PERFECT
JOURNAL OF SMART ALGORITHMS

E-ISSN: 3064-0377
Volume 1, **Number** 2, July 2024
https://doi.org/10.62671/perfect.v1i2.25

Body Temperature Measuring Device Based On Nodemcu Esp8266

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open access

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Article History:
Submitted: 12-12-2024
Accepted: 15-12-2024
Published: 23-12-2024

Keywords:
Nodemcu; Thermal camera; Esp8266; IoT; Body Temperatute.

ABSTRACT

Health is a state of well-being of the body, soul, and society that allows everyone to live productively socially, and economically. Health maintenance is an effort to overcome and prevent health disorders that require examination, treatment, and care. The research method of the body temperature measuring device uses a thermal camera based on the Internet of Things (IoT). It uses two parts, namely input and output, where the input is a thermal camera sensor that functions to measure body temperature in humans while the production is in the form of a display on the LCD and in the Blynk application. The purpose of this tool is to produce a tool that can read human body temperature. The tool that is produced will later be able to read body temperature accurately like existing measuring instruments. The results of the thermal camera tool will detect human body temperature at a distance of 2 to 3 cm. Where each body temperature reading will be displayed on the LCD and the Blynk application, making it easier to find out the body temperature that has been detected by the sensor.

INTRODUCTION

Health is a state of physical, mental, and social well-being that enables everyone to live productively socially and economically. Health maintenance is an effort to overcome and prevent health disorders that require examination, treatment, and care. This is reinforced by the World Health Organization (WHO) that health is a state of physical, mental, and social well-being and not just the absence of disease or weakness. Meanwhile, according to Law No. 36 of 2009 concerning health, health is a human right which is a fundamental right of every citizen and must be fulfilled.

Health is a vital element in all activities carried out by humans. Vital signs of human health can be known from body temperature, breathing, blood pressure, and pulse. Finding a disease through a physical examination can be known by conducting a vital signs examination which includes blood pressure, pulse, breathing, and body temperature (Izhangghani et al., 2022). Based on the description above, the author intends to design a "Body Temperature Measuring Device Based on NudeMCU ESP 8266".

LITERATURE REVIEW

Research that has been conducted by previous researchers regarding body temperature measuring devices using the AMG8833 IR Thermal Camera Sensor includes: Non-Contact Body Temperature Measurement System Using the AMG8833 Thermal Camera (Nasir & Supria, 2020).(Wahyat, 2021). And research that has been carried out by previous researchers regarding other body temperature measuring devices such as Design and Building a Children's Temperature Monitoring System Using the MLX90614 Temperature Sensor and NODEMCU ESP-12E Based on Android (Abdullah, 2022). Iot-Based Blood Pressure and Body Temperature Monitoring System (Saputro et al., 2022). Human Temperature And Heart Rate Monitoring Device Based On Internet Of Things Using Blynk (Masthura et al., 2023). Temperature Monitoring System using Arduino Uno and Smartphone Application (Hasibuan et al., 2021). Measuring Body Temperature Based Internet of Things (IoT) Using Esp8266 and Firebase (Gunawan et al., 2021). Design and Construction of a Touchless Body Temperature Meter Based on IoT (Internet of Things) for Student Screening Ahead of the Implementation of Face-to-Face Learning (Wibowo et al., 2022). Design of a Human Body Temperature Measuring Instrument with a Contactless Based System Internet of Things (Santoso et al., 2023). Design and Build of Masked Face Identification System and IoT- Based on Body Temperature Measurement (Bayupati et al., 2023). Remote Health Monitoring System Using NodeMCU(ESP8266) and Arduino (Nithin Kumar et al., 2024). Heartbeat Monitoring and Stimulation with Murottal Al-Qur'an Based on Internet of Things (IOT) (Ilham et al., 2020). (Ilham et al., 2019). Opening doors using internet of things (IoT) based face recognition (Ariansyah et al., 2021). Design of an automatic temperature and humidity measuring device in the oyster mushroom cultivation room (Permata et al., 2024). Implementation of The Internet of Things on Monitoring and Control Tools Hydroponic System (Ilham et al., 2024).

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METHOD

Tools and materials

The tools and materials required in designing a body temperature meter using the AMG8833 IR Thermal Camera Sensor consist of hardware and software, including:

Hardware

Table 1. Hardware

No	Name	Function
1	AMG8833 IR Thermal Camera Sensor	Functions detect heat or infrared energy and convert it into electrical energy or electronic signals, which can then be processed to produce thermal images. In addition to producing thermal images, these electronic signals can be used to perform calculations or temperature measurements.
2	Computer	This computer receives electrical energy or electronic signals to produce thermal images.
3	Nodemcu ESP8266	Microcontroller that provides efficient Wi-Fi connectivity

Flow chart

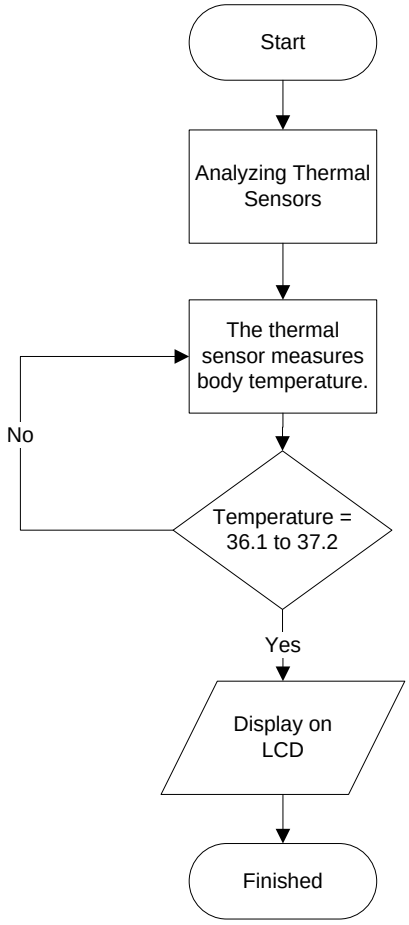

Figure 1. Flowchart

In Figure 1, when the system starts running, NodeMCU will analyze the thermal sensor first. After the sensor is analyzed, the thermal sensor is ready to measure body temperature. If the body temperature measured by the thermal sensor is 36.2 to 37.2, the human body temperature is normal and will appear on the LCD and in the Blynk smartphone application.

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Body Temperature Measuring Tool Sketch

Figure 2. Tool Sketch

Description:

1. Placement of thermal camera sensor
2. Placement of OLED LCD
3. Placement of Push Button
4. Blynk application

Here are some complete components in the scheme above, the first is a smartphone container where body temperature is displayed via a local web server. The second is a battery as an energy source so that the device remains on so that it functions. The third is nodemcu v3 as a Bluetooth media connection between the main device and the smartphone. The fourth is the AMG8833 temperature sensor as a detector of the body temperature to be checked.

RESULT AND DISCUSSION

Body Temperature Measuring Tool Series Results

In the process of using a body temperature measuring device, several stages are required, the stages required include:

Thermal Camera Circuit

The thermal VCC pin is connected to the Nodemcu Vin pin, the Thermal GND pin is connected to the Nodemcu and pin, and the Thermal Sda and Scl pins are connected to the Nodemcu D1 and D2 pins. As in Figure 3.

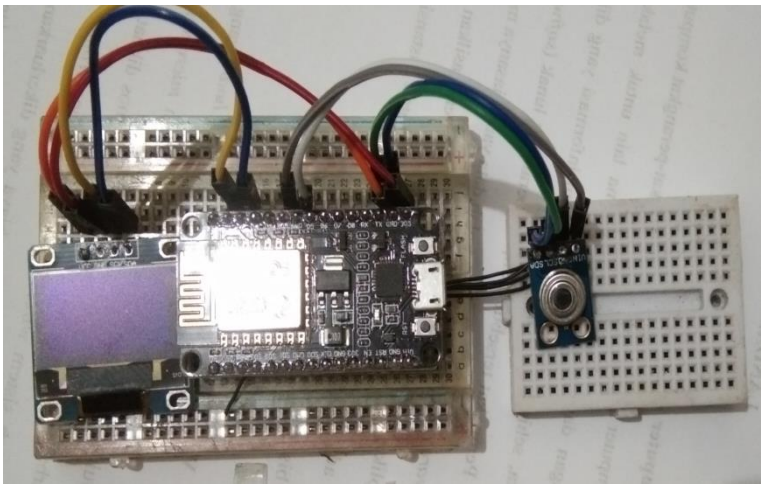

Figure 3. Thermal Camera

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Oled LCD circuit

The Oled LCD VCC pin is connected to the Nodemcu Vin pin, the Oled LCD GND pin is connected to the Nodemcu GND pin, the Oled LCD SDA and SCL pins are connected to the Nodemcu D3 and D4 pins.

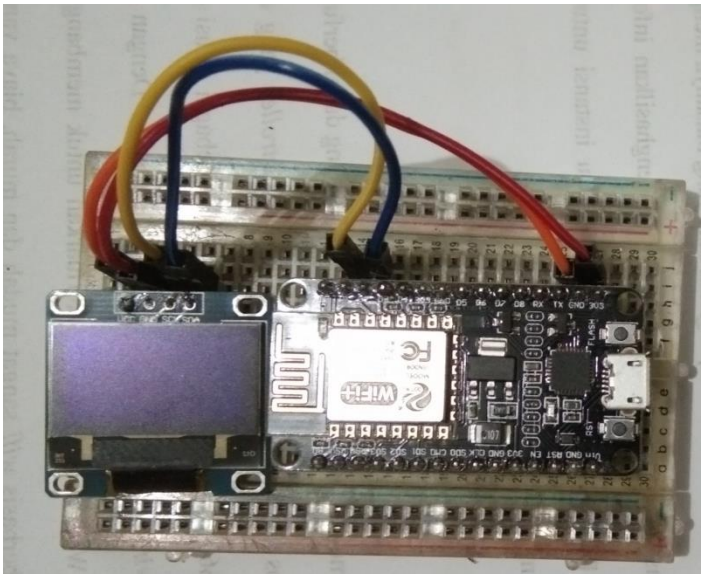

Figure 4. OLED LCD

Blynk Application Display

The icon display on the Blynk application has been adjusted to the program created in the Arduino Ide application. On the V2 icon, D2, and D3 Thermal Camera sensors are connected, so they can send results detected by the sensor accurately.

Figure 5. Blynk Application display

Tool Testing Procedure

After the system is finished, it is necessary to test the system. Then the Thermal sensor will detect the temperature in the body and send the data detected by the thermal sensor to the Blynk application. While the normal temperature limit for adults ranges from 36.1 to 37.2 degrees Celsius Here the author conducted research for 10 days in 1 day done 3 times.

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Table 2. Testing the tool with a thermal camera

No	Name	Time			Description	
		Morning	Afternoon	Evening	Normal	Hyperthermia
1	Mza	35.3^{0}C	35.2 ^{0}C	34.0 ^{0}C	√	
2	Hakiki	35.0 ^{0}C	35.3 ^{0}C	34.2^{0}C	√	
3	Deppi	35.0 ^{0}C	35.3 ^{0}C	34.32^{0}C	√	
4	Mukjizat	35.0 ^{0}C	35.3 ^{0}C	34.2 ^{0}C	√	
5	Hasmina	35.0 ^{0}C	35.3 ^{0}C	34.3 ^{0}C	√	
6	Cutty	35.0 ^{0}C	35.3 ^{0}C	34.33 ^{0}C	√	
7	Rinda	35.0 ^{0}C	35.0 ^{0}C	35.8 ^{0}C	√	
8	Nurasiah	35.0 ^{0}C	35.0 ^{0}C	35.1 ^{0}C	√	
9	Hasmina	35.0 ^{0}C	35.0 ^{0}C	35.2 ^{0}C	√	
10	Aan	35.1^{00}C	35.0 ^{0}C	35.4 ^{0}C	√	

Table 3. Testing with Thermometer

No	Name	Time			Description	
		Morning	Afternoon	Evening	Normal	Hyperthermia
1	Mza	36.4^{0}C	36.4 ^{0}C	35,1 ^{0}C	√	
2	Hakiki	36.1 ^{0}C	36.5 ^{0}C	35,31^{0}C	√	
3	Deppi	36.1 ^{0}C	36.5 ^{0}C	35,3 ^{0}C	√	
4	Mukjizat	36.1 ^{0}C	36.5 ^{0}C	35,3 ^{0}C	√	
5	Hasmina	36.1 ^{0}C	36.5 ^{0}C	35,4 ^{0}C	√	
6	Cutty	36.1 ^{0}C	36.5 ^{0}C	35,5 ^{0}C	√	
7	Rinda	36.1 ^{0}C	36.1 ^{0}C	35,9 ^{0}C	√	
8	Nurasiah	36.1 ^{0}C	36.1 ^{0}C	35,2 ^{0}C	√	
9	Hasmina	36.1 ^{0}C	36.1 ^{0}C	35,3 ^{0}C	√	
10	Aan	36.1^{00}C	36.1 ^{0}C	35,5 ^{0}C	√	

Based on the research above, it was conducted 10 times and conducted at three different times, namely morning, afternoon, and evening. Then the thermal camera sensor will detect the temperature of the body and the results read by the sensor will be displayed on the LCD. While the comparison between the thermal camera and the thermometer ranges from 1 to 2%. While the normal human temperature ranges from 36.1 to 37.2. the accuracy of the thermal sensor ranges from 90%.

Morning tool testing

The first test was conducted in the morning around 10:00 where the body temperature read by the sensor was 36.4 while the thermometer sensor read 36.5. The difference between the thermal camera and thermometer ranges from 1 to 2 percent.

Testing the tool during the day

The second test was conducted during the day at 14.00 where the thermal sensor read the body temperature of 35.33. while the body temperature read by the thermometer was 36.4.

Testing the tool at night

The third test was carried out at night where the body temperature read by the thermal sensor was 36.1 while that read by the thermometer sensor was 36.3.

Comparison between thermal camera and thermometer

Thermometer readings are accurate between 100 percent while thermal camera readings are around 95 percent.

Tool Test Results

The body temperature detector is designed to measure human body temperature, the thermal camera will detect human body temperature at a distance of 2 to 3 cm. Where each body temperature reading will be displayed on the LCD and the Blynk application, making it easier to find out the body temperature that has been detected by the sensor.

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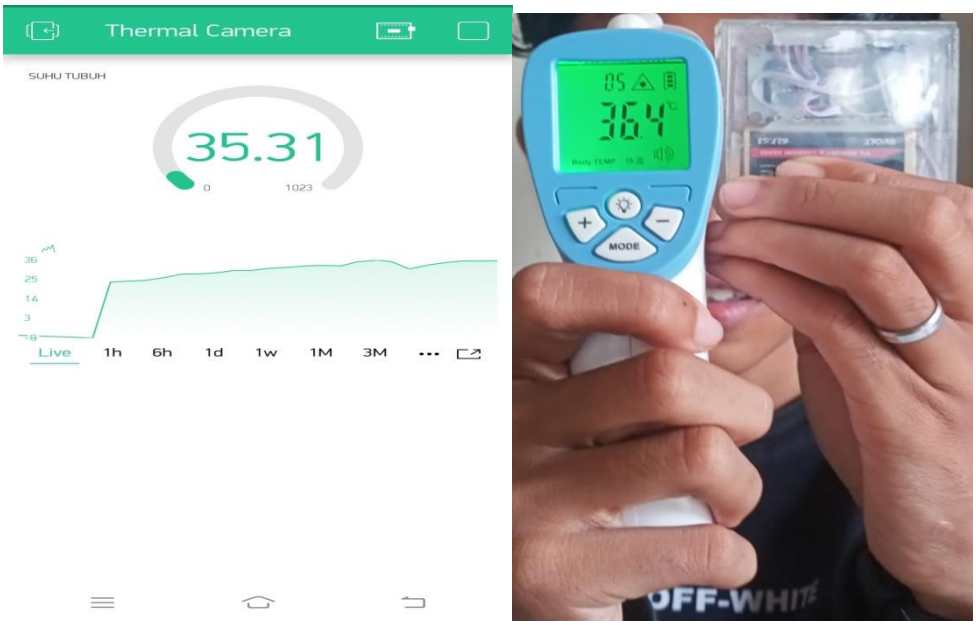

Figure 6. Tool test results

CONCLUSION

After designing and circuitry of body temperature measuring device based on Nodemcu esp 8266 and then testing the device, both testing each circuit and overall sensor reading. Then the following conclusions can be drawn:

1. This device can measure body temperature and the measurement results are displayed on the LCD and smartphone.
2. The body temperature measuring device uses a thermal camera sensor with an accuracy of 90% while the thermometer has an accuracy of 100%.

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