

Android Application for Automatic Door Control System using Body Temperature Measuring Sensor

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Abstract— One way for people to prevent the transmission of Covid-19 in indoor and outdoor activities is by using body temperature detection. People who have a body temperature higher than the measurement limit are prohibited from mingling with other people because they have a high probability of being infected with the virus and can transmit it to other people. Manual checks in public places can cause officers to potentially contract the virus and can spread it to other visitors more quickly. Therefore, it is necessary to develop an automatic body temperature measurement system by displaying the results of the measurements on a screen and automatic door as a further prevention step, and temperature data can be stored in a database to help make the right decisions in preventing the spread of Covid-19 in that place. The implementation stages of the activities include: Data Collection, Preparation of Technology Design and Purchase of Materials, Product Manufacturing, Product Testing, Product Evaluation. An Android application for an automatic door control system using a body temperature measurement sensor can be developed into an even better tool. The development of this prototype will be developed by adding a PIR sensor and system modifications. The addition of a PIR sensor is used to increase the security of the tool to detect only human body temperature which can be recorded in order to minimize data errors. The system modifications made can be used for initial examination assessments with body temperature and also the addition of a system for measuring body weight and height to complete the assessment data.

Keywords : System Mods, Android, Sensors

I. INTRODUCTION

Coronavirus Disease-19 (Covid-19) is a disease caused by the corona virus that first appeared at the end of 2019 in Wuhan, China, which is currently causing a pandemic throughout the world. Fever is one of the symptoms of Covid-19. To support human survival during the spread of Covid-19, technological innovation in various fields has grown rapidly. For example, research on an Automatic Body Temperature Measuring System Based on the Internet of Things for Health Protocols. In this research, a body temperature measuring device was created using the ESP8266 Wifi module, GY-906 MLX90614 Sensor, Ultrasonic Sensor, Oled LCD, and Buzzer [1].

Places such as offices, shopping centers or public facilities are the locations where the Covid-19 virus is transmitted with the highest numbers. Therefore, preventive measures are needed that have been regulated by complying with health protocols, namely washing hands, wearing masks and maintaining distance [2]. One way for people to prevent the transmission of Covid-19 in indoor and outdoor activities is by using body temperature detection. People who have a body temperature higher than the measurement limit are prohibited from mingling with other people because they have a high probability of being infected with the virus and can transmit it to other people. Manual checks in public places can cause officers to potentially contract the virus and can spread it to other visitors more quickly. Therefore, it is

necessary to develop an automatic body temperature measurement system by displaying the results of the measurements on a screen and automatic door as a further prevention step, and temperature data can be stored in a database to help make the right decisions in preventing the spread of Covid-19 in that place.

During the current Covid-19 pandemic, entrance doors to public places such as shopping centers, hospitals and other public facilities that do not yet use automatic doors cause visitors to come into physical contact with other visitors, although not directly. In a similar case, there are temperature check officers who continue to monitor the temperature of each visitor closely, so that direct physical contact can occur. Not only that, temperature monitoring by officers does not yet record the average body temperature of visitors which is used to help determine various conditions. In this case, a body temperature recording tool will be created which is equipped with an automatic sliding door and the recording results can be accessed mobile.

II. RESEARCH METHODS

The implementation stages of activities include figure 1

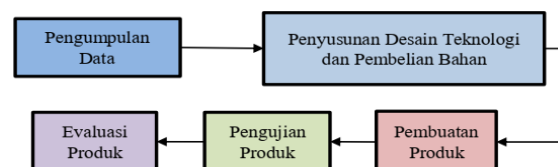


Figure 1. Implementation Stages

Based on the image above, the details of each stage are as follows:

1. Data Collection
 Collect library data, read and take notes, and manage research materials completely and comprehensively regarding the need for tools and materials to the manufacture of tools/products for the system design that will be completed.
2. Preparation of Technology Design and Purchase of Materials
 Carry out system design and purchase tools and materials needed to manufacture tools/products.
3. Product Manufacturing
 Carrying out system design designs and assembling tools according to designs that have been made with materials that have been purchased so that they can be applied according to the designs that have been obtained from literature studies that have been carried out.
4. Product Testing
 Once the system is deemed sufficient at the manufacturing stage, the next step is to test all product functions so that the evaluation stage can be carried out.
5. Product Evaluation
 Provide an assessment of products that have been tested to correct deficiencies obtained from product testing

III. RESULT AND ANALYSIS

1. Collection of supporting materials and tools
 The programming language used is C++ using the Arduino IDE application with supporting components used in the Android Application for the Automatic Door Control System using Body Temperature Measuring Sensors including NodeMCU ESP8266, LCD I2C 16x2, MLX 90614 temperature sensor, Infrared Sensor, GM861 Barcode/ QR reader, Relay Module, Buzzer, Servo Motor, LED, DC 12V Adapter, Jumper Cable, Gear and sliding door rail, and Acrylic, Male Jumper Cable, Male Jumper Cable, Female Jumper Cable. Along with the assembly, the creation of the application by coding the PHP programming language system and also the database with MySQL is carried out via localhost first with the XAMPP server, after the system is complete the collection of code and database is stored on the hosting so that the API code can then be run to connect the application with the Arduino device. so it can work. The final step is to create a display on the code to produce an Android application with the Apk extension.

2. Program Design and Realization

a) Prototype Overview

The Android application used to control automatic doors using body temperature sensors aims to reduce direct physical contact and prevent the spread of Covid-19 through droplets attached to conventional door handles. This technology can be used in business centers such as shops, offices and restaurants which are located in indoor areas or indoor areas that are not exposed to direct sunlight. As shown below is an Arduino component design created using the Arduino programming language, C++.

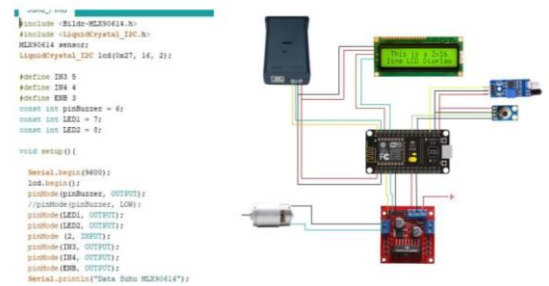


Figure 2. Component Circuit Design and Programming Code

The PHP code below is the database connection code and API used to receive data from NodeMCU to be stored in the database with user_id and user_temperature parameters.



Figure 3. API Code and Database Connection

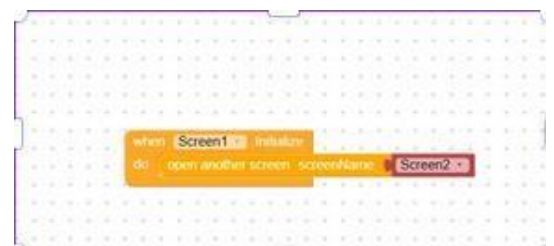


Figure 4. Codular Code

The Kodular code created is used to create a web application so that it can be used in Android-based applications.

b) Function and How it Works

The function of this system is:

- 1) Provide comfort for temperature monitoring officers and visitors
- 2) Reduce physical contact between visitors and temperature monitoring officers with a more effective system.
- 3) As a solution to reduce physical contact during the Covid-19 pandemic.
- 4) As a further prevention step, temperature data can be stored in a database to help make the right decisions in preventing the spread of Covid-19.

In its implementation, users are divided into 2, namely general users and registered users. Registered users can be thought of as users who already have an account on the system or can be analogous to patients. When a user checks their temperature, they first scan the user's QR code to detect them as a registered user, but if they don't scan they will be declared as general users. Next, the Infrared Sensor detects an object, such as a human hand, which activates the MLX90614 Temperature Sensor. The reading results are displayed on a 16x2 LCD screen and the data is sent to the server for automatic data retrieval.

If the temperature read is a normal temperature between 36 and 37°C, the Servo motor with gear will be activated. This will rotate the door automatically, and the LED will light up as protection for a few seconds. a sign that if the recorded temperature is abnormal, two conditions will occur: if there is registered user data, the door will remain open; if a general user uses a servo motor, the LED will flash several times within a few seconds as a warning signal.

The results of processing temperature recording by the user displayed in the system are temperature recording graphs and recording tables with the status of temperature conditions during the recording of the last 10 data. In this system there is also a Qr Code image that registered users can use to record. Additionally, admins are responsible for monitoring system data; Based on user status and type, the number of people checking temperature can be tracked. The admin can also monitor all user data registered for weighing and create master temperature status data based on human body temperature categories.

c) Advantages and Predicted Benefits for Users

The advantages of this system are:

- 1) Can be one of the newest options in implementing the Covid-19 health protocol, namely checking body temperature with a more effective system.
- 2) Provide comfort for temperature monitors and visitors.
- 3) Can reduce physical contact between visitors and temperature monitors.
- 4) Creating security and comfort for all visitors.
- 5) Temperature recordings stored in the database are used to provide daily reports of temperature recording results, from these reports you can also find out the average temperature recorded as well as the date and time of each recording.

Prediction of Benefits for Users, namely:

- 1) Users can find out how high, status and time their body temperature is recorded.
- 2) Provide comfort for temperature monitors and visitors.
- 3) Can reduce physical contact between visitors and temperature monitors.
- 4) Creating security and comfort for all visitors.

3. Testing and analysis of results

1) Test Results

The results of this prototype trial prove that the level of functionality of this prototype with Black Box testing can work at 100%, with the results recorded as follows:

Table 1. Test Results

No	Variable	What was tested	Results
1.	Application	Main Menu Display	Success
		Temperature monitoring graphic display	Success
		User data	Success
		History of each user	Success
		Temperature category master	Success
		Report	Success
2.	Tool	Function	Success
		Infrared Sensor	Success
		MLX90614 Temperature Sensor	Success
		DC motors	Success
		LED	Success

In this trial, it was carried out in conjunction with temperature recording from the MLX90614 Temperature Sensor with a Thermogun, it was found that the level of accuracy of the temperature sensor readings with the MLX90614 Temperature Sensor was 94% with the recording results as follows:

Table 2. MLX90614 Temperature Sensor Accuracy Table

First try -	Temperature recording results	
	MLX90614 Temperature Sensor	Thermogun
1	36,06	36,26
2	36,07	36,27
3	36,10	36,34
4	36,12	36,35
5	36,07	36,28
Average	36,08	36,30
Accuracy	94%	

2) Development Potential

An Android app that uses body temperature sensors to control automatic doors might be a better tool. By adding PIR sensors and changing the system, this prototype will be developed. The addition of a PIR sensor increases the safety of the device by only detecting human body temperature to reduce data errors. System modifications can be used for initial examination assessment with body temperature, and weight and height measurement systems are added to complete the assessment data.

VI. CONCLUSION

An Android application that utilizes body temperature sensors for an automatic door control system has been completed. This prototype uses a nodemcu microcontroller and uses the C++ programming language, PHP to create web applications, and Kodular to run applications on Android phones. With 95% accuracy compared to a thermogun, the MLX90614 temperature sensor can be used as a tool to measure body temperature. Test results on the prototype show that all applications and tools in the Android application for the automatic door control system can work with 100% accuracy. Therefore, this system can be applied in busy areas such as shopping centers, offices and restaurants which are located in central indoor areas or indoor areas that are not exposed to direct sunlight.

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