5 MHz (mayoritas), untuk beberapa negara mempunyai batasan frekuensi sendiri, spasi kanal 1 MHz.
Maksimum Output Power	Power class 1: 100 mW (20 dBm)Power class 2: 2.5 mW (4 dBm)Power class 3: 1 mW (0 dBm)
Modulasi	GFSK (Gaussian Frequency Shift Keying), Bandwidth Time: 0,5; Modulation Index: 0.28 sampai dengan 0.35.
Out of band Spurious Emission	30 MHz – 1 GHz: –36 dBm (operation mode), –57 dBm (idle mode)1 GHz — 12.75 GHz: –30 dBm (operation mode), –47 dBm (idle mode)1.8 GHz — 1.9 GHz: –47 dBm (operation mode), –47 dBm (idle mode)5.15 GHz —5.3 GHz: –47 dBm (operation mode), –47 dBm (idle mode)
Receiver	
Actual Sensitivity Level	–70 dBm pada BER 0,1%.
Spurious Emission	30 MHz – 1 GHz: –57 dBm1 GHz — 12.75 GHz: –47 dBm
Max. usable level	–20 dBm, BER: 0,1%

C.   Arduino Uno

Arduino Uno is a board that uses the ATmega328 microcontroller. The Arduino Uno has 14 digital pins (6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a voltage source connector, an ICSP header, and a reset button. Arduino Uno contains everything needed to support a microcontroller. Just connecting it to a computer via USB or supplying DC voltage from the battery or AC to DC adapter can get it working. Arduino Uno uses an ATmega16U2 programmed as a USB to serial converter for serial communication to a computer via a USB port. "Uno" means one in Italian and was named to mark the launch of Arduino 1.0. Version 1.0 is the reference version of Arduino going forward. Arduino

Uno R3 is the latest revision of the Arduino series of boards, and the reference model for the Arduino platform.

Figure 1. Arduino UNO

The technical data for the Arduino UNO R3 board are as follows:
- Microcontroller: ATmega328
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12 V
- Input Voltage (limit): 6-20 V
- Digital I/O pins: 14 (6 of them are PWM pins)
- Analog input pins: 6
- DC current per I/O pin : 40 mA
- DC current for pin 3.3 V : 150 mA
- Flash Memory : 32 KB with 0.5 KB used for bootloader
- EEPROM : 1 KB
- Timing Speed : 16 Mhz

Arduino Uno Input and Output Pins Each of the 14 Arduino Uno digital pins can be used as input or output using the pinMode(), digitalWrite() and digitalRead() functions. Each pin operates at 5 volts. Each pin is capable of receiving or producing a maximum current of 40 mA and has 10 internal pull-up resistors (disconnected by default) of 20-30 KOhm. In addition, some digital input pins have special uses, namely:
- Serial communication: pin 0 (RX) and pin 1 (TX), used to receive (RX) and send (TX) data serially.
- External Interrupt: pins 2 and 3, these pins can be configured to trigger an interrupt on a low value, an up or down side, or when a value changes.
- Pulse-width modulation (PWM): pins 3, 5, 6, 9, 10 and 11, provide 8-bit PWM output using the analogWrite( ) function.
- Serial Peripheral Interface (SPI): pins 10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK), these pins support SPI communication using the SPI library.
- LED: pin 13, there is a built-in LED connected to digital pin 13. When the pin is High, the LED is on, otherwise when the pin is Low, the LED goes out

The Arduino Uno has 6 analog inputs labeled A0 through A5, each pin providing 10 bits of resolution (1024 different values). By default the pins measure voltage values from ground (0V) to 5V, although it is possible to change the upper limit value by using the AREF pin and the analogReference( ) function. In addition, some analog input pins have special functions, namely pin A4 (SDA) and pin A5 (SCL) which are used for Two Wire Interface (TWI) or Inter Integrated Circuit (I2C) communication using the Wire library .

- TWI: A4 or SDA pins and A5 or SCL pins. Support TWI communication.
- Aref. Voltage reference for analog inputs. Used with analogReference( ) .
- Reset

D. Push Button

A push button is a push button that functions as a breaker or connector for electric current from a current source to an electrical load. The working principle of the push button is that if under normal conditions or there is no pressure, the contact does not change, if the push button is pressed, the NC (normally closed) contact will open and/or the NO (normally open) contact will be connected . (Supriyanto, 2015) Push buttons are distinguished into several types, namely: 1. Normally Open (NO) Type This button is also called the start button because the contact will close when pressed and open again when released. When the button is pressed, the moving contact will touch the fixed contact so that an electric current will flow. 2. Normally Close (NC) Type This button is also called the stop button because the contact opens when pressed and closes again when released. The moving contact will be separated from the fixed contact so that the electric current will be cut off. 3. Type NC and NO This type of contact has 4 terminal bolts, so that if the button is not pressed then a pair of contacts will be NC and another contact will be NO, when the button is pressed the closed contact will open and the open contact will be closed.

Figure 2. Push Button

E. LED

Light Emitting Diode or often abbreviated as LED is an electronic component that can emit monochromatic light through a forward voltage. LEDs are made of semiconductor materials which are a family of diodes. LEDs can emit various colors, depending on the semiconductor material used. LEDs can also emit invisible infrared light, like in a TV remote. LED has 2 poles namely anode and cathode. In this case the LED will light up when there is an electric current flowing from the anode to the cathode.
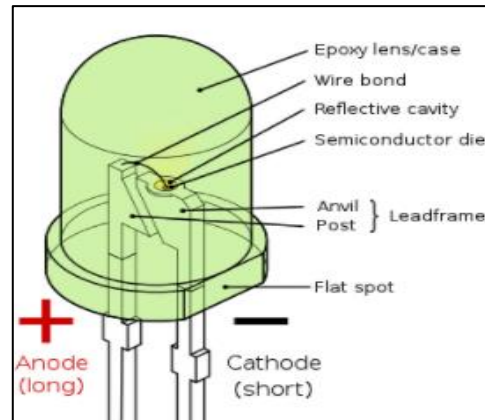
Figure 3. LED

F.   Bluetooth Module

Bluetooth is the industry communication standard for wireless personal area networks. Bluetooth can be used to connect or exchange information between electronic devices wirelessly within a short range of approximately 10m. HC-05 is an easy-to-use bluetoothSPP (Serial Port Protocol) module for wireless serial communication (wireless) that converts serial port communication into bluetooth communication. HC-05 uses bluetoothV2.0 + EDR (Enchanced Data Rate) 3 Mbps modulation by utilizing radio waves with a frequency of 2.4 GHz
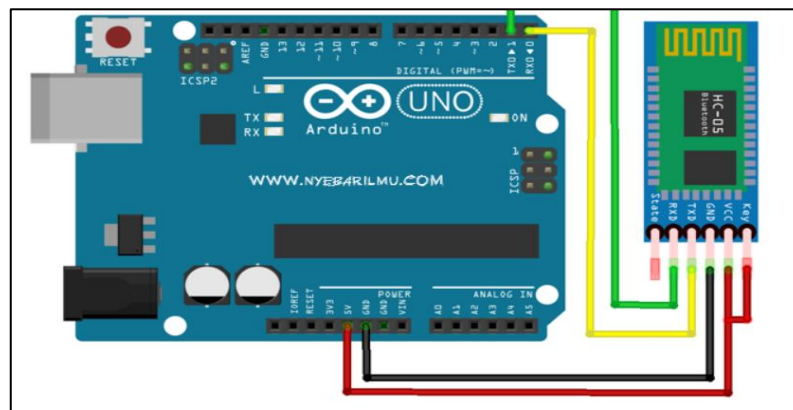

Figure 4. Bluetooth module with arduino

2.   RESEARCH METHOD

Based on on destination which want to achieved method- method which used in the preparation of this research These are: Design of an Android-Based Socket Control is the design and manufacture of a tool that functions to control household electronic equipment via a bluetooth connection with an application that is already installed on an android smartphone. This tool is composed of several electronic and electrical components. Among them are push buttons, sockets, bluetooth modules, arduino uno, current sensors, relay modules, LEDs and several supporting components such as power supplies, fuses and on/off switches. The flow of making this tool can be seen in Figure 5.

a.   System Working Principle

The working principle of the bluetooth socket that is controlled with this android application is to use the bluetooth on the smartphone to control household appliances that are connected to the bluetooth socket. The bluetooth socket is a box containing an arduino equipped with 19 input push buttons, bluetooth communication HC-05, arduino uno, output socket and LED . For its use, it is necessary to ensure that the "Stop Contact Bluetooth" application is installed on the smartphone. Then open the application and activate bluetooth for the interface between the smartphone and the device. When the

bluetooth socket is ON and connected to the electronic device to be controlled. The smartphone will detect electronic equipment in the ON or OFF condition for control. The LED will light up when the electronic device is ON. Push button is used to control the bluetooth socket manually.

Figure 5. Bluetooth working diagram to the socket
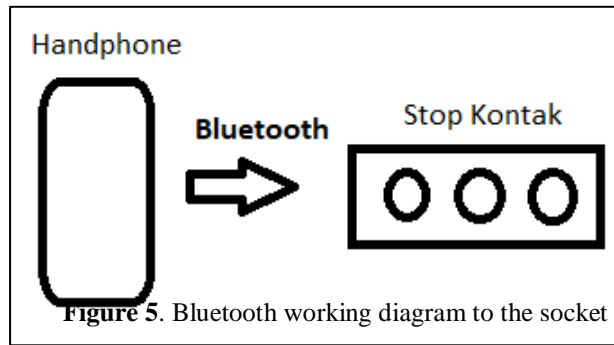
3.   RESULTS AND DISCUSSIONS

In this section, we will explain about tool testing, and then an analysis of the test results will be carried out. The test aims to find out how the tool works, as well as to determine the success rate of the tool that works according to specifications.

A.   ON/OFF Test

"ON/OFF" menu to turn the selected port on and off. When the slider switch on the android application is activated, the android will send serial data to the microcontroller via bluetooth, then the data obtained will be processed to turn on the selected socket port.

Table 2. Experiment On

Test	Hole 1	Hole 2	Hole 3
1	Succeed	Succeed	Succeed
2	Succeed	Succeed	Succeed
3	Succeed	Succeed	Succeed
4	Succeed	Succeed	Succeed
5	Succeed	Succeed	Succeed

Table 3. Experiment OFF

Test	Hole 1	Hole 2	Hole 3
1	Succeed	Succeed	Succeed
2	Succeed	Succeed	Succeed
3	Succeed	Succeed	Succeed
4	Succeed	Succeed	Succeed
5	Succeed	Succeed	Succeed

B.   Bluetooth Test

Table 4. Bluetooth testing experiment

Distance (Meters)	Test	Received	Rejected
5	1	☐	
	2	☐	
10	1	☐	
	2	☐	
20	1	☐	
	2	☐	
25	1		☐
	2		☐

From the results of testing the bluetooth circuit in table 4 when bluetooth is operated at a distance of 5 meters to 20 meters, bluetooth can still respond to operate the device. Meanwhile, when operated at a distance of 25 meters bluetooth cannot respond. From these tests it can be concluded that the maximum distance bluetooth can respond at a distance of 20 meters.

4.   CONCLUSION
This study discusses the control of sockets using Bluetooth from a smartphone. The results of this study can be concluded as follows:
1.   The "ON/OFF" menu can turn on and off the selected hole in the socket.
2.   The optimal working range of the control outlet is a maximum of 20 meters.

REFERENCES
Brian Evans, 2012. Beginning Arduino Programming, Technology In Action
Michael McRoberts.2012,Beginning Arduino, Technology In Action
https:// Pendidikanmu.com/2020/05/pengertian-bluetooth.html
Sugiantoro, B. (2005) 'Application of Bluetooth Technology for Wireless Communication', National Seminar on Application of Information Technology 2005 (SNATI 2005). Supriyanto (2015) Definition of Push Button Switch. Available at: http://blog.unnes.ac.id/antosupri/pengertian-push-button-switchsaklar-button-tap/
Kadir, A. (2017) Arduino & Android Programming. PT Elex Media Komputindo.
https://id.wikipedia.org/wiki/Bluetooth.