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AUTOMATICALLY CONTROL LIGHT INTENSITY WITH GOOGLE VOICE ASSISTANT COMMANDS

by
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Abstract

Everyday light is the most important part to support human activity. Inadequate light quality can harm visual function, thinking, productivity, and human work activities. Therefore we need a tool that can adjust the intensity of light. This research realizes several human activities that can adjust the light intensity with google voice assistant commands using a smartphone. ESP32 is used as a connecting device between the Google voice assistant and the AC light dimmer module. In addition, this tool can be controlled remotely to all corners of the world because it uses the blynk API and is connected to the internet network. Based on the results of the tests that have been carried out, on the command "mati" the lamp voltage is 3.6 volts with a light intensity of 0 lux, on the command "sleep" the lamp voltage is 107 volts with a light intensity of 1604.4 lux, on the command "Santai" the lamp voltage is 161, 8 volts with a light intensity of 2416.4 lux and on the command "learn" the lamp voltage is 216.6 volts with a light intensity of 3603 lux.

Keyword : Light, ESP 32, Google Voice Assistant, AC Light Dimmer Module

INTRODUCTION

Light is an absolute part of life, so human life is very dependent on light. Without light, human life cannot develop properly. Lighting is one of the most important factors in the continuity of human activity. Inadequate light quality adversely affects visual function, mind, work activity, and productivity. Excellent lighting makes it possible to see the object being worked on clearly and quickly[1].

The light in question is in the form of a lamp. In the current era, various types of lamps can be found, ranging from slightly bright to very bright lamps, ranging from cheap to expensive. When studying, of course, bright lights are needed to make it easier to see[2]. In addition, the light of the lamp affects sleep quality[3].

In previous studies, a tool was made using a pat sensor to turn off and turn on the lights[4]. After that, a device was developed that can turn on lights with voice commands with an Arduino UNO microcontroller and an HC-05 Bluetooth module connected to a smartphone[5]. After that, a tool was also developed using the HC-05 Bluetooth module as a light intensity regulator connected to a smartphone and a Bluetooth voice application to turn on and off the lights and Arduino Uno as a microcontroller which is used for people with special needs and the elderly with a maximum control distance of the Bluetooth connection 10 meters long with a wall thickness of 10 cm[6].

Based on this problem, there is already a light-intensity control device that can be controlled via a smartphone connected to the HC-05 Bluetooth module. Therefore this study, created "Automatic Control of Light Intensity with ESP32-Based Google Voice Assistant Commands". Where this tool can adjust the light intensity of the lamp using a smartphone through a google voice assistant. In addition, this tool uses the ESP32 board as a link to the internet with a smartphone. So that it can be used with various sounds of the wearer and can be connected with several

people to be able to control this tool with remote control.

THEORETICAL BASIS

Light intensity

Light intensity is the amount of light that is on a surface area [7]. Meanwhile, the luminous flux is defined as the amount of light emitted by the light source. Luminous flux is described as the light emitted by a light source emitted in all directions, the luminous flux is measured in lumens. Ideally, the light flux emitted by a light source should be uniform in all directions. But in fact a light spreads evenly, but there is a difference between the light from the source and the direction the light is directed. Therefore, this term is used to indicate the amount of light emitted which is called the light intensity [8].

ESP 32

ESP32 is a microcontroller developed by a company called Espressif System. The ESP32 microcontroller can be connected to the internet network via a WiFi signal hotspot network independently, besides that this microcontroller can also be connected to other devices via a Bluetooth signal intermediary. ESP32 uses a dual core processor and runs on Xtensa LX16 instructions. The following is a display of the ESP32 microcontroller board [9].

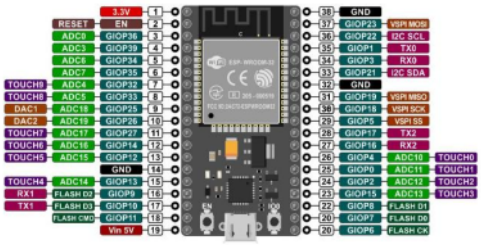

Figure 1. Pin Out ESP32

AC Light Dimmer Module

The AC dimmer functions to adjust the light intensity level of incandescent lamps. AC dimmers have been used in room lighting control systems because they can adjust and maintain the desired room lighting and make it more energy efficient [10].

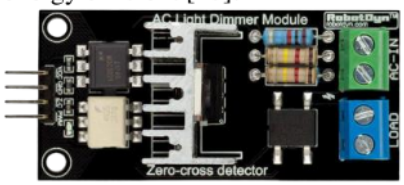

Figure 2. AC Light Dimmer Module

Google Voice Assistant

Google voice assistant is a virtual assistant powered by artificial intelligence developed by google that is first on mobile devices and smart home devices. Google voice assistant can carry out a two-way conversation. Although keyboard input is primarily supported, users primarily interact with the Google Voice Assistant mainly through natural voice. With the same methods and characteristics as the Google Voice Assistant, this assistant can search the internet, adjust the user's device hardware settings, schedule events and alarms, and display information on the user's Google account [11].

Webhooks IFTTT

If This Then That, abbreviated as IFTTT, is a free application that is used to combine two stages into something new. For example, receiving a notification of, for example, SMS (Short Message Service) every time another email appears, this must use IFTTT. [11].

Blynk API

Blynk API is a platform providing several libraries for smartphones. The function of the blynk API is that it is used to connect the web with the processor or firmware. To connect it requires an authorization token on the device [12].

Google Home

Google home is a subsidiary app of google. inc used to control and set up Google Nest or Home speakers and displays, and

Chromecast. This application can also be used to control electronics in homes that are used for smart homes. It can also be used to check your latest reminders and notifications, all from one app[13].

METHODS

The method used in this study is Research and Development. A subsequent design of the testing process of the tool was carried out.

Block System Diagram

Voice commands are executed using Indonesian on google voice assistant on android connected to the internet. The Google voice assistant converts voice commands to text. The text will then be passed from google voice assistant to webhooks by IFTTT (If This Than That). Webhooks will request the blynk API. The blynk API uses the cloud which will then be sent to ESP32. Google home is used as an interface between IFTTT and google voice assistant. ESP32 as a microcontroller connected to the internet receives a command from the blynk API to send an ADC signal on the AC light dimmer module to regulate the light intensity of the lamp. Here is the block diagram of the system used in Figure 3.

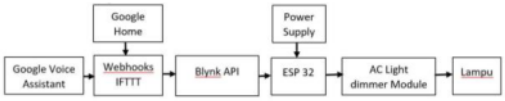

Figure 3. Block System Diagram

Flowchart System

The flowchart system describes the sequence of working procedures of this tool. It starts with inputting voice commands on the smartphone. Then the command is changed in the form of text on IFTTT which next webhooks will make a web request on ESP32. If the voice command is the same as "my applets" IFTTT, then the AC light dimmer module changes the light intensity of the lamp. The following is the flowchart system used in Figure 4.

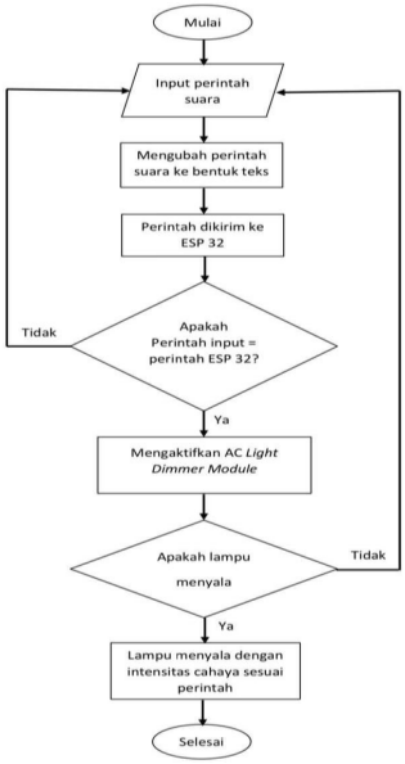

Figure 4. Flowchart System

Software Design

Software design is used to explain the stages of creating a program so that it can run the system on the tools that have been created, from these stages it is explained as follows:

Figure 5. Blynk API template

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Figure 5. is the cloud creation stage in the blink API. It starts with logging in on the blynk website. Then create an account or log in if you have one. Create a template according to this study to get the blynk template id, blynk device name, and auth token.

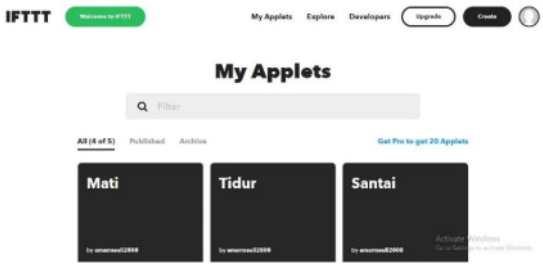

Figure 6. Form Applet on IFTTT

Figure 6. This is the stage of making voice commands in Google Voice Assistant into text integrated with webhooks. The initial step is to open the IFTTT website in a browser. Then sign up or log in if you already have an account. Create an applet by filling in "if that" with the word trigger on google voice assistant and "then that" with the cloud blynk API for web requests on webhooks.

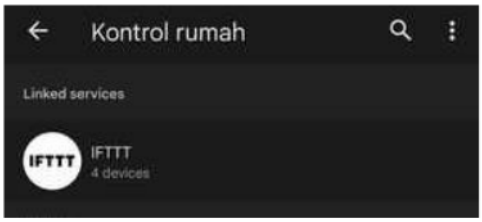

Figure 7. Controls on Google Home

Figure 7. is the stage of integrating IFTTT with the google voice assistant account on google home. The initial stage is to download google home on a smartphone and log in to the same account on IFTTT and blynk API. Next, it is compatible with google and searches for IFTTT until "4 devices" appears.

Hardware Design

In designing the research hardware this time, please pay attention to the circuit scheme that has been made.

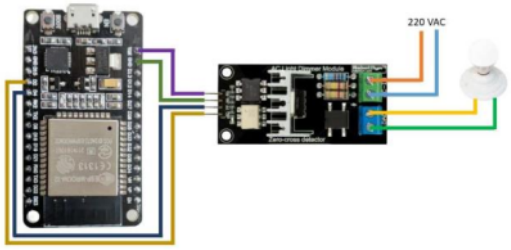

Figure 8. Circuit Schema

Figure 8. is a circuit schematic of the system created in this study. AC light dimmer module is connected to the VIN, GND, D2, and D4 pins on the ESP32. Meanwhile, for the output of the AC light dimmer module, it is connected to a voltage of 220 VAC for its input and a lamp for its output

RESULT AND DISCUSSION

The tests are carried out on a per-block basis to create a perfect study. Starting with testing google voice assistant, google home, blynk API with ESP32, AC light dimmer module, remote and light intensity.

Google Voice Assistant testing

Google voice assistant testing was done to find out how quickly google voice assistant changes the text.

Figure. 9 Pronunciation of Voice Commands in Google Voice Assistant

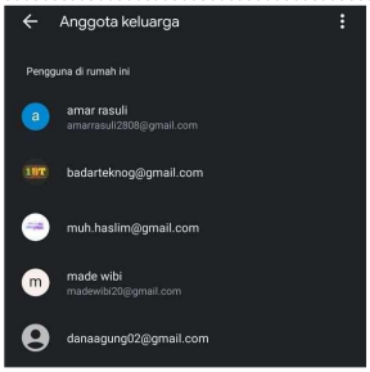

Figure. 10 Google accounts linked to google home

From the results of taking 4 samples of spoken voice commands, an average delay of text change of 2.25 seconds was obtained. This delay is relatively fast in converting voice to text in google voice assistant. The delayed jug time affects the internet network used at the testing site.

Table 1. Google Voice Assistant testing

No.	Spoken Voice Commands	Text results on Google Voice Assistant	Delay (sec)
1	Aktifkan Mati	Aktifkan Mati	2
2	Aktifkan Tidur	Aktifkan Tidur	2
3	Aktifkan Santai	Aktifkan Santai	3
4	Aktifkan Belajar	Aktifkan Belajar	2
Average Delay			2,25

Google Home testing

The google home test is used to find out which google account can control this tool.

The test was conducted 5 times on Google accounts with different locations. It was found that the five accounts could be connected to control this tool. This method is efficient because it can be controlled by 5 different people and can be controlled from different locations.

Table 2. Google Home testing

No.	Google Account	Location	Status
1	amarrasuli2808@gmail.com	Pasuruan, East Java	Connected
2	badarteknog@gmail.com	Depok, West Java	Connected
3	muh.haslim@gmail.com	Enrekang, South Sulawesi	Connected
4	madewibi20@gmail.com	Central Lampung, Lampung	Connected

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5	danaagung02@gmail.com	Hungary, Europe	Connected

Blynk API Testing with Serial Monitor Arduino IDE

The blynk API tester for sending web requests on the ESP32 is used to determine the delivery speed. This test can be done on a laptop or smartphone browser.

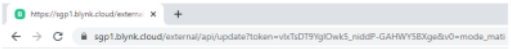

Figure. 11 Blynk API web request

There were 4 samples from the blynk API used in this study, which obtained an average delay for data transmission of 1 second. This delay is faster than in the google voice assistant test. The result corresponds to the serial monitor.

Table 3. Blynk API Testing with Serial Monitor Arduino IDE

No.	URL API Blynk	Text results on serial Arduino IDE monitors	Delay (sec)
1.	https://sgp1.blynk.cloud/external/api/?token=vlxTsDT9YglOwk5_niddP-GAHWY5BXg e&v0=mode_mati	mode_mati lamp value = 0%	1
2.	https://sgp1.blynk.cloud/external/api/?token=vlxTsDT9YglOwk5_niddP-GAHWY5BXg e&v0=mode_tidur	mode_tidur lamp value = 40%	1
3.	https://sgp1.blynk.cloud/external/api/?token=vlxTsDT9YglOwk5_niddP-GAHWY5BXg e&v0=mode_santai	mode_santai lamp value = 60%	1
4.	https://sgp1.blynk.cloud/external/api/?token=vlxTsDT9YglOwk5_niddP-GAHWY5BXg e&v0=mode_belajar	mode_belajar lamp value = 90%	1
Average Delay			1

Remote Testing

Remote testing was conducted to see how far this tool could be controlled. It is proven that this tool can work as far as Hungary. In this case, this tool can be controlled anywhere as long as it gets an internet network. There were 5 samples controlled from various places by saying all four voice commands, obtaining an average delay to control this lamp from 5 places for 3.1 seconds.

Table 4. Remote Testing

No.	Location	Lamp Value(%)				Average Delay per location (second)
		M	T	S	B	
1	Pasuruan, East Java	0	40	60	90	3
2	Depok, West Java	0	40	60	90	3,25
3	Enrekang, South Sulawesi	0	40	60	90	4
4	Central Lampung, Lampung	0	40	60	90	2,75
5	Hungary	0	40	60	90	2,5
Average Delay						3,1

Description : M = Aktifkan Mati
T = Aktifkan Tidur
S = Aktifkan Santai
B = Aktifkan Belajar

Light Intensity Testing

Light intensity testing uses a lux meter measuring instrument to determine the lux of lamps and multitesters directed at VAC. This test used a 5-watt filament incandescent lamp with a lamp lux of 4000 and a room area of 4 m^2. In this test, every voice command is performed, namely, turn off the switch, enable sleep, enable relaxation, and enable learning.

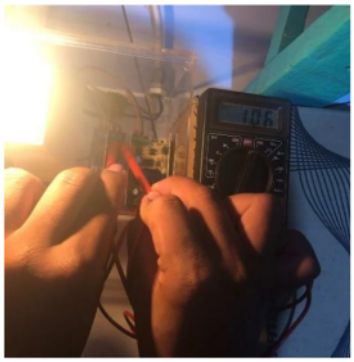

Figure. 12 Measurement Using Multitester on AC Light Dimmer Module

Figure. 13 Measurement using a lux meter

In the light intensity test, the voice command activates off with a lamp value of 0% using 5 experimental samples. The average incoming voltage is 219.8 volts, the load voltage is 3.6 volts and 0 lux.

Table 5. Light Intensity Testing with the "Aktifkan mati" Voice Command

No.	Measurement Results		
	Multitester		Lux Meter (lux)
	V in (V)	Load (V)	
1.	219	2	0
2.	221	7	0
3.	220	4	0
4.	220	2	0
5.	219	3	0
Avg	219,8	3,6	0

In the light intensity test, the voice command activated sleep with a lamp value of 40% using 5 experimental samples. The average incoming voltage is 219.6 volts, the load voltage is 107 volts and 1604.4 lux.

Table 6. Light Intensity Testing with "Aktifkan Tidur" Voice Command

No.	Measurement Results		
	Multitester		Lux Meter (lux)
	V in (V)	Load (V)	
1.	218	106	1606
2.	219	108	1601
3.	221	110	1602
4.	221	105	1607
5.	219	106	1606
Avg	219,6	107	1604,4

In the light intensity test, the voice command activated casually with a lamp value of 60% using 5 experimental samples.

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The average incoming voltage is 220 volts, the load voltage is 161.8 volts and 2416.4 lux.

Table 7. Light Intensity Testing with "Aktifkan Santai" Voice Commands

No.	Measurement Results		
	Multitester		Lux Meter (lux)
	V in (V)	Load (V)	
1..	220	162	2415
2.	221	162	2420
3.	221	164	2414
4.	219	160	2416
5.	219	161	2417
Avg	220	161,8	2416,4

In the light intensity test, the voice command activates learning with a lamp value of 90% using 5 experimental samples. The average incoming voltage is 218.8 volts, the load voltage is 216.6 volts and 3603 lux.

Table 8. Light Intensity Testing with "Aktifkan Belajar" Voice Commands

No.	Measurement Results		
	Multitester		Lux Meter (lux)
	V in (V)	Load (V)	
1	218	216	3603
2	218	217	3607
3	219	217	3600
4	220	216	3601
5	219	217	3604
Avg	218,8	216,6	3603

In the light intensity test, the average result of the incoming voltage on the device was 219.55 volts.

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CONCLUSION

Based on the results of tests that have been carried out, this tool can be controlled remotely in Hungary because it is connected to the internet network. The delay on the device is affected by the internet speed of the smartphone. The average incoming voltage on the device is 219.55 volts. In the "off" command the lamp voltage is 3.6 volts with a light intensity of 0 lux, in the "sleep" command the lamp voltage is 107 volts with a light intensity of 1604.4 lux, in the "relax" command the lamp voltage is 161.8 volts with a light intensity of 2416.4 lux as well as in the "learn" command the lamp voltage is 216.6 volts with a light intensity of 3603 lux.

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