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IOT Smart Lamp Based on Arduino Using Internet Network

Agus Wiranto[1*]

[a]*University of Pamulang, Jl. Raya Puspitek, Kec. Pamulang, Kota Tangerang Selatan, Banten 15310, Indonesia*
[1] *dosen02367@unpam.ac.id* *
**Corresponding author*

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ABSTRACT

The development of technology in today's era is very rapid. So many innovations and many discoveries that affect everyday life make our daily lives easier and more efficient and effective, the combination of technology that we can see for example is smart home. Smart home can simply be interpreted as a smart home. Smart home can be translated as a house or building equipped with high-tech devices that allow various devices and systems to be connected to each other and is one example of technological developments that make work easier to be more efficient. From what we have discussed, here I want to make an IoT smart lamp when using electricity that can help our work more efficiently and more economically. With the progress in this era, will make a tool that makes it easy to turn off the lights with a smartphone and Arduino using the XP or Extreme Programming method. Which makes it easy to turn the lights on and off using a cellphone connected using WIFI without having to press the switch, just clicking on an application installed on our smartphone can turn a light on and off.

I. Introduction

The technology that is developing in this era is very rapid and has several impacts, one of which is the limited supply of electricity, which requires us to be more economical in its use. Indonesia's electricity consumption has continued to increase in the past five years, since 2014 by 878 kWh per capita, then in 2015 by 918 kWh per capita, 2016 by 956 kWh per capita. The figure rose again in 2017 by 1,012 kWh per capita and 2018 by 1,064 kWh per capita. "Indonesia's electricity consumption continues to increase, in 2018 it was recorded at 1,064 kWh per capita". One thing that can be done to save electricity is to use household lights as needed, therefore one way to save electricity is by controlling electrical or electronic devices and also the Internet of Things (IoT) has changed the trend of world society regarding communication needs. The Internet of Things (IoT) has the potential to change the world as the internet has done, maybe even better/

In general, the Internet of Things (IoT) is a concept that aims to expand the benefits of continuously connected internet connectivity. IoT technology transforms devices into something more valuable. The Smart Home concept is one of the technological developments in this modern era that involves programming languages and electro. Enabling the integration and exchange of data between physical devices and computers, this new wave of technology focuses on making human life more simplified and comfortable with the right mix of efficiency and productivity.

Smart home technology provides convenience for users where devices can be connected to each other and make work easier. in line with this development, it creates a new breakthrough for public lamps called Lamps. Smart home is divided into 3 categories: Comfort, Healthcare and Security. Smart Lamp devices have changed the concept of conventional lamps that are only able to illuminate into a device that controls the lights. However, the installation process in using the smarthome concept is not easy. With the extreme programming method, it can solve existing problems and facilitate the

smarthome concept. Research related to the development of smart lamps that were previously developed. In this study, the wifi communication component so that it can be connected. with the support of smartphones and devices, the development of smart lamps can be implemented. The application used is Android-based and the hardware uses Arduino. Control of electrical devices, especially lamps, is important in managing energy in a place, for example at home, buildings or other areas that have many lights, automation or control of something is very important in today's era to prevent waste of electricity, for example from people who travel and forget to turn off the house lights, for that we develop smartlamp technology, namely an application used to control lights online with the smarthome concept and using Arduino.

Some studies on the Internet of Things (IoT) include the first Internet of Things on motor speed control and monitoring [1]. Second about implementation of fuzzy logic method for air quality measurement system in medan city based on Internet of Things (IOT)[2], third internet of things using firebase and nodemcu for smart helmet [3], fourth about Mobile based electricity monitoring [4], fifth Internet of Things used during homecoming [5], sixth about Internet of Things for plant media monitoring [6], seventh internet of things in agricultural irrigation [7], eighth use of electrical power using the internet of things [8], ninth about home installation control using internet of things [9], tenth about flood monitoring system on MQTT protocol using internet of things [10].

II. Method

The method used in the design and manufacture of the system on this tool is to use the trial method. The design of the tool system is a stage of the design process before making the tool. The design and manufacture of the tool system are used to determine the components of a tool to be made so that the final results obtained are as desired. The hardware design that will be used in the implementation of this tool includes the design of a microcontroller circuit as a tool for turning the lights on and off. The hardware architecture of the IOT Smart lamp using Arduino-based internet can be seen in Figure 1:

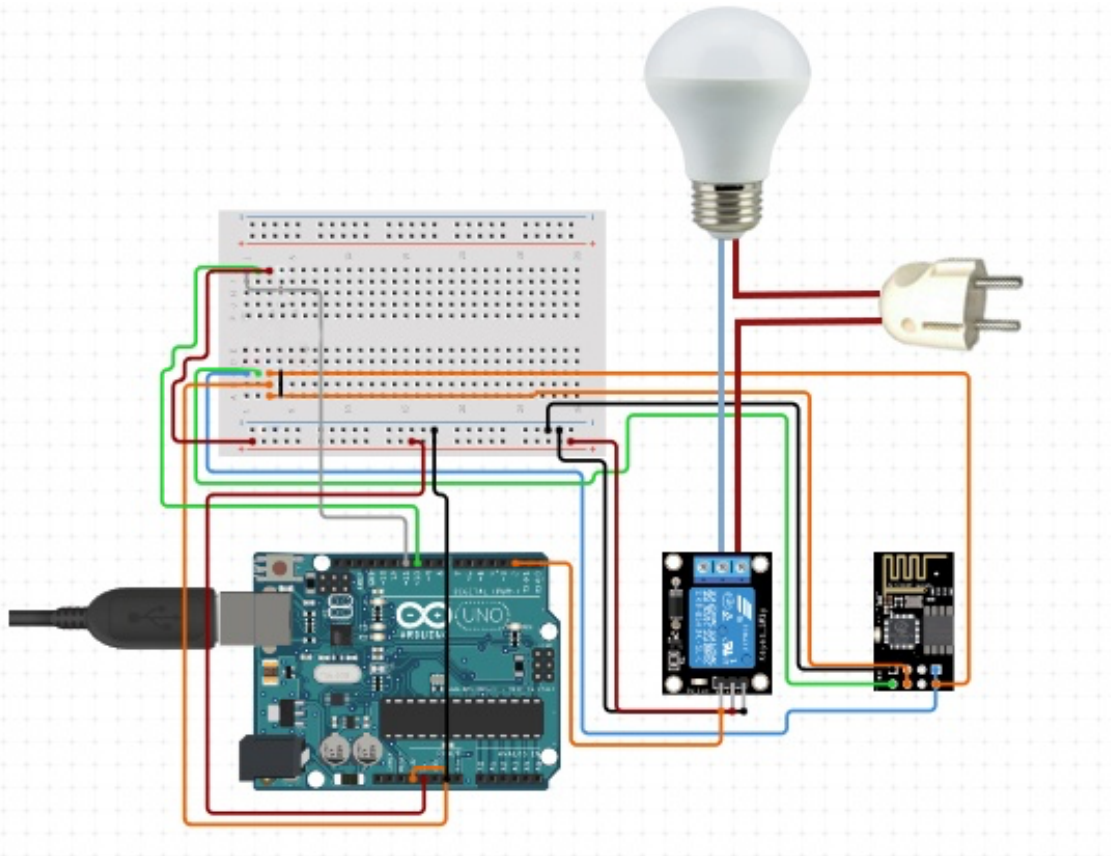


Fig 1. Hardware Architecture

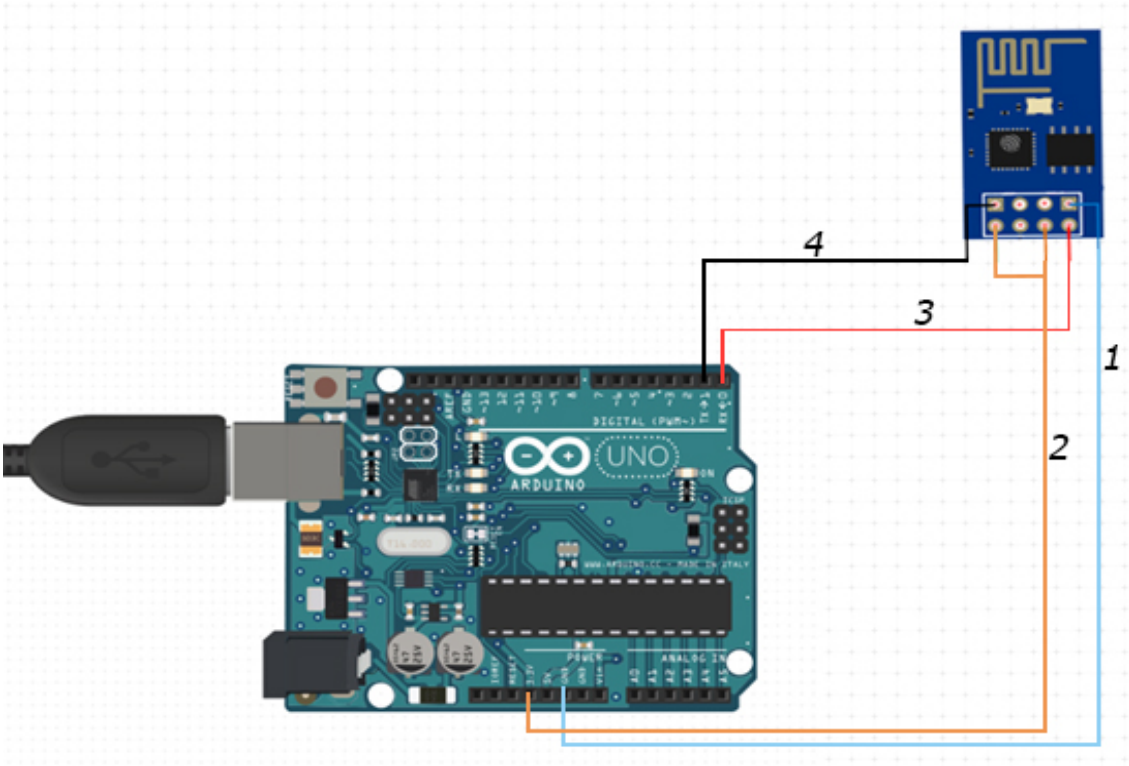


Fig. 2 Arduino and Esp8266 Module Configuration

Here is an explanation of the configuration between Arduino and the Esp8266 module:

a) Connection 1: connect the GND (ground) Pin on the Arduino Board to the GND Pin on the Esp8266 module.
b) Connection 2: connect the 3.3 V Pin on the Arduino Board to the 3.3 V Pin on the Esp8266 module.
c) Connection 3: connect the RX0 Pin on the Arduino Board to the RX0 pin on the Esp8266 module.
d) Connection 4: connect the TX1 Pin on the Arduino Board to the TX1 pin on the Esp8266 module.

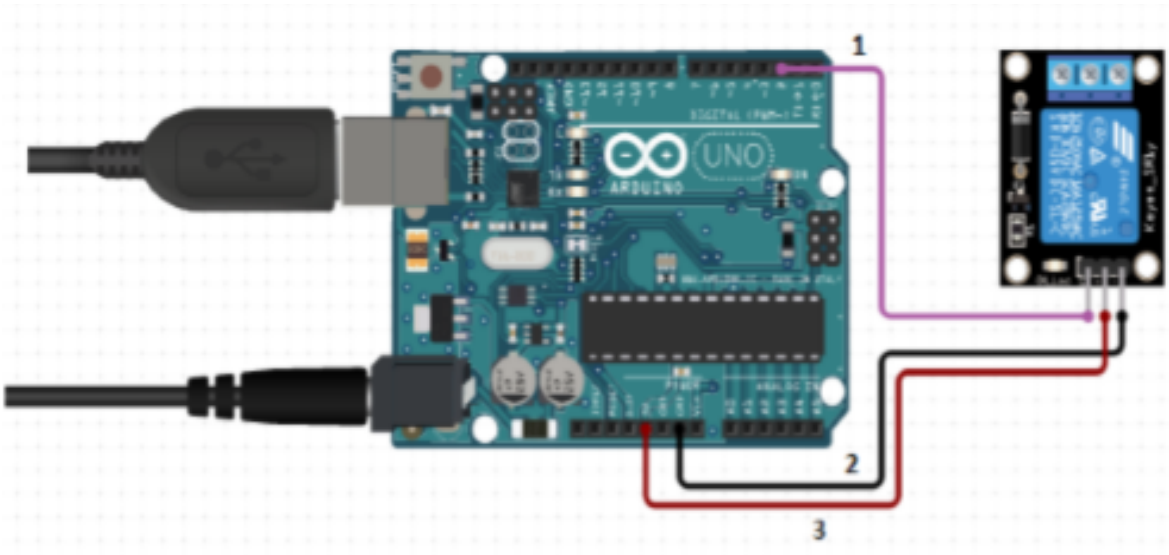


Fig 3. Arduino and Relay Configuration

Here is an explanation of the configuration between Arduino and Relay:

a. Connection 1: Connect Pin 13 on the Arduino Board to the IN (input) Pin on the Relay.
b. Connection 2: Connect the GND (ground) Pin on the Arduino Board to the GND Pin on the Relay.
c. Connection 3: Connect the VCC (5V) Pin on the Arduino Board to the VCC Pin on the Relay

III. Results and Discussion

IOT-based testing and control is carried out by conditioning all available tools, namely Arduino Uno, Relay, Esp8266, Cable, LED Lights, Lamp Fittings, Lamp Plugs as in Figure 4.

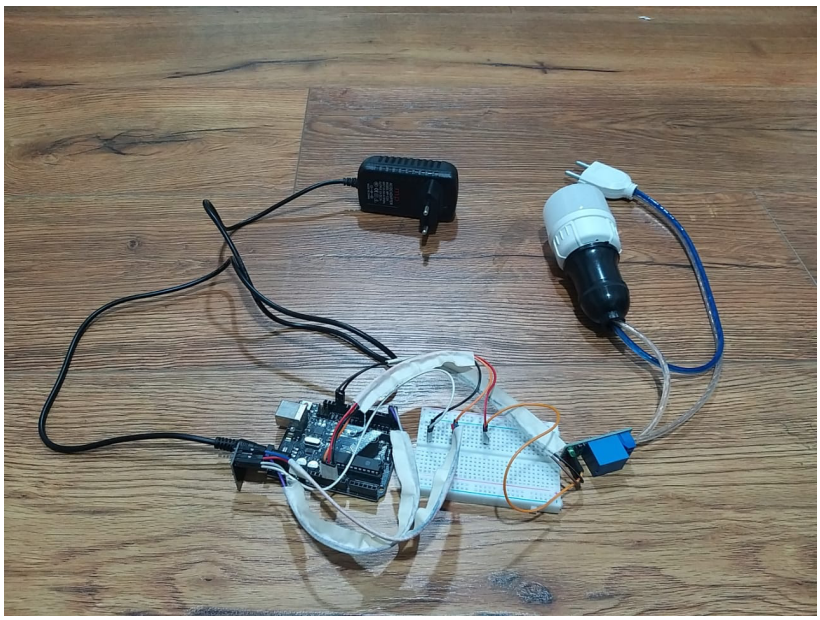


Fig 4. Overall Tool Chain

Testing is done by changing the sensor conditions to find out the signal reception process through the WiFi network that we use. The conditions in question are how fast the Esp8266 sensor responds if we control it from remoteXY and how much the maximum distance is between the sensor and remoteXY and also whether the signal we send from remoteXY can pass through obstacles or not. The results of the Esp8266 sensor test are as follows:

Table 1. Esp8266 Sensor Distance Tester Results

Condition	Lamp
Distance 100-300 cm	On
100-300 cm with barriers 3 cm (door)	On
Distance 100-300 cm with barriers 13 cm (wall)	On
Distance 800 cm	Off

This test is done in observing the LED Light to find out whether the light will light up as desired. The results of the observation are as shown in the image below:

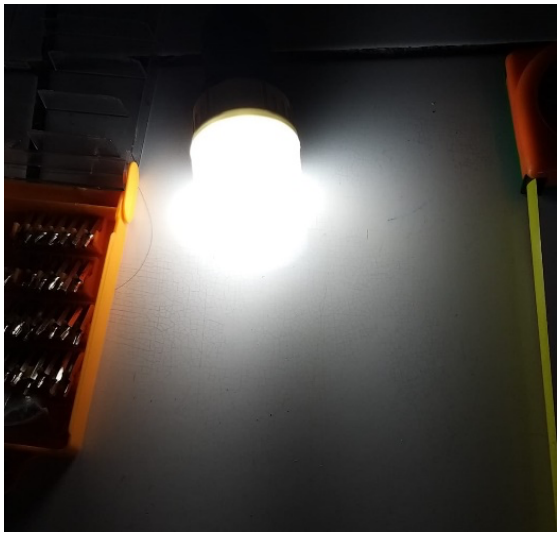


Fig 5. LED Light Observation Results

This final result shows the results obtained from the previous test in the form of input from the Esp8266 sensor which is forwarded to the Relay with the received signal being ON or OFF to turn the LED lights on or off.

Fig 6. With a Distance of 100-300 cm and the Lights on

Fig 7. LED Lights On

Description of Figure 6 and Figure 7 When turning on the lights using RemoteXY with a distance of 100-300 cm without obstructions, the Esp8266 captures the signal well and the lights can turn on.

Fig 8. With a Distance of 100-300 cm Using a 3 cm Barrier and the Light is On

Image description 8 when turning on the light using remoteXY with a distance of 100-300 cm with a 3 cm thick barrier, the Esp8266 catches the signal well without any problems and the light can turn on.

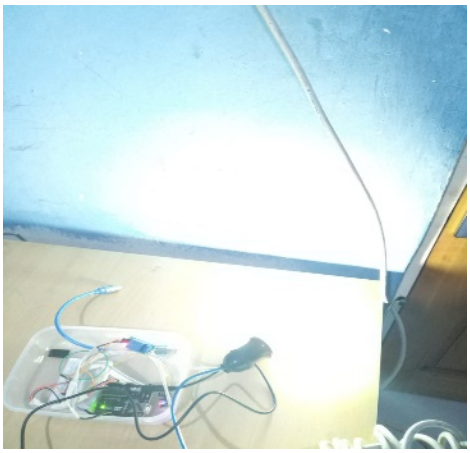


Fig 9. With a Distance of 100-300 cm with a 13 cm Barrier and the Light Remains On

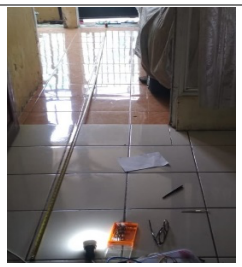
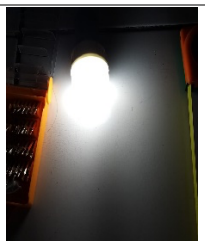
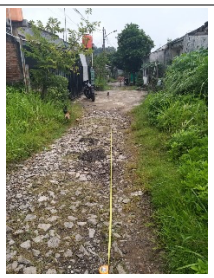
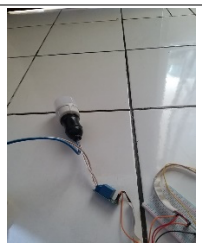
Figure 9 shows that when turning on the light using RemoteXY with a distance of 100-300 cm with a 13 cm thick barrier, the Esp8266 receives the signal from the remote very well and the light can turn on.

Fig 10. Distance Using RemoteXY 800 cm

Fig 11. The lamp cannot be turned on. The top is off and cannot be connected to the lamp.

Figure 10 and Figure 11 show that the lamp cannot be used because it has exceeded the maximum distance of the WiFi signal transmission so it cannot connect between the lamp and the XY remote.

Table 3. Results of analysis in the second experiment

No	Test Scenario	Test Case	Expected results	Test Results	Conclusion
1	Viewing the lamp displays light from a distance of 100 cm – 600 cm		The relay receives the signal then supplies electricity to the lamp and the lamp lights up.		Valid
2	Seeing the lamp displaying light from a distance of 600 cm - 800 cm		The relay cannot receive the signal and cannot supply electricity to the light and the light does not turn on.		Valid

IV. Conclusion

Based on the results of automatic testing of remote control of lights using Arduino-based WIFI, it can be concluded as follows:

a) With this system, we can use electrical energy efficiently. And the system we use is Android, ardiono and Internet of things (IoT).

b) The system created helps the lights to be easily turned on or off with an internet connection because we use a remote without having to go to the switch and is very helpful when we have left the house when we forget to turn off the lights here we only need to use the remote without having to go back into the house

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