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E-THAAP

Automatic Temperature Measuring Device

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Abstract: Modern world has all the sophisticated ideas and technologies to overcome any disasters and any diseases. New ideas are emerging day-by-day which is far better than t he exciting system. E-Thaap is also a new idea for temperature measurement automatically and without any contact with person to person. So as to avoid the spread of communicable disease. Already the idea of temperature measurement is implemented, but it is done manually with an infrared temperature measurement gun. Also, many ideas of automatic temperature sensing device are being discussing all over the world. This is just a basic idea of an automatic temperature measuring device which, in future, can be modified in any form and more sophisticated. This system is using a simple infrared temperature sensor, which is controlled by an Arduino. Also, the movement of the sensor, according to the height of t he person, is done with a simple gear motor. Manual temperature recording is a difficult and prolonged method, this may cause large crowd at the temperature screening stations. E-Thaap consists of a movable temperature sensor which triggers a buzzer system if the body temperature of the individual is higher than the normal temperature.

Index Terms **- Arduino, MLX90614, Temperature measurement, Infrared thermometer.**

I. INTRODUCTION

Modern world has solutions to the problems which they are facing and more developed ideas of exciting system is coming up. Today the whole world is facing the disastrous COVID'19. Due to this temperature measurement has become a vital part in every sector of the society. By measuring the temperature, we will have the basic idea if the person is having any symptoms, not only this covid-19 pandemic but any communicable disease, as the temperature will be changing in human body if the person is affected. The existing system of using the temperature gun is manual, in which a person points the gun towards the forehand of the incoming person and thus temperature is measured. So, people have to stand in queue, waiting for their turn. For people in rush this will not be advisable. Also, for educational institutions, like colleges and schools, students will be in a crowd, so manual method is not advisable.

II. EXISTING SYSTEM

In the current scenario of COVID'19, temperature measurement techniques have crucial role. This will give an idea if a person is having a normal temperature or not and others can be alerted if a person is not having normal temperature. For that infrared thermometer (gun type) is used for temperature measurement, which is done manually by a person. Infrared thermometers work based on a phenomenon called black body radiation. In the conventional system, the person points the temperature gun to the forehead of the incoming person. The thermopile receives the information from the sensor and converts it to electrical signals and the amplifiers amplifies the signal. Then through the multiplexer, the signal reaches the microprocessor. The microprocessor processes the signal and gives the output through display Current system is manual and the person assigned for measuring the temperature will be vulnerable to be get affected by the disease. Also, in places like schools, colleges, railway station, shopping malls, etc., group of people will be attending together, so it is not advisable to use temperature gun to measure the temperature in such crowd. Sometimes people can skip from checking the temperature.

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III. PROPOSED SYSTEM

This project proposes a fully automatic temperature measuring equipment which can be operated automatically. All technologies and components used will be open source and commercially available. The system operation begins when a person appears in front of the device. The ultrasound sensor which is set up on the top of the device measures the height of the person. At the same time another ultrasound sensor checks if the person is within the limit of the temperature sensor. According to the height measured, the motor moves the temperature sensor pointing the forehead of the person. Another ultra sound sensor is provided for checking the extremes of the movement of motor. The temperature sensor senses the temperature and checks whether the temperature is within the normal limit. If the measured temperature is above normal, the buzzer activates.

IV. OBJECTIVES AND FEAUTRES

The main objectives of our project are to design and development of an automatic, contactless and efficient temperature measurement system to the society in such a situation and also for future. The system is to ensure that no one is eluded from measuring the temperature. We mainly aim to avoid crowd that may create at the time of temperature measurement. This system is usually eco-friendly and also user-friendly.

The main features of the system are the system measures temperature automatically and this will be a Contact less process. The time taken for whole process is very less time, so that the crowd can be avoided and also this is very easy for transportation temperature measurement, the crowd can be avoided.

V. METHODOLOGY

E-Thaap consists of a moveable temperature (which moves according the height of the person), a height sensing device (measures the height of the person), a motor system (for moving the sensor) and controller (which controls the whole process). The temperature sensor used here is MLX90614 which is an infrared sensor. The height sensing device is a combination of Arduino Uno and ultrasonic sensor which is set up to measure the height of the person on the platform according to which the temperature sensor moves. The motor system is to move the temperature sensor according to the height of the person.

VI. BLOCK DIAGRAM

The whole setup of the system can be explained in two different block diagrams as one for measuring height and other is for block diagram for showing components for measuring the temperature

- **Block Diagram for Measuring Height of Person**

The Fig. 1 shows the components present in circuit for measuring height of the person. It consists of Arduino Uno which is the microcontroller, two Ultra sound sensors one of which is used for measuring the height and other is used to find the extreme ends, Motor driver and DC gear motor for moving the temperature sensor, interrupt switch to stop the motor when extreme ends are reached and a trigger for initializing the temperature measurement.

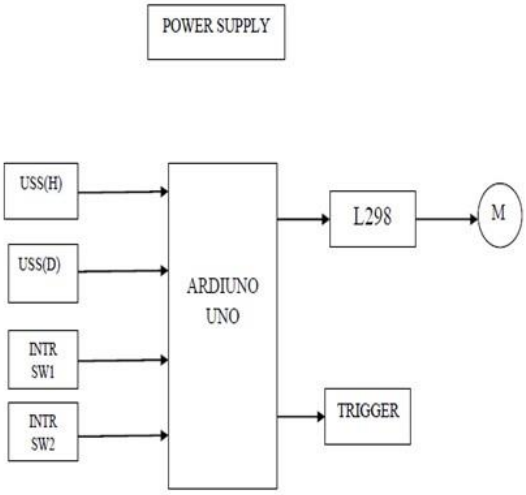


Fig 1. Block diagram of height measurement system

- **Block diagram for measuring temperature of person**

The Fig. 2 shows the components present in circuit for measuring temperature of the person. It consists of Arduino Nano which is the microcontroller, Ultra sound sensor to find the distance between the temperature sensor and the incoming person, Bluetooth module to obtain the measured temperature in android app and the temperature sensor which measure the temperature.

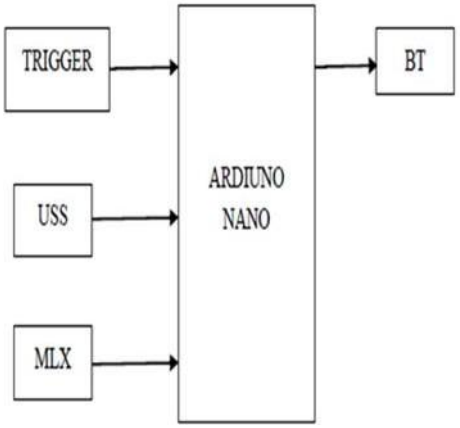


Fig 2. Block diagram of temperature measurement system

VII. COMPONENTS USED

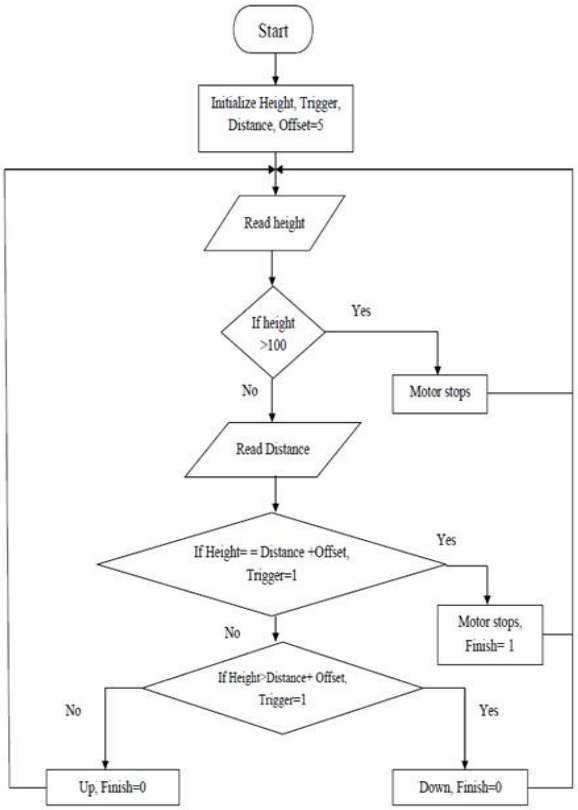
The components used in this device are:

- Arduino nano
- Arduino Uno
- Temperature Sensor (MLX90614)
- DC gear motor
- Motor Driver (L298 motor driver)
- Ultra Sound Sensor
- Bluetooth Module
- Buzzer

VIII. SOFTWARE IMPLEMENTATION

The flowchart and algorithm used for measuring height of person, for interrupt and for measuring temperature is described here.

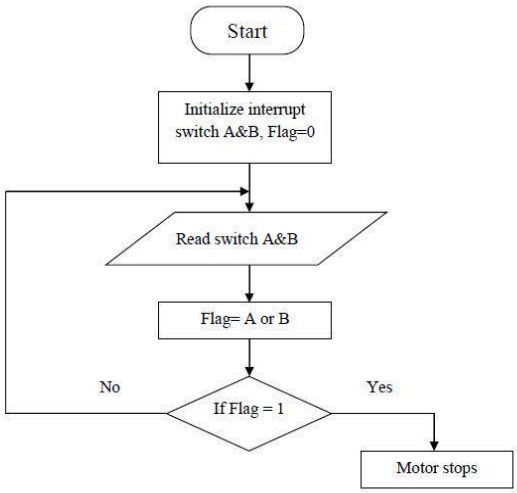
➢ **Flow chart and algortihm for measuring height of person**



Algorithm

Step 1: Start
Step 2: Initialize Height, Distance, Trigger, Offset=5
Step 3: Read the Height
Step 4: Check if the Height>100
Step 5: If yes go to Step 6, else go to Step 7
Step 6: Motor stops, Go to Step 3
Step 7: Read the Distance
Step 8: Check if the Height is equal to Distance +Offset and Trigger=1
Step 9: If yes go to Step 10, else go to Step 11
Step 10: Motor stops, Finish= 1, go to Step 3
Step 11: Check if the Height is greater the Distance +Offset
Step 12: If yes go to Step 13, else go to Step 14
Step 13: Down, Finish= 0, go to Step 3
Step 14: Up, Finish= 0, go to Step 3

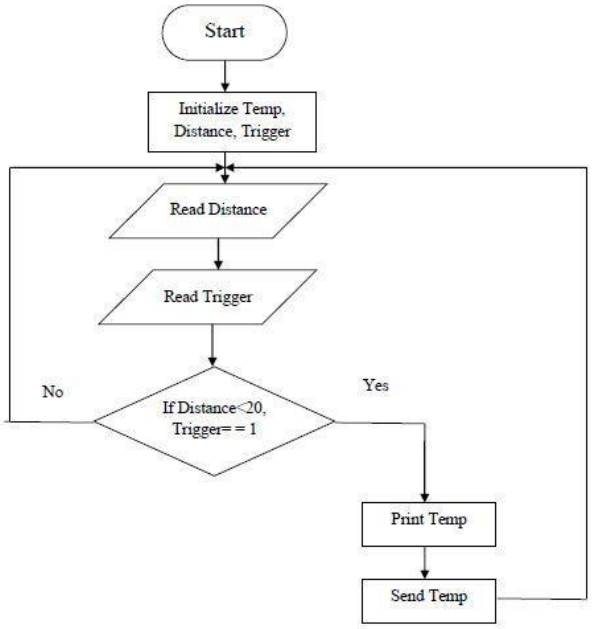
- **Flowchart of interrupt**



Algorithm of interrupt

Step 1: Start
Step 2: Initialize interrupt switch A & B, Flag=0
Step 3: Read switch A & B
Step 4: Assign Flag A or B
Step 5: Check if Flag is 1
Step 6: If yes go to Step 7, else go to Step 3
Step 7: Motor stops

➢ **Flow chart of temperature measurement**



Algorithm of temperature measurement

Step 1: Start
Step 2: Initialize Temperature, Distance, Trigger
Step 3: Read Distance
Step 4: Read Trigger
Step 5: Check if the Distance is less than 20 and Trigger = 1
Step 6: If yes go to Step 7, else go to Step 3
Step 7: Print Temperature
Step 8: Send Temperature, go to Step 3

IX. CIRCUIT DIAGRAM

Since we are using two controllers we have two circuit diagrams.

➢ **Main circuit**

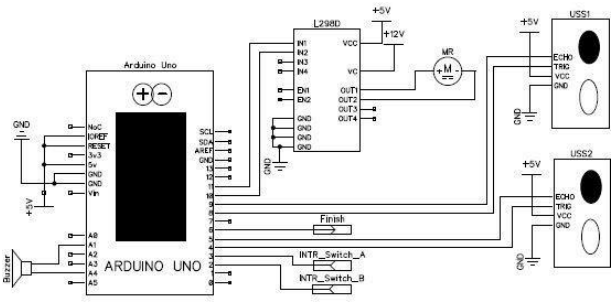


Figure 1 Main circuit diagram.

➢ **Temperature measurement circuit**

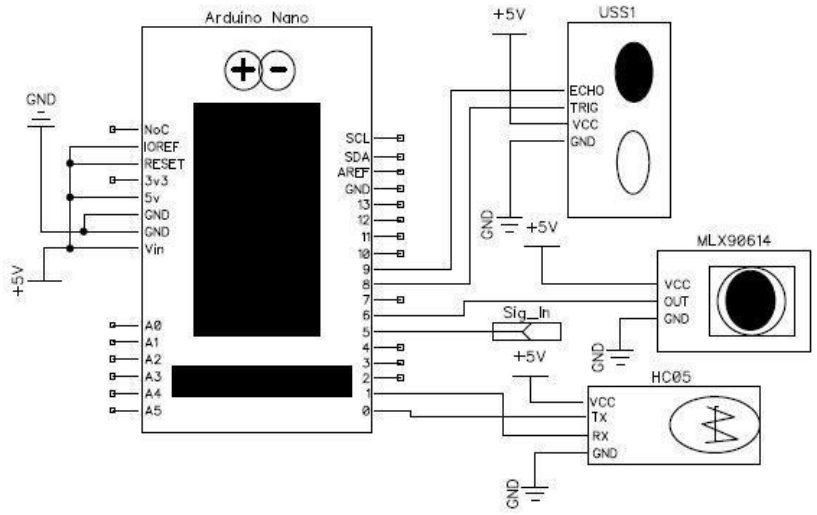


Figure 2 Temperature measurement circuit

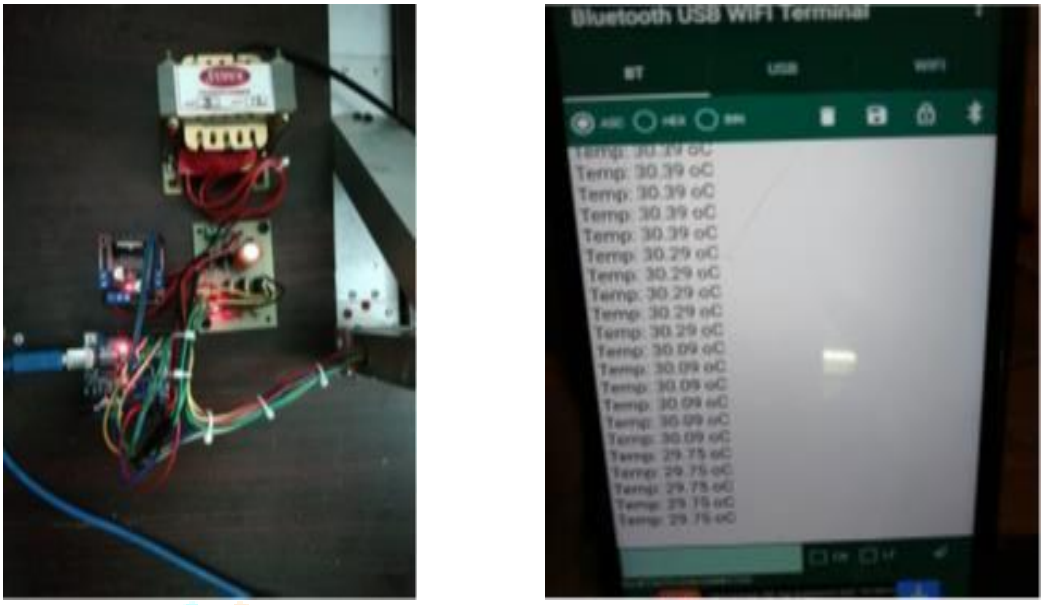
X. HARDWARE SETUP AND RESULT

The arrangement of hardware setup is as shown in Fig 3 (a). Theultrasound sensor for height measurement is placedon the top of the device. Different persons have different heights, so the temperature sensor should be moveable. Here the sensor moves a distance of 4 feet i.e., between 3 feetfromtheground to a maximum of 7 feet. Themovingsystem is set up in a lead screw anda motor is attached to it.

The moveable temperature sensor is coupled with an ultra sound sensor to know the extreme ends and also interrupt switches to stop the motor movement. There is a buzzer system to know if the measured temperature is above normal. The output can be obtainedthrough the Bluetooth modulein an android app as shown in Fig 4(b).

(a) (b)

Figure 3.(a) Hardware Arrangement (b) measuring arrangement



(a) (b)

Figure-4. (a)circuit componentarrangement(b) resultscreen showingmeasured temperature

Table 1 shows some samples of temperature measured using the proposed system and the accuracy is also calculated in percentage. The actual measurement was done using the contact digital thermometer and hence that is more precise than the contactless thermometer. Hence, we can statethat our proposed system has high accuracy.

Table 1. Accuracy measurement of the system

Sl.no	Measured details			
	Height of the person	Measured Temp.	Actual Temp.	Accuracy in %
1	152	34.5	34.7	99.42
2	162	35.1	35.9	98.00
3	170	36.2	36.9	98.10
4	155	35.8	36.3	98.62
5	169	36.5	36.8	99.14
6	171	34.7	35.2	98.57
7	154	34.5	35.1	98.00
8	166	30.9	31.8	97.16
9	158	32.5	33.0	98.48
10	161	33.4	34.1	97.94

XI. CONCLUSION AND FUTURESCOPE

The E-Thaap is an automatic, contact less and efficient temperature measurement device which is both useful for the current situation of COVID'19 andalso thefuture. It can be modifiedinto any form, with an automatic sanitization, with face recognition etc. This device ismore effective in places like schools, colleges, railwaystations, airports, etc. It has the main advantage of less time consumption and reduces the crowd. The requirement of this project includes Arduino uno, Arduino mega, temperature sensor, motor, motor driver and a display which is set up in a framework. This is also portable andrequires only less space. Thispaper explains theproblem of theexisting system, main objective and features of this project, then the block diagram of the existing system and the proposed system. Overall, thedevice is more advantageous than the present system of temperature guns.

The system will be more efficient if added and modified certain elements to the system as, we can add an automatic sanitizer spraying system in thefutureso after checking the temperature we can sanitize our hands. Also, we can havea face recognition system so as to identify the face of the person. Also, if we add a weight measurement system, it will be more useful for doctors in both hospitals and medical camps, to find the BMI of a person a time. If we add a display then it can be easily used by a person who is unaware of using android applications. If a display is connected, then this device can be used by common peoplewho is notaware of using an android app.

XII. ACKNOWLEDGEMENT

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