LOGIC
Journal of Engineering Design and Technology
Vol.22 No.3 November 2022; p. 225 - 233

p-ISSN : 1412-114X
e-ISSN : 2580-5649
http://ojs2.pnb.ac.id/index.php/LOGIC

DESIGN AND BUILD AN INTERNET OF THINGS (IOT) AUTOMATIC TV BROADCASTING ANTENNA SYSTEM

Jon Endri [1], Elizah Fitri [2], Suroso[3]

[1,2,3]Department of Electrical Engineering, State Polytechnic of Sriwijaya, St. Srijaya Negara, Palembang, Indonesia

Corresponding email [1]: elizafitri555@gmail.com

Abstract. Nowadays, television is used for educational purposes. It is easily accessible through air-to-air broadcasts and can be connected via satellite. What is witnessed on a television screen is all image and sound elements. Many people feel uncomfortable watching television shows because when the television is used, the broadcasts that appear are not all images and sounds that can be seen and heard properly. Most antennas used by every household are patented in a certain position. Based on the existing description, the problem that would be solved is how to design an IoT-based TV broadcasting antenna system to make it easier to watch television with clear broadcasts and good sound without changing the antenna's position manually. With the design method, the tool to be made consists of a flowchart and a circuit design, namely, building a system with inputs, processes, and outputs. The automatic TV broadcasting antenna system based on the internet of things (IoT) is a system that points the antenna in the best position for each selected broadcast that can be controlled via Android using the Blynk IoT Application. After that, the test was carried out by taking data at two locations for the IoT antenna. The assessment results showed that each location was different, and the position of the antenna direction would also be different, so the location of the antenna must be changed by changing the angle contained in the Arduino IDE software.

Keywords: NodeMcu, Motor Servo, Lcd, Smartphone, Blynk, Arduino IDE

1. INTRODUCTION

Television is an electronic system that transmits still and live images alongside sound via cable or space. Nowadays, television is used for educational purposes. It is easily accessible through broadcasts from air to air and can be connected via satellite. What is witnessed on a television screen is all image and sound elements. The function of television is to provide information, educate, entertain, and persuade. But the entertaining function is more dominant in television media. The main characteristic of television is that it is audio-visual, which means that it can be seen and heard[1].

Along with the development of technology today, which is increasingly developing, Many people feel uncomfortable watching television shows[2]. When the television is used, broadcasts that appear are not all images and sounds that can be seen and heard properly. Also, most antennas each household uses are patented at a certain position. Therefore, the quality of the broadcast received by each channel is different, while changing the antenna's position every time it moves a channel on the television can cause inconvenience to users[3].

A television antenna is a device for capturing pr[4]ograms broadcast on a television channel, but not at the same time, meaning that television broadcasts will appear one by one according to the broadcast chosen by the viewer in front of the television[3]. To get a good broadcast, the antenna is moved manually. Consequently, additional equipment is needed on the antenna to automatically adjust the position of the antenna when the television channel is moved.

To make it easier to find the signal on each channel on the television. One of them can design a system with the Internet of Things that can connect everyday objects such as smartphones, internet TVs, sensors, and actuators to the internet, where devices are connected to automatically adjust the antenna's position when the

television channel is moved. Based on the existing description, the problem that will be solved is how to design an IoT-based broadcasting TV antenna system to make it easier to watch television with clear broadcasts and good sound without changing the antenna's position manually[5].

This study discusses how to direct the antenna position according to television broadcasts that can produce the best TV image and sound quality. This study used the Blynk IoT application to make remote control and sensor data read from NodeMCU or ESP826 devices and Arduino. This system consisted of a television antenna drive, which is later controlled with a servo motor that functions as a rotary actuator, automatically controlled by NodeMCU, which receives commands from a smartphone[6].

Compared to the previous study, the advantage of this tool is the TV Receiver Antenna Controller System Using Arduino[7] by using the control panel contained in the antenna system. In addition, the tool in this study can be operated more easily and effectively because it can direct the antenna through a smartphone or remotely with the Blynk application connected to the NodeMcu in the antenna system.

2. METHODS

This research used an experimental method, which was a research method used in designing an Io-based TV broadcasting antenna system, creating a research framework, hardware design, and software design.

2.1 Research Framework

The research framework is the most important part because it can know the stages to be achieved. At the research stage, it followed the research framework in figure 1 as a reference to facilitate and not confuse the design process and produce a system.

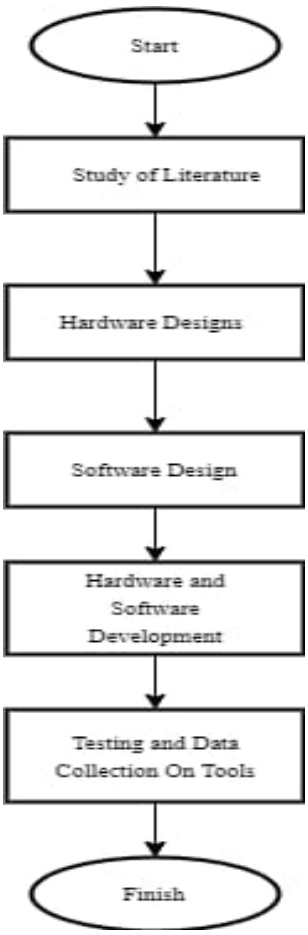


Figure 1 Flow Chart

2.2 Hardware Design

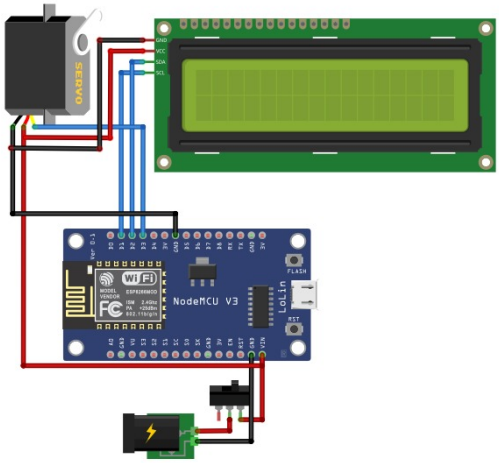


Figure 2 Schematic of the Antenna System Circuit

The figure below is a schematic of the network of automatic TV broadcasting antenna systems based on the internet of things that displays the paths on the circuit. At the source, it was connected to a socket that enters the switch on the positive leg, while the second switch leg was connected to the NodeMcu pin, and the GND socket was connected to the NodeMcu GND. The servo motor had three legs where the data legs were connected to the VIN D3 on NodeMcu, the VCC was connected to the NodeMcu VIN, and the GND legs on the servo motor were connected to the GND contained in NodeMcu, while the legs contained in the LCD were 3, namely, GND, VCC, SDA, and SCL. First, the SDA leg was connected to D2 on NodeMcu, while the SCL leg was connected to D1 on NodeMcu, then the VCC leg was connected to NodeMcu VIN, and the GND leg was connected to GND on NodeMcu.

2.3 Software Design

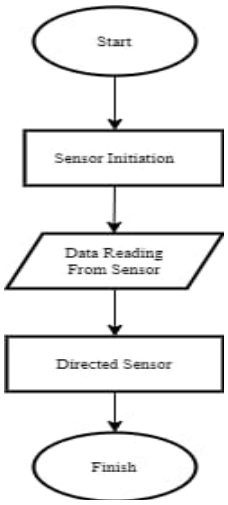


Figure 3 Flow Chart

Starting with initialization, then looking for the strongest signal by looking for the direction of the angle using the compass application, then making a command using the Arduino IDE software and connecting it to the Blink IoT application that has been installed on Android, then connecting the USB cable to NodeMcu and uploading it after successfully checking if the network can be operated or not if the Blink IoT application on Android can already direct the antenna according to the selected channel and the image and sound are good. The software design in this study used Blynk IoT, the operating steps of the Blynk IoT Application, to connect to the antenna system.

1. Installed the Blynk IoT app on the smartphone
2. Clicked Sign In
3. Entered your email and password
4. Clicked Settings, then clicked + and selected the icon you want to use
5. Clicked + Add New Device to connect to NodeMcu
6. Clicked Connect to Wi-Fi
7. Clicked the Star
8. Selected the Wi-Fi to use
9. Entered the Wi-Fi password
10. Waited until the 3 tick is green
11. If the status was online, it meant that it had successfully connected to NodeMcu

3. RESULTS AND DISCUSSION

3.1 Design Results

The automatic TV broadcasting antenna system based on the internet of things (IoT) is a system that directs the antenna in the best position for each selected broadcast. It can be controlled via Android using the Blynk IoT Application, and the selected broadcast will be seen on the antenna system's LCD screen.

3.2 Hardware Build Results

The result of the hardware circuit is a circuit that can find the direction of the strongest antenna angle in each broadcast using NodeMcu, which can be connected to Android to be controlled remotely.

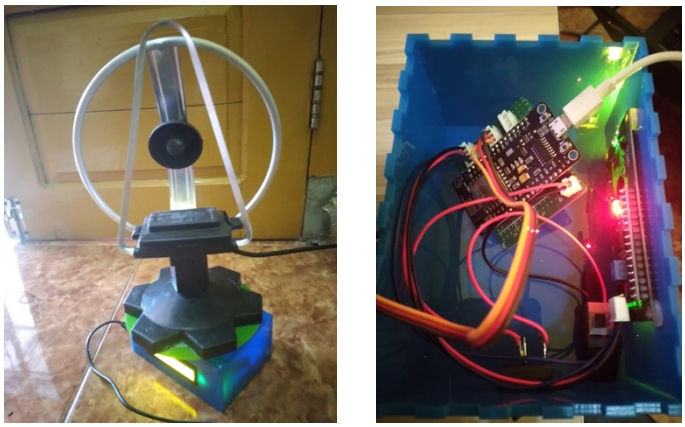


Figure 4 System Circuit Result

3.3 Software Build Result

The results of the software design in this study using the Blynk IoT application appear as shown in figure 4.2, where, using 15 broadcast TV broadcasting, the display on the application and the LCD on the system will show the direction of the antenna according to the broadcast on the selected TV.

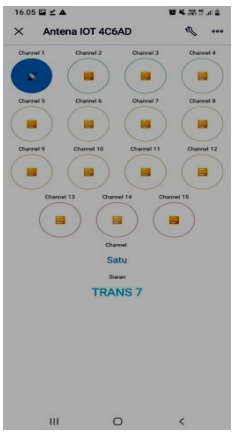
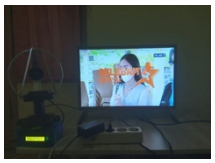
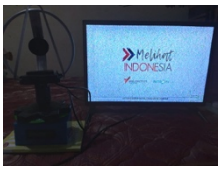
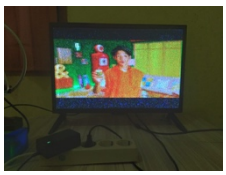
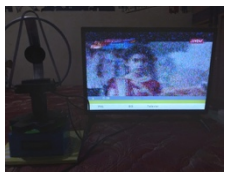
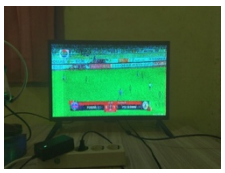
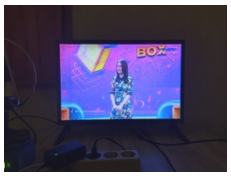
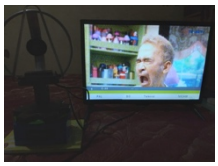
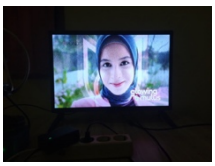
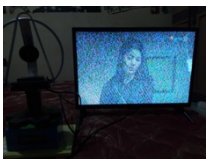
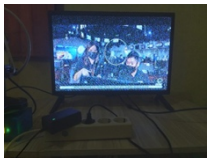
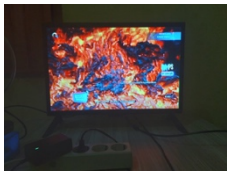
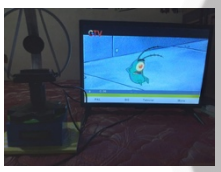


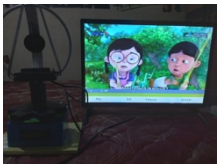
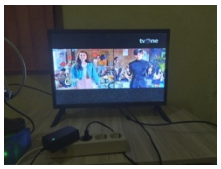
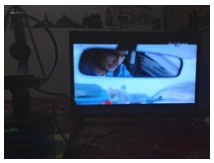
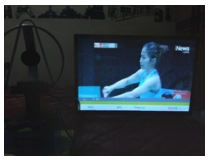
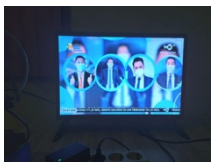
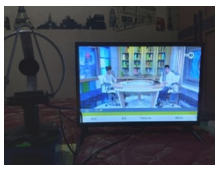
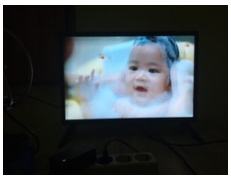
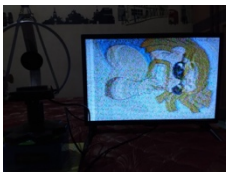
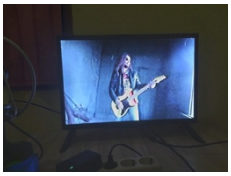
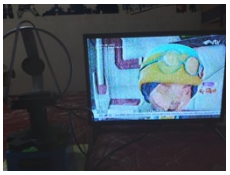
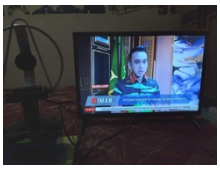
Figure 5 Blynk Application Display

3.4 Tool Testing Results

The results in Table 1 are the same angle arrangement in both locations; the first location was in Bukit Palembang with an initial angle of 90° westward on all canals; the second location was in Skip Palembang with an angle of 90° westward on the 15th canal. It was found that the images and sounds produced on each channel showed different images and sounds that were good, some were less good, and some were even unclear if the angle was set at 90° on all channels.

Tabel 1 Anggel Setting Corner

Canals	Corner	IoT Antenna Detection Location 1; Bukit Palembang	IoT Antenna Detection Location 2; Sekip Palembang
TRANS 7	90°		
RCTI	90°		
ANTV	90°		
INDOSIAR	90°		
TRANSTV	90°		
SCTV	90°		
METROTV	90°		
GTV	90°		

Canals	Corner	IoT Antenna Detection Location 1; Bukit Palembang	IoT Antenna Detection Location 2; Sekip Palembang
MNCTV	90°		
TV ONE	90°		
INEWS	90°		
TVRI SUMSEL	90°		
NET.	90°		
Rtv	90°		
KOMPAS	90°		

Tabel 2 Result of Using Antenna System

IoT Antenna Detection Location 1; Bukit Palembang	Corner Location 1; Bukit Palembang	IoT Antenna Detection Location 2; Sekip Palembang	Corner Location 2; Sekip Palembang
Good	115°	Less Good	90°
Good	115°	Good	95°
Good	115°	Good	103°

IoT Antenna Detection Location 1; Bukit Palembang	Corner Location 1; Bukit Palembang	IoT Antenna Detection Location 2; Sekip Palembang	Corner Location 2; Sekip Palembang
Less Good	60°	Less Good	90°
Good	130°	Good	90°
Good	130°	Less Good	65°
Less Good	0°	Good	90°
Good	90°	Less Good	110°
Good	90°	Good	90°
Good	0°	Good	95°
Good	60°	Good	85°
Good	90°	Less Good	50°
Good	110°	Good	50°
Good	75°	Less Good	70°
Good	100°	Good	90°

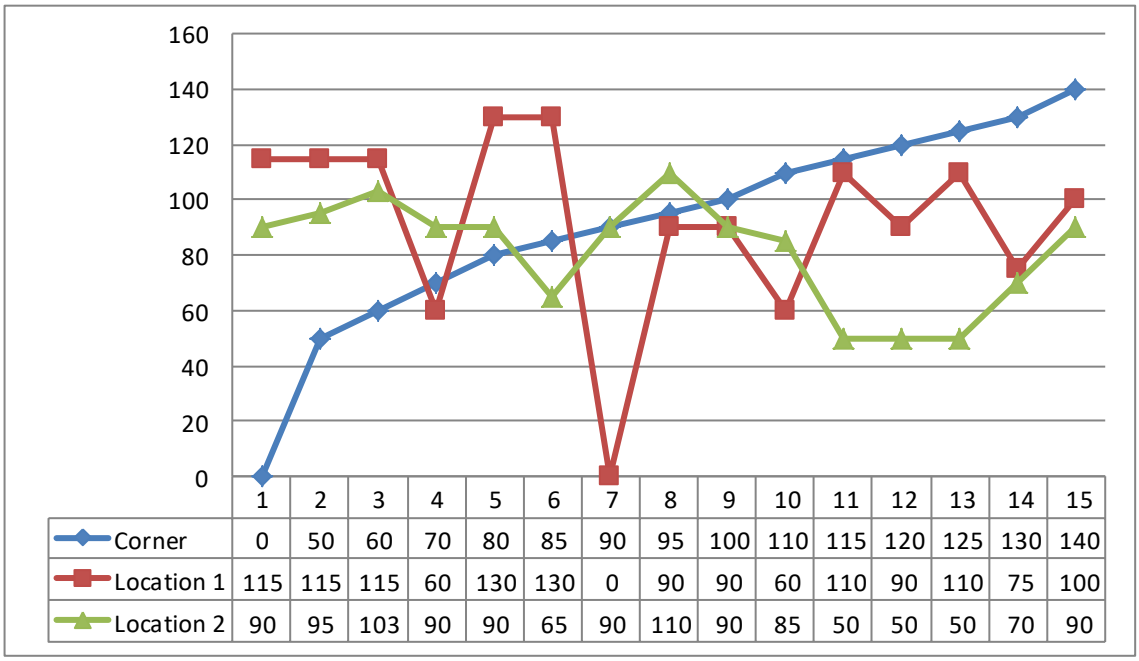


Figure 6 Corner Result

The results of the study obtained in table 2 show that at different locations of TV broadcasting, the angle on the antenna would also change, where it can be seen in the 1st image, namely on the TRANS7 channel, at the location 1 at an angle of 115° with good images and sounds, while at the location 2 in Skip it is at an angle of 90° with less good images and sounds. The 2nd image on the RCTI channel at location 1 with an angle of 115° and the location 2 with an angle of 95° shows the image and sound that good produces in both locations. The 3rd picture is on the ANTV channel with an angle of 15° at the location 1 and 103° at the location 2, which produces a good image and sound. On the 4th channel, namely INDOSIAR, with an angle of 60° at location 1 and an angle of 90° at location 2, and producing fewer good images and sounds. Then on the 5th channel, there is TRANS TV with a 130° angle at location 1 and a 90° angle at the location 2, with the image and sound produced by both good. On the 6th channel, location 1 with an angle of 130° and the location 2 with an angle of 65°, namely on the SCTV channel at location 1 of good image and sound and in the 2nd position of less good image and sound, The

7th channel is METRO TV with an angle of 0°, and at the location 2 with an angle of 90°, the image and sound produced at location 1 are Less Good while at the location 2 is good, On channel 8 at location 1 with an angle of 90° and location 2 with an angle of 110° on the GTV channel, the sound, and image produced at location 1 are good, while at location 2, they are less good. On the 9th channel, MNCTV, with both angles at 90°, the image and sound produced are good for both. On channel 10th, namely TVONE with an angle of 0° and the location 2 with an angle of 95°, the results can all be good for both locations. On the 11th channel, the angle at the location 1 is 60°, and the location 2 with an angle of 85°, produced a good image and sound. The 12th channel is TVRI SUMSEL. The first location is 90° and the second location has a 50° angle. The results can be at the location 1 while the location 2 is good. At the 13th location, namely NET, an angle of 110° at location 1 and 50° at the second location can be achieved for both locations. Then on the 14th channel, there is RTV with a location of 1 image and good sound in the location 2 of the image and less good sound with an angular position of 75° at location 1 and 70° at location 2. The 15th channel at a 100° angle at location 1 and a 90° angle at the location 2. The resulting image and sound can be reached in both good locations.

3.5 Overall Result Analysis

From the results of the tests carried out, it can be seen that for each TV broadcasting that used an indoor type antenna, a design can be made to automatically deploy the antenna on each channel using NodeMcu, Servo motor, LCD, and Blynk IoT Application. Thus, the angle settings that we wanted can be done using Arduino IDE software after designing the device, which was divided into three stages, namely the first stage of hardware design, "the second stage of software design," and the third stage of integration between hardware and software into an IoT antenna system. The test was carried out by taking data at two locations for the IoT antenna; Without manually rotating or moving the antenna. Application development is necessary to improve quality and keep up with the flow of technological developments. the first in Bukit Palembang and the second in Skip Palembang. The study results showed that each location was different, and the antenna's position would also be different, so the location was different. Therefore, the antenna's position must be changed by changing the angle contained in the Arduino IDE software. The antenna will rotate as expected so that the image quality will look clearer, and the sound will be better. In addition, this will result in more accurate antenna parameters[8]

In addition, this study also compared the results with the images and sounds that used outdoor-type antennas. The images and the sound produced turned out to be better and clearer channels obtained more than TVs that used indoor antennas. This research shows that the IoT-based antenna controller system using the Blynk application can be more efficient than previous studies. Namely, the TV Receiver Antenna Controller System Using Arduino. Because in previous studies, the antenna was still directed using the control panel on the TV antenna system.Maintenance on this tool is very easy. Place the antenna system at room temperature and ensure the NodeMcu contained in the system is always connected to an internet connection. This antenna system is produced in large quantities and is marketed for the price of this antenna system which is Rp. 300,000.

4. CONCLUSION

In this study, it can be seen that for each TV broadcasting that uses an indoor type antenna, design can be done to move the antenna automatically on each channel using NodeMcu, Servo motor, LCD, and Blynk IoT Application. Thus, the angle settings we want can be done using Arduino IDE software. The test is carried out by taking data at two different locations for the IoT antenna. The first location is in Bukit Palembang, and the second location is in Skip Palembang. The results of the study show that each location is different. Therefore, the position of the antenna direction will also be different. Since the location is different, the antenna's position must be changed by changing the angle in the Arduino IDE software.

The tools in this study can be well implemented according to the design carried out for the next study. The author hopes this antenna system can also be applied to the outdoor antenna.

5. REFERENCES

[1] B. A. B. Ii and A. Televisi, “yang mempunyai arti jauh (,” pp. 10–37, 2013.
[2] M. Shofiyullah, “Perancangan Sistem Kontrol Rotasi Antena TV Dengan Arduino,” vol. 7, no. 1, 2020.
[3] D. Vitalocca and D. D. Andayani, “Sistem Pengontrolan Antena Penerima TV Menggunakan Arduino,” pp. 607–612, 2019.
[4] A. Junaidi, “INTERNET OF THINGS, SEJARAH, TEKNOLOGI DAN PENERAPANNYA : REVIEW,” *Apri Junaidi J. Ilm. Teknol. Inf. Terap.*, vol. I, no. 3, 2015.
[5] D. Mariani and Y. M. Safarudin, “Rancang Bangun Antena Mikrostrip dengan Metamaterial CSRR untuk Penerima TV Digital,” *J. Sustain. J. Has. Penelit. dan Ind. Terap.*, vol. 7, no. 1, pp. 7–12, 2018, doi: 10.31629/sustainable.v7i1.438.

[6] K. Kunci, "Desain Simulator Kontrol Posisi Antena Penjejak Satelit Sudut Azimuth dengan Mengintegrasikan Software LabVIEW dan SOLIDWORKS," pp. 4–5, 2021.
[7] M. Shofiyullah, "Perancangan Sistem Kontrol Rotasi Antena TV Dengan Arduino," 2020. [Online]. Available: http://test-erwinproject.blogspot.com.
[8] I. Nurizal Sakti and S. Purbawanto, "Modifikasi Antena Televisi Jenis Yagi Sebagai Penguat Sinyal Modem Menggunakan Sistem Induksi," vol. 5, no. 1, pp. 32–38, 2013.
[9] E. Hutajulu *et al.*, "PENERAPAN LOGIKA FUZZY UNTUK PENGENDALIAN POSISI," vol. 14, no. 2, pp. 263–270, 2021.
[10] P. F. Ghz, "RANCANG DAN BANGUN SMART ANTENNA SYSTEM," pp. 1–7.
[11] G. F. SETIAWAN, "SISTEM PENGGERAK OTOMATIS ELEVASI DAN AZIMUT ANTENA SEBAGAI PENJEJAK OBJEK YANG BERGERAK," 2015.
[12] K. T. Nomas, B. S. Nugroho, and B. Syihabuddin, "Perancangan Dan Realisasi Sistem Pengukuran Parameter Antena Otomatis Terintegrasi," *eProceedings Eng.*, vol. 3, no. 1, Apr. 2016, Accessed: Jan. 21, 2022. [Online]. Available: https://openlibrarypublications.telkomuniversity.ac.id/index.php/engineering/article/view/9180.
[13] M. Artiyasa, A. N. Rostini, A. P. Junfithrana, P. Studi, T. Elektro, and U. N. Putra, "Aplikasi smart home node mcu iot untuk blynk," vol. 7, no. 1, pp. 1–7, 2020.
[14] A. Budiman, Y. Ramdhani, A. R. Sanjaya, U. Adhirajasa, and R. Sanjaya, "MENGGUNAKAN MODUL NODEMCU ESP8266 DENGAN APLIKASI BLYNK," vol. 2, no. 1, pp. 68–74, 2021.
[15] M. F. Huda, Z. Abidin, and A. B. Laksono, "Penggerak Parabola Otomatis Pada Satelit KU-Band Berbasis Mikrokontroler JEETech," pp. 85–89, 2020.
[16] P. Kuat, S. Dan, P. A. Di, and S. B. Oping, "Dengan Bluetooth," vol. 1, no. 2, pp. 67–72, 2017.