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Design Of Electric Switching Systems For Electronic Equipment In Home Based Internet of Thing (IoT)

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Abstract

The tool for designing an IoT-based electronic equipment switch system has been designed. This system uses the NodeMCU ESP 8266 microcontroller where the NodeMCU ESP8266 functions as a data processor, and also as a receiver for wi-fi networks emitted by wi-fi network systems. This tool system uses a control system using an Android smartphone to turn on and off switches for electronic devices at home, this tool uses a Wi-Fi network communication system so that the device system and Android smartphone can be connected, in this tool system it uses a DC fan and incandescent lamps as outputs. connected to an electrical switch system, and the switch can turn on and turn off electronic devices on designed devices. The smartphone application used in this design is the Blynk application which can be downloaded at Playstore or Google.com. This tool is expected to help and facilitate humans in controlling electronic equipment at home both at home and when traveling.

Keywords: *NodeMCU Esp8266, Smartphone Android, Wi-Fi, Blynk*

1. Introduction

In our daily activities, we often need to regulate the electric current of various devices, such as lights, fans, or other electronic equipment[1]. The main problem today is the wastage of electricity which is increasingly becoming the focus of environmental attention. This problem arises due to excessive electricity consumption which is ultimately triggered by human negligence. The impact of this problem can be seen in various aspects of life, both inside and outside the home. For example, daily activities at home can be disrupted due to delays in turning on or turning off electronic equipment in various rooms at night and in the morning. Even when we travel, we often forget to turn off these devices. This can be overcome by wiser management of electricity consumption and paying more attention to energy saving practices in daily routines.
Therefore, the use of an electric switch system can interact with an automatic system at home or an intelligent system. An electric switch is a device that functions to connect or disconnect electricity to the network. With this integration, users can remotely control these devices using a smartphone, voice commands, or through a computer network. These advantages provide comfort and
greater ease in managing electrical devices in a variety of situations.

2. Theoretical Basis

2.1. Switch

The switch is an electrical component that functions to provide a signal or disconnect or connect a control system. The switch is a mechanical contactor component that is driven by a certain condition. The switch is a fundamental component in an electrical circuit or system control circuit. This component is simple but has the most vital function among other electrical components. So a switch is basically a device that can or functions to connect or disconnect electricity (electric current) both in strong electric current networks and weak electric current networks.

There are several types of switches based on how they work and design:

1. On/Off Switch (Toggle Switch): This is the most common type of switch. Usually has an "On" (on) and "Off" (off) position. This switch can be moved by sliding, rotating, or pressing.

2. Touch Switch: This switch works by detecting physical touch or capacitance of the human body. They are often found in more advanced modern equipment and can replace physical switches with flat, touch-sensitive surfaces.
3. Motion Sensor Switch: This switch activates or deactivates the flow of electricity based on movement detected by the sensor. They are often used in automatic lighting systems, security and other devices that require response to movement.
4. Automatic Switch: This type includes various types of switches that work automatically based on certain conditions. An example is a light switch that activates lighting when the ambient light falls below a certain threshold.
5. Push Button Switch: This switch works by pressing and releasing. Typically used in applications that require temporary control, such as doorbells or emergency alarm buttons.
6. Smart Switch: These are switches that can be connected to a smart network or system, such as the Internet of Things (IoT), allowing remote control via a mobile phone app or other device.

2.2. Microcontroller

Microcontroller is a functional computer system on a chip. It contains the processor core, memory (a small amount of RAM, program memory, or both), and input-output equipment. Microcontroller is one of the basic parts of a computer system. Although much smaller than personal computers and mainframe computers, microcontrollers are built from the same basic elements. In simple terms, the computer will produce a certain output based on the input received and the program being executed[2].

2.3. NodeMCU ESP8266

NodeMCU is an electronic board based on the ESP8266 chip that is capable of implementing microcontroller and internet network (WiFi) functions. It was even found that a number of I/O pins were able to develop to form an application for monitoring or controlling IOT work. NodeMCU ESP8266 can be programmed with the Arduino compiler, using the Arduino IDE. An overview of the NodeMCU ESP 8266 framework, there is a USB (mini USB) port that makes program management easier. NodeMCU ESP8266 is a development derivative module from the ESP8266 type ESP-12 family of IoT (Internet of Things) platform modules. The use of this tool is very similar to the Arduino tool, but the difference is prioritizing "Connected to the Internet"[3].

2.4. Wi-Fi

In general, the notion of Wi-Fi is a data exchange technology using radio waves (wireless) by utilizing various electronic devices. It requires electronic equipment such as computers, smartphones, tablets, or even video game consoles to connect to computer networks, including the internet, via Wifi[4].

2.5. Blnyk

This application is a Cloud IoT platform for IoS and Android which is useful for controlling modules, Rasbery Pi, NodeMcu ESP32 and similar modules via the internet. For people who are still studying this application, it is very easy, because this application has many features to make it easier for users. From this application the user can control anything remotely wherever the user is as long as he is connected to the internet. How to make this application project users simply drag and drop[5].

2.6. Android

Android is a Linux-based operating system developed with the aim of making it easier for human users to access the internet. This operating system is popular and widely used on smartphones. With a smartphone that uses the Android operating system, users can carry out various computerized activities without limits, because the device can be taken and used at any time to access the internet[6].

2.7. Relay

Relay is a switch that is operated electrically and is an electromechanical component consisting of 2 main parts, namely electromagnet (coil) and mechanical (a set of switch/switch contacts). Relays use electromagnetic principles to drive switch contacts so that with a small electric current (low power) they can conduct higher voltage electricity[7].

3. Method Of Collecting Data

Research plan or design in the narrow sense is defined as a process of collecting and analyzing research data. In a broad sense, research design includes the process of planning and implementing research. The preparatory steps in the Design of an Electrical Switching System for IOT (Internet Of Things) Based Electronic Equipment are as follows:

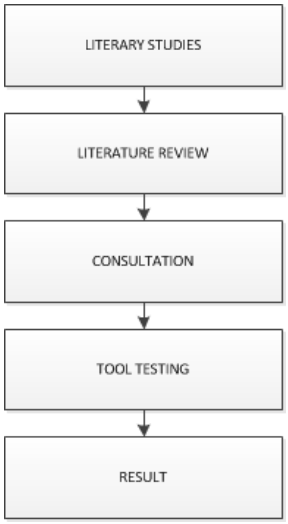

Fig. 1: Data Collection Method

3.1. Research Tools And Materials

1. The materials used to design an electrical switch system for IoT-based electronic equipment at home are as follows:
    1. USB data cable and rainbow cable
    2. NodeMCU ESP8266
    3. Wi-Fi network
    4. Smartphones
    5. Relay Module
    6. Adapter
    7. Glue
    8. Soldering
    9. Tin
    10. PCB board
    11. Some bolts and nuts

2. The Software used in this study is as follows :
    1. Arduino IDE
    2. Fritzing
    3. Microsoft Word

3.2. System Block Diagram

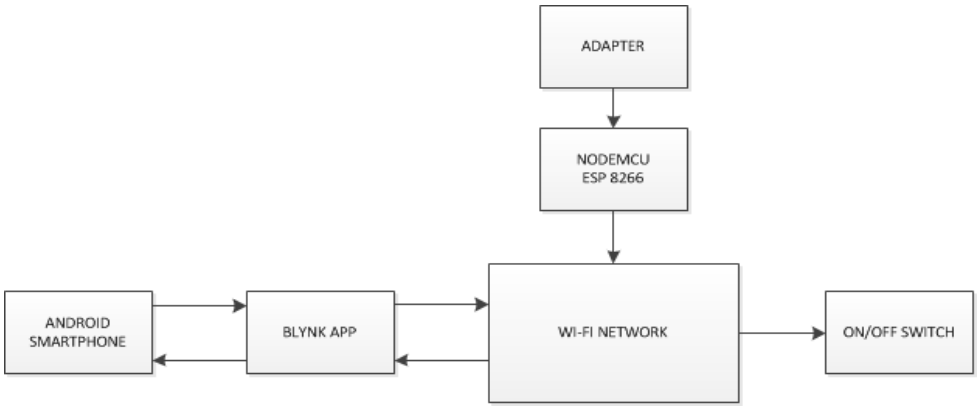

Fig. 2: System Block Diagram

The function of each block is as follows:
1. The adapter functions as a connector for electrical power to turn on the tool system.
2. NodeMCU ESP8266 functions as a processor, receiver and sender of data on the device system.
3. The BLYNK application functions as a communication media application on smartphones.
4. The Android smartphone functions as a signal input to turn on and turn off the output of electronic equipment
5. The Wi-Fi network functions as a communication medium between the device system and the Android smartphone.
6. The Relay Module functions as an electrical switch output to turn on and turn off the output of electronic equipment.

3.3. Overall Tool System Range

In this circuit, the adapter functions to provide a voltage supply from electricity to all existing circuits. The smartphone acts as a control system for the blynk app. The NodeMCU 8266 functions as a processor, data receiver and WI-FI signal transmitter for the device system, and the relay then functions as an output to turn on and turn off electronic equipment.

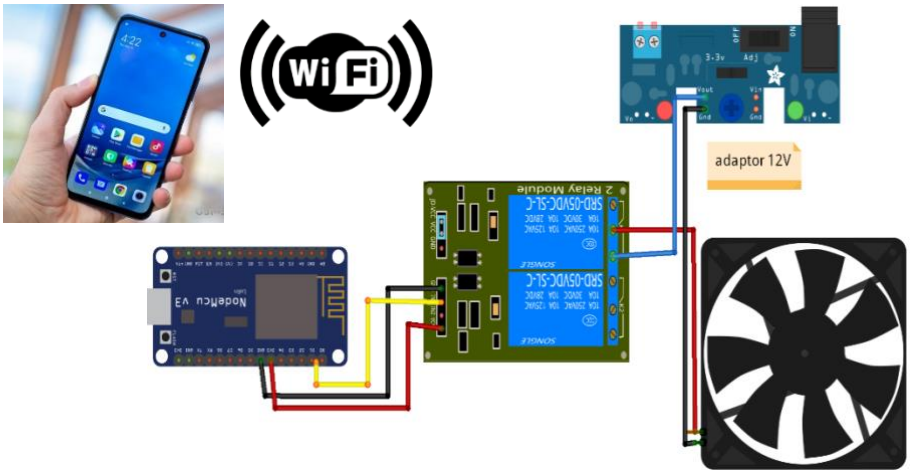

Fig. 3: Overall Tool System Range

3.4. System Flow Chart

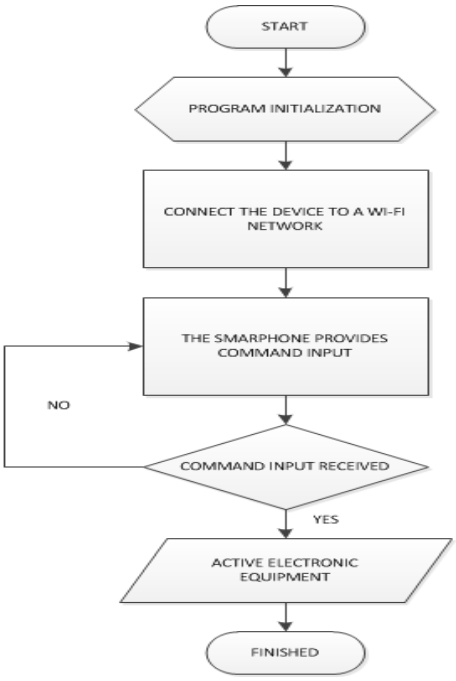

Fig. 4: System Flow Chart

Information :
From the flowchart above it can be explained that the design of this tool consists of several paths.
1. start
2. initialization of the program
3. then connect the device to the wi-fi network
4. The smartphone displays command input
5. If the command is not accepted, then return to the process of giving the input command
6. If the command input is received, the electronic equipment is on
7. done.

4. Conclusion

After carrying out the design stage which is then followed by the testing and analysis stage, it can be concluded:

1. The relay module functions as a replacement switch to turn on or turn off electronic equipment connected to the ESP8266 NodeMCU in the tool control system.
2. NodeMcu ESP8266 functions as a controller, data receiver and data processor as well as a WiFi signal receiver that can connect to Android
3. The relay module functions as a replacement switch to turn on or turn off electronic equipment connected to the ESP8266 NodeMCU in the tool control system

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