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Design of Non-Contact Temperature Meter and Automatic Berrier Based on Arduino Uno with C Programming Language

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Abstract

Buddhi College Junior High School is one of the Buddhist schools in Tangerang City in the field of education that requires infrastructure in it. In the era of the Covid-19 pandemic which is increasingly rampant and many activities are dismissed so that it interferes with performance both in terms of education and in the business sector, until in the end many places have to be closed and even have to lose money due to this pandemic, then places must have standard protocols that are met . With this protocol, entrepreneurs and places, one of which is the world of education, need tools that can fulfill the protocol. The lack of knowledge about the symptoms of this disease requires the user to measure his body temperature when entering a place, one of which is a school or university. Temperature gauge is the hotness of an object or object that can be felt. not only used for companies or crowded places, temperature meters can also help health workers to monitor patients easily and quickly. Through the process of understanding until the design process is carried out, an Arduino-based tool design is formed with an algorithm with the c programming language and the workings of the tool to be made. The collected dataset is then sampled for manual processing. The manual process serves to measure the accuracy of the temperature being measured so that it can be implemented on the tool to be made.

I. INTRODUCTION

In the era of the Covid-19 pandemic which is increasingly rampant and many activities are dismissed so that it interferes with performance both in terms of education and in the business sector, until in the end many places have to be closed and even have to lose money due to this pandemic, then places must have standard protocols that are met . With this protocol, entrepreneurs and places, one of which is the world of education, need tools that can fulfill the protocol. The lack of knowledge about the symptoms of this disease requires the user to measure his body temperature when entering a place, one of which is a school or university. Temperature gauge is the hotness of an object or object that can be felt. not only used for companies or crowded places, temperature meters can also help health workers to monitor patients easily and quickly.

Arduino is a microcontroller that is intended to be used easily by artists and designers (who are not technical people) [1]. Thus Arduino makes it very easy to make a prototype that is quite diverse according to the type of needs needed. The use of Arduino can also be collaborated with other modules so that the assembly becomes easier and more efficient.

A temperature sensor is an electronic component that has a function to convert the temperature quantity into an electrical quantity in the form of a voltage [2]. This sensor has high accuracy and the ease with which it is designed so that it can be easily connected to Arduino and other sensors. There are so many types of temperature sensors that are sold both in e-commerce or in shops that sell computer equipment, so they are very easy to find.

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The ultrasonic sensor is also a module that can be combined with Arduino just like the temperature sensor, this module is also very easy to obtain and how to use it easily and efficiently.

Servo motor is a rotary hardware designed with closed loop feedback system. Servo motors can be adjusted to determine the desired angle position according to taste according to needs.

Temperature is the point at which an object has hot or cold properties [3]. This concept fits with the everyday idea of temperature as a measure of how hot or cold it is, because if we knew about temperature, all objects would have the same amount of heat after a long period of exposure.

Many measurable physical properties change as temperature we respond to psychological changes, including air temperature, humidity, and other temperature parameters. Instrumentation systems in the form of data collection are widely used in industrial operations because they are part of process control. Measuring physical quantities is one step in the data collection process. Temperature is one of the physical variables commonly used in control systems for monitoring systems and other control processes.

If you're measuring the temperature of a room or forest, you'll need an instrument to determine how high the temperature is using a thermometer. The benefit of a thermometer is to detect changes in temperature due to an increase or decrease in the concentration of hot and cold at the measurement site. A thermometer is basically a device such as a temperature measuring device, where the device uses a sensor as a detector and is a circuit with an attached device to read the measured temperature. to measure. In general, measuring objects and measuring objects are places where measurement operations are carried out.

Currently, the process of collecting, storing, processing and analyzing measured data is in progress. However, not all measurement operations can be performed in this way, sometimes the measured object and the measured object need not be in the same place all the time, making the device ineffective for industries or measurements that require constant monitoring.

That is, in terms of measurements for areas that are dangerous or difficult for humans to access, such as mountains, caves or valleys, or for industries such as traditional wood drying in the interior industry.

Currently, the temperature measurement process is still carried out using officers as inspectors. Temperature measuring officers are very at risk of being infected when doing their job measuring the user's body temperature. Without supporting tools, this activity becomes very risky. This causes a negative impact on officers even for students and students who are around. In the absence of measuring devices, officers cannot know one of the symptoms of this disease, one of which is by checking body temperature.

These problems become the basis for the need for contactless measuring devices that can help measuring officers and even students in measuring their body temperature. Making tools in research uses Arduino as one of the useful supporting tools supported by infrared sensors and ultrasonic sensors that function as distance controllers so that they can be detected by infrared. The purpose of this tool is to fulfill health protocols that are more efficient and easy to use. In addition, the application of infrared and ultrasonic sensors provides convenience when measurements are made.

II. Literature Review

Arduino is an open-source single-board micro controller that is widely used to build an electronics project. Arduino contains two hardware (hardware) in the form of a board and software (software) or IDE (Integrated Development Environment) that runs on a computer, to write and load programs onto the Arduino board.

A temperature sensor or temperature sensor is a component that is able to change the amount of heat in the object into an electrical quantity so that it can detect changes in the temperature of the object being read. According to [4] detecting temperature by emitting infrared light to the target object and producing an analog signal output. MLX90614 has a communication line, namely, SCL as clock and SDA for two-way data transmission between master and slave [5], MLX90614 also has the ability to detect temperature on objects between -70°C to 380°C.

According to [6] High-level language is a programming language oriented to human language. Programming is done in a programming language that is easy for people to understand, usually English words; For example, IF to declare if and AND to declare and which belongs to the language group is C language.

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller. simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to run.

Arduino IDE software is one of the software needed in making an Arduino project other than a microcontroller. IDE stands for Integrated Development Environment which can also be interpreted as an integrated environment for development. It is said to be an environment, because it is through this software that Arduino can be programmed to perform functions according to the syntax of certain programs. The Arduino software has its own programming

language, namely the simplified C language and is equipped with a library, making it easier and more efficient for users to program and use the software.

The function of the Arduino Integrated Development Environment or IDE is as software that can be used to write, verify, debug, compile, and upload programs (sketches) from the computer to the Arduino board, so that the modules installed on the Arduino can work properly and efficiently. correct.

In designing this tool, this block diagram consists of circuits including: a power circuit that serves to supply voltage throughout the existing circuit, the ATmega328P functions as a servo control center, buzzer, and I2C1602 LCD and can read the temperature obtained from the temperature sensor and ultrasonic sensors. The ultrasonic sensor HC-SR04 functions to read the distance from the ultrasonic sensor to the user's body then sent to the Arduino ATmega328P for processing and display in visual form. The MLX90614 Temperature Sensor functions to read body temperature, then the read temperature data is sent to Arduino for processing and visually displayed.

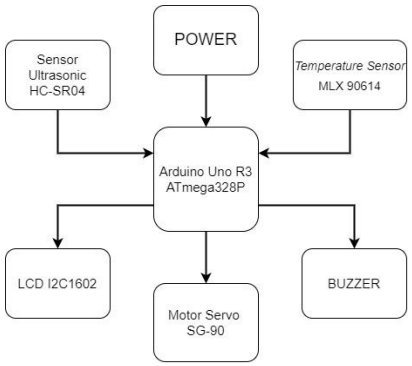

Figure 1. Blok Diagram

Servo motor serves to open the main access door which is processed by Arduino ATmega328P with a time lag determined by the maker itself. The LCD I2C1602 functions to display information that has been processed in the Arduino Atmega328P into a variable that can be read by the user of the tool itself. The buzzer functions as an output from the module by issuing a warning sound if the temperature in the body does not match the predetermined minimum and maximum standards or limits.

III. METHODS

Pseudocode is the main description of an algorithm that is presented in the form of program code. Pseudocode in an algorithm is needed to provide a clearer picture of the algorithm by presenting the program code on a basic basis. Thus the algorithm will be very easily understood by programmers, especially in terms of program code that will later be executed. Here is the pseudocode for each tool:

1. *Temperature* Sensor

```
Library sensor ultrasonik
Mlx = sensor ultrasonik
Library Lcd (ukuran lcd)
Setup()
Input lcd
Input mlx
Loop()
   If
   Temperature sensor reads temperature over 37.3 in 3 seconds
   So
Cetak ”—ANDA DEMAM—”
   If
   Temperature sensor reads temperature less than 37.3 with 3 seconds
   So
Cetak ”—ANDA SEHAT—”
```

2. Sensor Ultrasonik

Pin trig number 10
Pin echo number 11
Distance
setup()
Output pin trig
Input pin echo
Input distance
loop()
Trig pin not lit for 2 microseconds
Pin trig flashes for 10 microseconds
Trig pin not lit
Pin echo reads time duration
Distance = (duration / 2) / 29.1
Print "cm"
With a time of 0.5 seconds

3. Servo

Library Servo
Servo input at pin 6
Servo name myservo
setup()
Enter myservo
loop()
0 degree angle with 1 second time
180 degree angle with 1 second

4. Buzzer

Buzzer input on pin 3
setup()
Buzzer output
loop()
Buzzer is on for 1 second
Buzzer is on for 0.2 seconds

IV. UNIFED MODELING LANGUAGE

The design of UML in this study uses activity diagrams. The following is an activity diagram of the application that will be created:

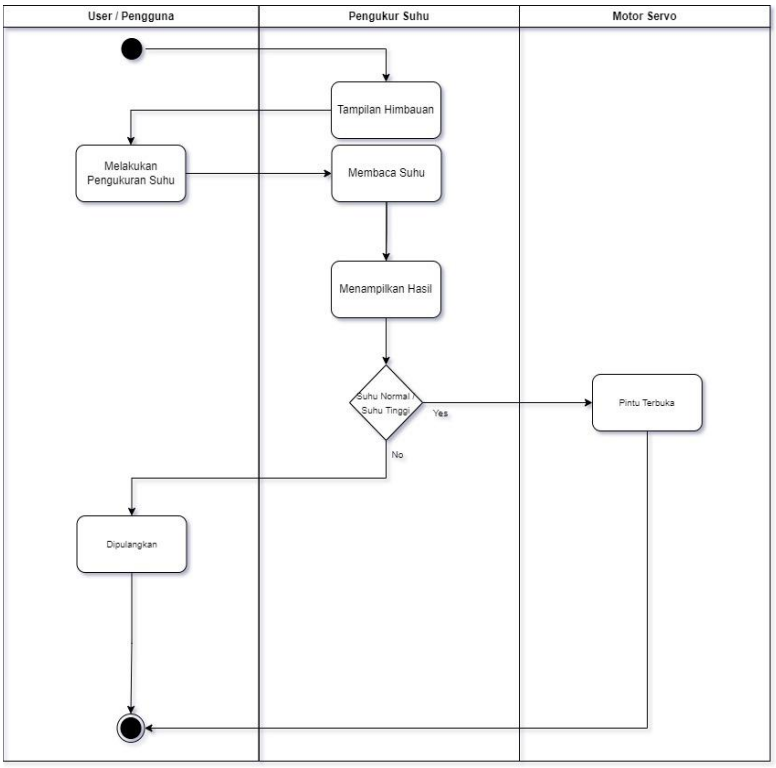

Figure 2. Unified Modeling Language

V. RESULT

The following is a display of the Contactless Temperature Gauge, which can be seen in Figure 3, the Temperature Sensor display can be seen in Figure 4, the display of the servo motor can be seen in Figure 5, the Arduino Uno R3 display can be seen in Figure 6, the display of the breadboard can be seen in Figure 7, and the LCD screen display can be seen in figure 8.

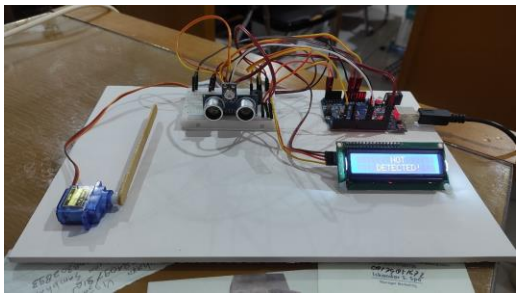

Figure 3. Contactless Temperature Gauge Display

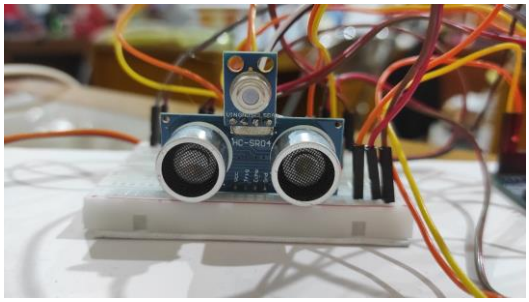

Figure 4. Display Temperature Sensor and Ultrasonic Sensor

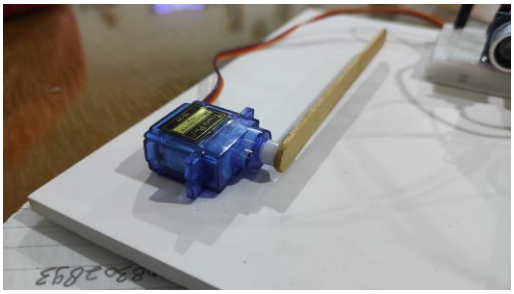

Figure 5. Servo Motor Display

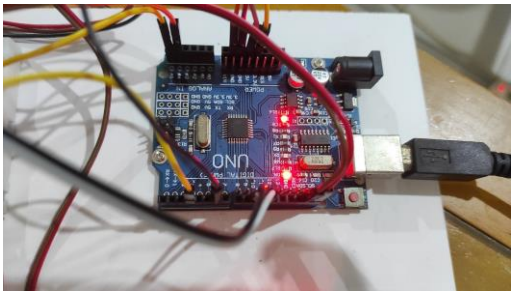

Figure 6. Arduino Uno R3 Display

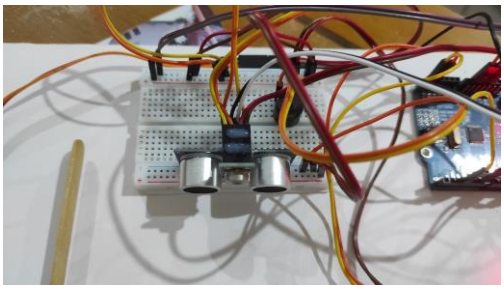

Figure 7. Breadboard Display

Figure 8. LCD Screen Display

Procedure for Using the Tool

1. Connect the power cable to a power source.
2. Wait for the device to boot up.
3. Bring the object you want to measure closer to the ultrasonic sensor and temperature sensor.
4. Wait for the buzzer to sound with a short duration (if the temperature is above > 37.3°C, the buzzer sound will last longer).
5. To find out the results of the temperature can be seen on the LCD screen.
6. If the temperature is below or < 37.3°C, the servo door latch will open and the user can enter the area/environment that is intended (if the temperature is above or > 37.3°C then the servo latch does not open.

7. When the tool is not in use, turn it off by unplugging the power from the mains voltage source.

Test result
Testing which includes hardware and software. Hardware testing includes testing the microcontroller (Arduino), temperature sensor, ultrasonic sensor, servo motor, buzzer, and LCD while software testing includes testing sensor readings, distance, time when opening the doorstop.

Temperature Sensor Test
This test aims to determine the condition of a person's body temperature, whether the temperature sensor can function properly and correctly. To test the function of the buzzer as a completed output as well as a warning tool and Ultrasonic sensor as a precise and ideal distance meter when measuring. Testing the temperature sensor by entering hot water and cold water into a glass as a sample.

Servo Motor Test
This test is carried out for selection when someone will enter the room after every body temperature check. This test is carried out by measuring the temperature of hot water and cold water that is inserted into the glass after which it is brought closer to the temperature sensor and ultrasonic sensor which functions to determine whether the servo motor is functioning or not.

Ultrasonic Sensor Test
This test aims to determine the distance that has been determined to function or not. This test is carried out by bringing body objects such as hands closer to a certain distance, assisted by other tools, namely a ruler as a predetermined standard distance.

```
Ambient = 28.83*C       Object = 29.85*C
22 cm
Ambient = 28.81*C       Object = 28.79*C
23 cm
Ambient = 28.81*C       Object = 28.79*C
25 cm
Ambient = 28.87*C       Object = 32.81*C
5 cm
Ambient = 29.01*C       Object = 32.27*C
6 cm
Ambient = 29.25*C       Object = 28.85*C
22 cm
Ambient = 29.31*C       Object = 28.77*C
23 cm
Ambient = 29.35*C       Object = 28.95*C
23 cm
Ambient = 29.35*C       Object = 28.99*C
25 cm
Ambient = 29.35*C       Object = 28.99*C
27 cm
Ambient = 29.29*C       Object = 28.83*C
22 cm
```

Figure 9. Data jarak dan suhu

Figure 10. Distance and temperature graph data

VI. CONCLUSIONS

Making temperature measuring devices without physical contact can find out and review body temperature data on students so that they can produce body temperature data that is useful as a strategy to prepare in case of an emergency during the COVID-19 pandemic until the following month. The use of Arduino with the right temperature sensor and using the c programming language method can produce accurate body temperature data and the efficiency of a tool that is able to detect body temperature quickly makes the tool highly recommended for schools. The c programming method with algorithms can design Arduino-based tools that can be used by teachers, students and staff at schools in knowing the body temperature of students at each level in the Buddhi College Junior High School by determining the minimum temperature and maximum temperature value.

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