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Design and Development of Dew Fan Control Device Using IoT

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ABSTRAK

Kipas angin embun (blower) adalah perangkat yang penting dalam berbagai aplikasi industri dan komersial, terutama dalam proses pendingin dan ventilasi. Dalam upaya untuk meningkatkan efisiensi dan kemudahan penggunaan kipas angin embun, kami memperkenalkan sebuah rancangan bangun inovatif yang berbasis Internet of Things (IoT). Proyek ini bertujuan untuk mengembangkan alat pengontrol angin embun yang dapat diakses dan dikendalikan secara jarak jauh melalui jaringan internet. Alat ini akan dilengkapi dengan sensor-sensor yang menghubungkan suhu dan kelembaban lingkungan, sehingga kipas angin embun dapat dikontrol untuk menjaga kondisi lingkungan yang nyaman. Selain itu, alat ini akan dilengkapi dengan kemampuan memantau konsumsi energi, yang memungkinkan pengguna untuk mengoptimalkan penggunaan daya kipas angin embun. Data yang dihasilkan oleh alat ini akan dapat diakses melalui aplikasi seluler atau platform web, sehingga pengguna dapat menghubungkan dan mengendalikan kipas angin embun dari mana saja dan kapan saja. Rancang bangun ini menggabungkan teknologi IoT dengan penggunaan energi yang efisien, sehingga dapat meningkatkan kenyamanan dan efisiensi dalam berbagai aplikasi industri dan komersial yang menggunakan kipas angin embun. Hasil pengujian proyek ini memiliki potensi untuk memberikan dampak positif pada penghematan energi dan produktivitas secara keseluruhan.

ABSTRACT

The mist fan (blower) is an essential device in various industrial and commercial applications, particularly in cooling and ventilation processes. To increase the efficiency and user-friendliness of mist fans, we introduced an innovative design based on the Internet of Things (IoT). This project aims to create a remote-controllable mist fan controller accessible through the internet. The device will be equipped with sensors that monitor environmental temperature and humidity, allowing the mist fan to automatically adjust to maintain comfortable environmental conditions. Furthermore, the controller will include energy consumption monitoring capabilities, enabling users to optimize the mist fan's power usage. The data generated by the device will be accessible through a mobile application or web platform, allowing users to monitor and control the mist fan from anywhere and at any time. This design combines IoT technology with energy-efficient usage, thereby enhancing comfort and efficiency in various industrial and commercial applications that employ mist fans. System test result this project has the potential to positively impact energy savings and overall productivity.

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1. INTRODUCTION

Dew fans, or as they are often referred to as “blowers,” are important devices in many applications related to controlling environmental temperature and humidity. As technology develops, the use of the Internet of Things (IoT) has introduced new possibilities in controlling and monitoring devices such as exhaust fans. IoT refers to a network of devices connected to the internet, which allows users to access and control devices remotely over the internet. In this context, we will discuss the design of a dew fan controller using IoT technology.

The use of IoT in controlling household devices is increasingly common and relevant in everyday life. IoT turns devices such as exhaust fans into “smart devices” that can be controlled and monitored from anywhere, at any time. For example, you can turn your mist fan on or off using your smartphone even when you are not at home. The IoT concept has gained increasingly widespread recognition in Indonesia, especially in fields such as agriculture, industry and smart city development. Research by Alamsyah in the article "Utilization of IoT Technology for Monitoring River Water Quality Based on Microcontroller Sensors" shows how IoT can be used to monitor and control river water quality efficiently [1]. Another study by Suryadi et al in "Development of an IoT-Based Weather Monitoring and Data Delivery System in a Campus Environment" also illustrates the potential of IoT in location-based weather monitoring [2].

In the development of IoT technology, hardware and software have become key aspects in designing efficient mist fan controllers. Another relevant reference is research by Prayudi et al. in "Design of an Internet of Things Based Air Monitoring System Using an ESP8266 Microcontroller," which discusses the development of an IoT-based air monitoring system using a microcontroller [3]. Similar research by Santoso et al. in the article "Internet of Things (IoT) Based Temperature and Humidity Monitoring System in Plant Storage Spaces" describes the implementation of IoT for temperature and humidity monitoring in the context of plant storage [4].

Apart from that, in developing a dew fan control device, security and privacy aspects are also a major concern. Karyanto et al in "IoT Network Security Using MQTT and CoAP with DTLS Protocol on Raspberry Pi" discuss security issues in IoT networks using the DTLS protocol [5]. Another reference by Nurhadi et al. in "Application of the AES Cryptographic Algorithm in IoT-Based Security Systems" reviews the use of cryptographic algorithms to improve the security of IoT systems [6]. By considering the existing framework in IoT development, this research aims to design and implement a dew fan controller that can be accessed and controlled via the internet. In this way, dew fan owners can regulate the temperature and humidity of the environment efficiently and effectively, even when they are far from the device. This will allow optimizing the use of dew fans in various applications, such as agriculture, industry and urban environments.

2. METHOD

2.1 Types of research

This research uses the prototype method. Which uses the concept of direct monitoring and allows repeated changes to be made until the desired results are achieved. So this prototype method makes it possible to display the appearance directly.

2.2 Problem analysis

In designing an IoT-based dew fan (blower) control system, there are several problems, including:

1. Systematic Tools
Designing this tool is quite complicated, namely how to control the fan and water pump as moisture and adding temperature checking tools and object movement detectors.

2. Work System
The working system of this tool is that when the circuit is installed on the blower controller, a program will be created on the Arduino IDE to carry out the commands created. After that, the program will be uploaded to the Arduino hardware using an Arduino cable. After the upload process is complete, power will be connected to the Arduino. Then connect it to the Telegram bot so it can be controlled via cellphone. Once you have done this, you will see the results of the air blower control device on the display of the telegram bot being applied and will display the temperature level in the room and the movement detector.

2.2 System Block Diagram

Hardware planning is designing electronic components in such a way that they have the desired function. In general, the tool design planning is as follows in Figure 1.

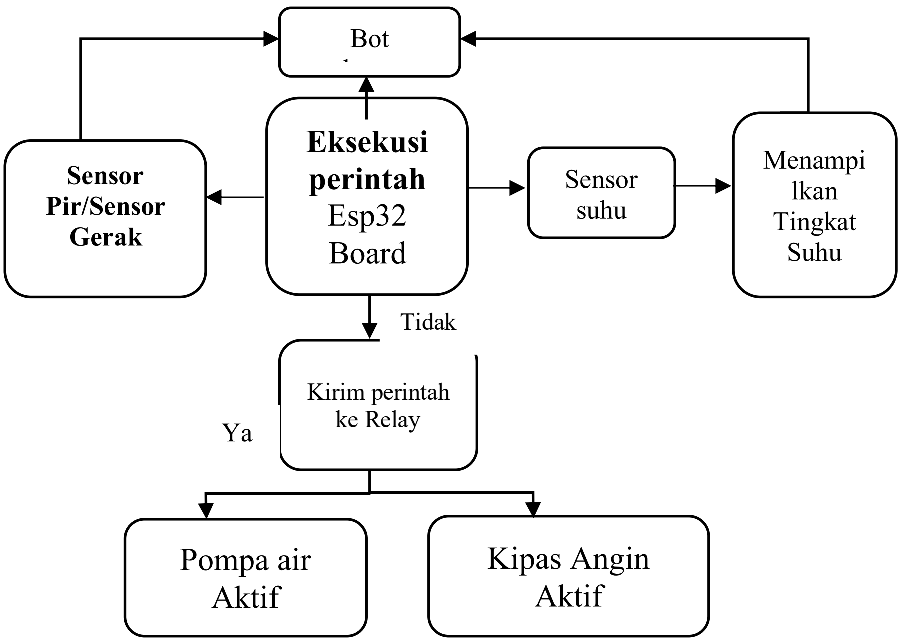

Figure 1. Components of the Overall Circuit Design Diagram

Making a dew fan control device using IoT has several parts in the process. These parts are as follows:
1. The Esp32 Board functions as the brain and controller function of the electronic system.
2. The temperature sensor uses DHT22 which functions as a room temperature level detector and will be displayed to the telegram bot when given a command first.
3. The motion sensor uses a PIR sensor which functions as a movement detector and will be displayed to the telegram bot as a notification
4. The 2Chan 5v relay functions as a switch for the fan and water pump.
5. Control the fan and water pump via telegram bot commands.

2.3 Flowcharts

Software planning starts from creating flowcharts to make it easier to plan and create programs on the microcontroller. Making flowcharts also aims to make it easier to understand the working process of this tool. The program flowchart of this Final Project includes the tool control system and IoT work system which can be seen in Figure 1 and Figure 2

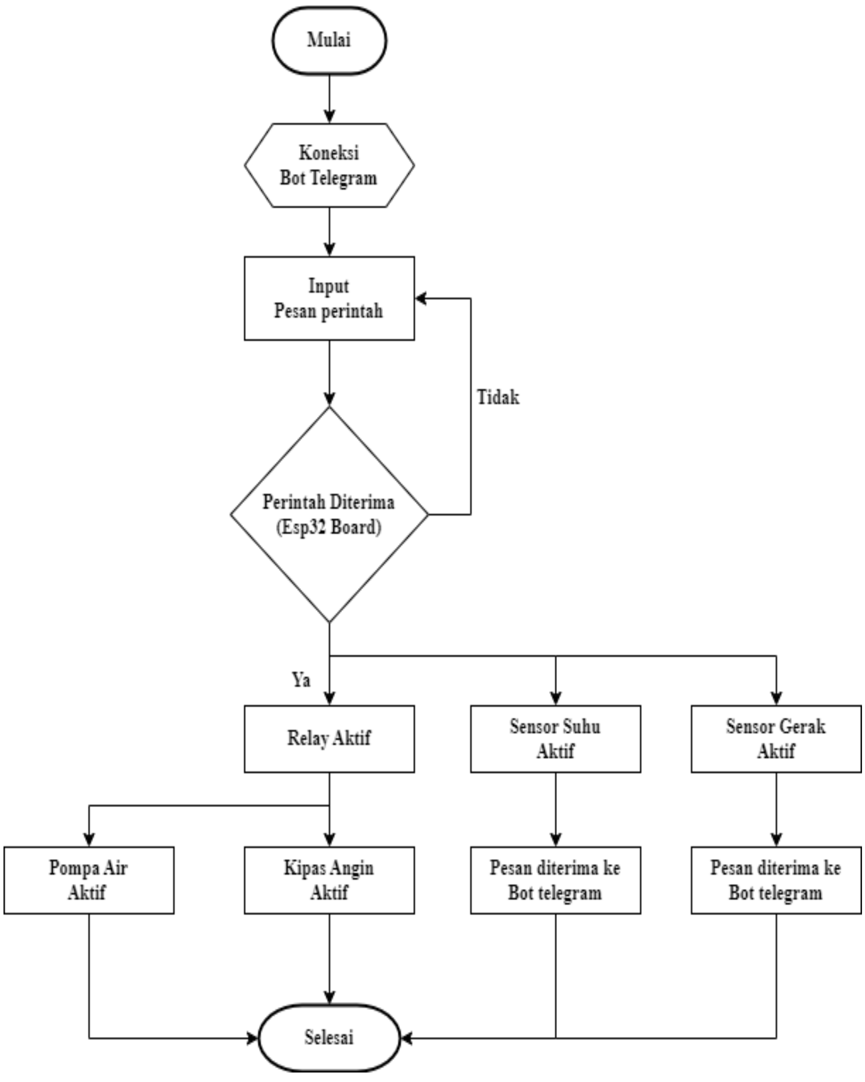

Figure 2. Tool System Flowchart

3. RESULTS AND DISCUSSION

3.1 Discussion

In this chapter, we will explain and show the results of testing the design of the tool made along with the discussion. The results of the tests carried out are a tool that was created or designed and programmed using the Arduino application. The tool made will be used to maintain the stability of the fan and the stability of the room temperature level with the following tools and materials:

1. 12 Volt adapter functions as an electrical power source.
2. The 2chan relay functions as a switch that works according to electromagnetic principles. The relay will work if there is an electric current and will stop if there is no electric current
3. Esp32 Board functions as a data processor, receiver and sender.
4. Android functions as a monitoring sensor for swimming pool water pH levels
5. The WI-FI network functions as a communication medium between Android and the tool design system
6. The water pump functions as dew water with low pressure
7. The fan functions as a research device
8. The DHT22 sensor functions as a room temperature detector
9. The PIR sensor functions as a movement detector

3.2 Software Testing

To find out whether the Esp32 Board Microcontroller circuit is working properly on the device, a test is carried out by giving a command program to the Microcontroller by inputting data from the computer into the Microcontroller. When installing, first connect the computer to the downloader via a USB cable to the microcontroller circuit. To test the tool with commands, you can do several steps, including:

1. The first step is to run the Arduino software. After the application loads, you will see a display like Figure 3.

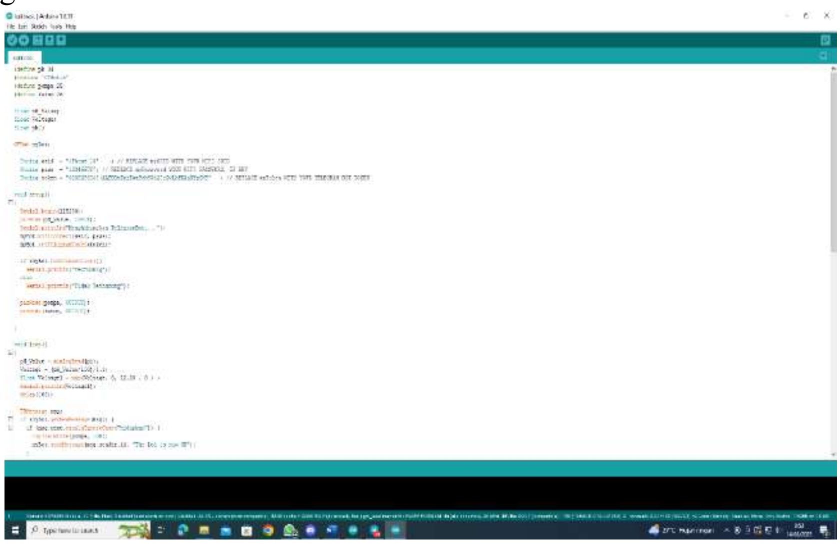

Figure 3. Arduino Software Display

1. Next, to program the Esp32 Board Microcontroller, type the program according to what is required on the tool. As seen in figure 4

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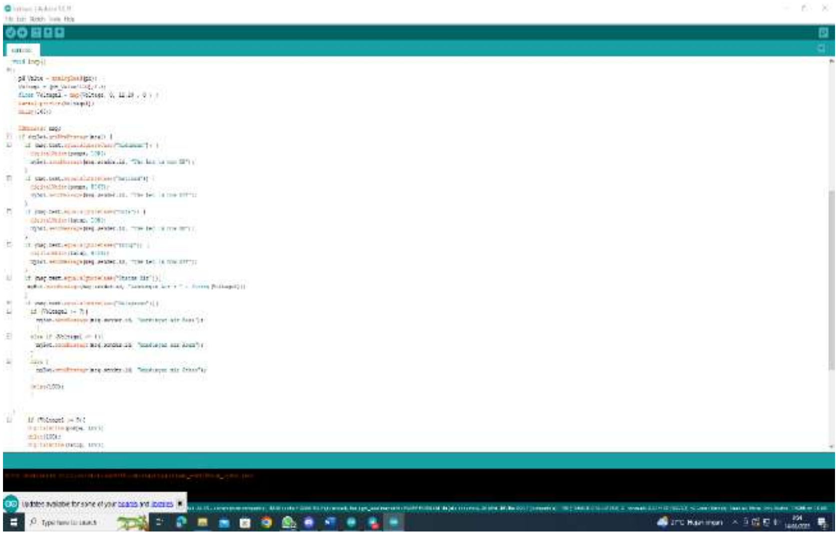

Figure 4. Program display

2. Before continuing the microcontroller installation stage with the completed program, first save the program before compiling it. To save the program, see Figure 5.

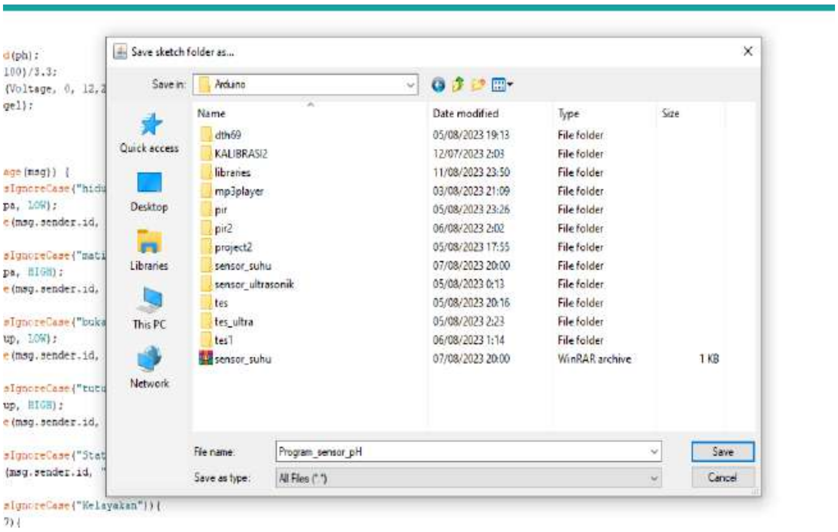

Figure 5. File Saving Process

3. To continue with the microcontroller installation stage, first check the program by clicking the "Compile" function button to set the program into the Microcontroller Chip. It can be seen whether the program created has errors or not, if successful it will say "No errors". The compile process can be seen in Figure 6.

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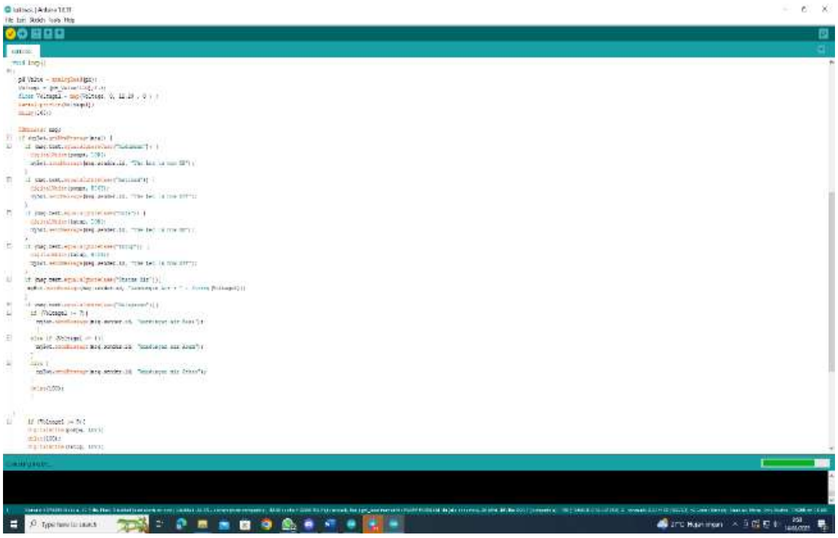

Figure 6. Compile results

3.3 Hardware Testing

After all the circuits that have been completed have been designed in "IOT-based dew fan (blower) controller design", then all the completed circuits are combined. The following is an image of the results of the system design shown in Figure 6.

Figure 6. Overall Hardware

3.4 Device Trial

After all components are installed and the program has been compiled, the next step is to test the tool. This testing is carried out in stages from series to series.

3.4.1 Downloader Programmer Testing

Testing this downloader circuit can be done by transferring program data from the computer to the Arduino microcontroller. The downloader is first connected to the PC, via the

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USB port. The program data is typed into the Arduino software using C language then compiled and downloaded to the microcontroller. If there are no errors in the downloading process, then the downloader and microcontroller used are in good condition.

3.5 Hardware Device Test Results

After the hardware device has been programmed into the microcontroller and executed using the downloader, the program will automatically be entered into the microcontroller. Can be seen in figure 7.

Figure 7. Tool Circuit System

3.5.1 Fan Test Results

For the fan test results here I control using a Telegram bot by entering the Fan command. It can be seen in figure 8

Figure 8. Fan Test Results

3.5.2 Water Pump Test Results

For the water pump test results here I control using a telegram bot by entering the Water Pump command. It can be seen in figure 9.

Figure 9. Water Pump Test Results

3.5.3 Water Pump Test Results

For the water pump test results here I control using a telegram bot by entering the Water Pump command. Can be seen in figure 10.

Figure 10. Water Pump Test Results

3.5.4 Fan and Water Pump Test Results

For the fan and water pump test results, here I control using a telegram bot by entering the command All ON. It can be seen in figure 11.

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Figure 11. Fan and water pump test results

3.5.5 Movement Detection Sensor Test Results

For the movement detection test results here I control using a Telegram bot by providing notifications when an object crosses the sensor. It can be seen in Figure 12 below

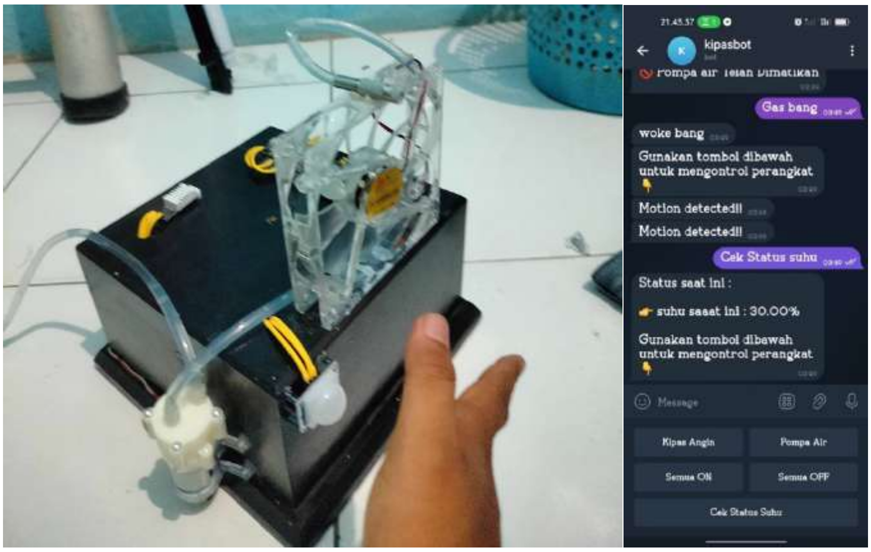

Figure 12. Test results for movement detection sensors

3.5.6 Temperature Sensor test results

For the temperature sensor test results here I used the DHT22 sensor and controlled it using a Telegram bot by giving the Check Temperature Status command. For research objects, use lighters. Can be seen in Figure 13.

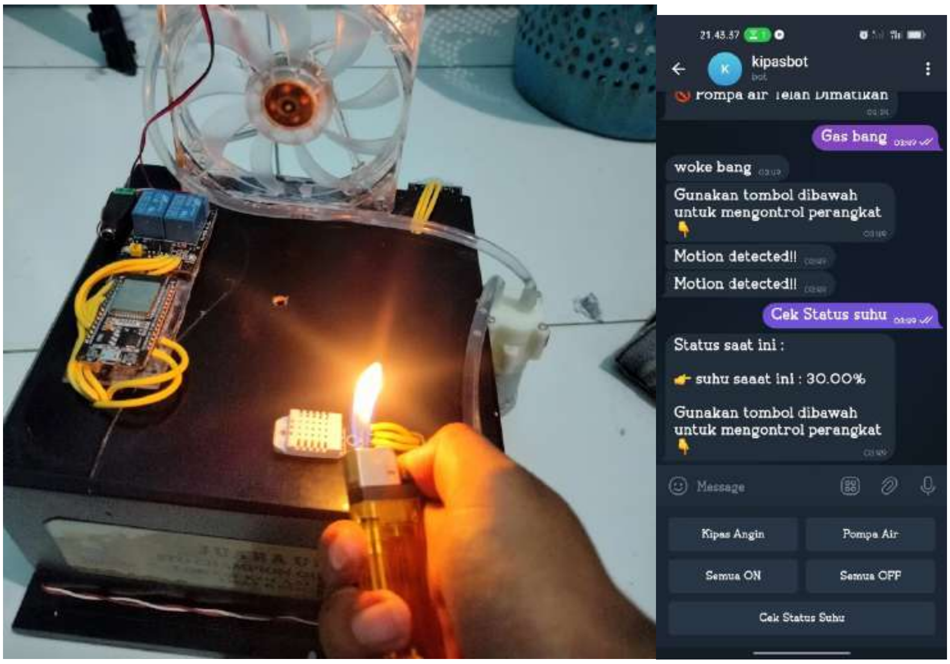

Figure 13. Temperature detection sensor test results

3. CONCLUSION

The working principle of WI-FI in a tool system is as a communication medium between the tool system and an Android cellphone. An Android cellphone can be used as a controller to control a dew fan (blower) using an application that can be downloaded on the internet. The Esp32 Board functions as a controller, data receiver and data processor as well as a WI-FI signal receiver that can be connected to Android. WI-FI on this device is a local network for sending and receiving data.

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