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Public Awareness Robot Sylvester

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Abstract: ***The Robot i.e. Sylvester firstly follow the human through its sensors then spread the awareness message through its speaker tell them to take mask hand sanitizer from its back by just putting their hand in front of the hand sanitizer tells them to grab the black part (situated on its neck) by two fingers according to your body temper- ature; it allows you to enter/depart to/from the place. Again, it can do so, after completion of the task which is mentioned above. It's especially useful in crowded areas like Market Places, Shopping Malls where there are lots of people. If we place such type of robot in the Shop- ping Malls, then there is no need to appoint a person for that kind of work at the entrance of the malls by sim- ply holding a hand sanitizer thermal scanner. This type of robot is totally helpful in that field, instead of a human.***

I. INTRODUCTION

During the periods of COVID, we all know about the importance of sanitizing checking body temperature daily. Some people fol- low the rules make them sanitized and wear masks, but some too many peoples know all of this, But don't follow the rules don't make them sanitized and wear masks also.

A. Deal with Real World

It's useful especially in crowded areas like Market Places, Shop- ping Malls where there are lots of people. If placed such type of robot is in the Shopping Malls, then there is no need to appointa person for that kind of work at the entrance of the malls by simply holding a hand sanitizer thermal scanner. That type of robot is helpful in that field, instead of a human.

B. Goal

The Robot Sylvester follows the human through its sensors. Now, it spreads the awareness messages through its speaker, tells them to take mask hand sanitizer from its back by putting their hand in front of the hand sanitizer tells them to grab the black part (situated on its neck) with the help of two fingers.
According to your body temperature, it allows you to enter/de- part to/from the place. Again, it will do so after completing the task mentioned above.

C. Motivation

Currently, there are a huge number of peoples who serves their effort for providing the mask & sanitizer. They also check the body temperature of visitors. They need to stand all the time in front of the entry point. As a result, they are always in contact with the visitors without knowing whether they are affected or not. For that reason, they may be also affected by that.
The development of the robot Sylvester may be reduced thesekinds of problems. It can check body temperature & allow/dis- card the visitors according to the measurement. It is also ableto provide masks & sanitizer to them.

D. Contribution

The project work will be helpful in crowded areas. The ma-chine can run and do its jobs to spread awareness messages. It can contribute an important role in malls and market places, instead of a human, needs to stand in front of the main entry by holding mask & sanitizer. The robot can have all the kindsof stuff on its back and provide, if necessary. It also checks the body temperature according to that, it will allow a visitor for entry/departure.

II. LITERATURE REVIEW

The chapter is about the existing literature related to this project report. There exist very limited works on that topic which isthe subject of the project. It is the area, where the previous works likely similar to the project are referred briefly. The ideaof the project is mainly based on the following models described in the following sections.

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A. Sprinkler Robot

Now a day world is affected by the covid19 pandemic. The healthcare workers are hostile to the work inside of the covid19 hospital due to social distancing. Supply essential food medicinesin hospitals have a challenge. The world health organization and the certified sanitization system have to be a solution for per- sonnel & surface decontamination.

To get rid of the problem, develop automatic portable sanitiz-ing equipment to spray sanitizer. The sanitizer is attached to the top of the robot. The system integrates a sprinkler mechanism and is used to distribute air and disinfectant fluid mixture. The robot's main components consist of a Submergible pump, DC motor, Arduino board, Motor driver, Battery, Bluetooth mod-ule, DC Converters, Sprinkler are used. The system is capableto sanitize the floor of hospitals. The application areas of that robot are walking pathways, testing centers, hospital corridors, doctor's rooms, medical shops, operation theatre, and patient room, etc.

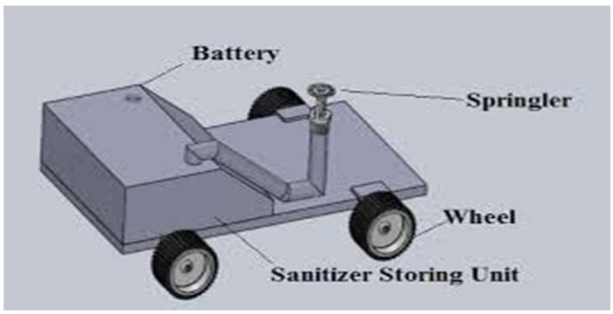


Figure 1: Sprinkler Robot[**1**]

B. KSUM launched Spread Awareness Robot

"*The robots have been employed to spread more awareness about the COVID-19 and encourage people to follow the precautionary measures as directed by the state*"

Jayakrishnan TAsimov CEO

We know that the health care staff have to go multipletimes & expose to this virus and all. Instead of sending them multiple times, we can minimize the exposition by sending thisrobot through a remote control model. One can see on the monitor what the robot can see and get the information aboutthe patient. The robot is connecting to all kinds of health care monitoring systems through IoT monitoring devices. By using that kind of robot, the doctors specially the health care members are aware of the upcoming patient. Another robot is used only for cleaning the doors and its handles & all kinds of human touched things.

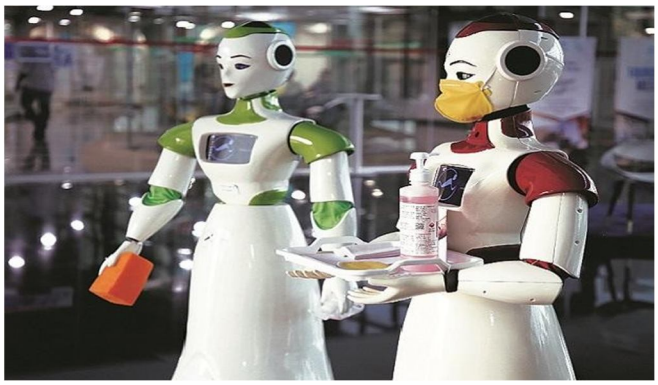


Figure 2: Spread Awareness Robot by KSUM[**2**]

"*Our idea is to make this a state-of-the-art facility for the entire Northeast region. This center in future would help to develop highly competent manpower for diagnosis of different infectious diseases in the early stage of infection and thus its prevention too*"

TG SitharamIIT Guwahati Director

III. ARDUINO UNO TECHNOLOGY

Arduino is an open-source electronics platform based on HW & SW. Arduino boards can read inputs like a finger on a button, light on a sensor & turn it into an output like turning on an LED, activating a motor. By sending a set of instructions to the board, one can achieve the specific goal of that circuit design. The work has been done with the help of the Arduino programming language & the Arduino Software, based on a process. Arduino has been the brain of millions of projects, from the day-to-day objects to complex scientific instruments. A vast community of makers has gathered around that platform. Their contributions include a vast amount of knowledge that can help novices and experts both.

The Arduino platform has quite popular with people who have just started with electronic devices or projects. The Arduino does not need a separate piece of h/w to load a new code onto the board using the USB cable.[**3**] The Arduino IDE usesa simplified version of C++ that makes it easier to learn and communicate with the machine.

A. Board Components

Arduinos have a majority of these components in common.

1) *Power USB:* Arduino board can be powered using the USB cable from the computer. Setup USB connection by using a USB cable.
2) *Power (Barrel Jack):* The boards are powered directly from the AC power supply connected to the jack.
3) *Voltage Regulator:* The function of a voltage regulator is applied for controlling voltage and stabilizing the DC voltages by using the processor.
4) *Crystal Oscillator:* Crystal oscillator helps the Arduino boards for dealing with time issues that will be arisen.
5) *Arduino Reset:* It starts a program from the beginning. It can be possible to reset the board in two ways. One is to be, by using the reset button on the board. The second is to be connecting an external reset button to the Arduino pin labeled RESET.
6) *Analog Pins:* The board has six analog input pins A0 through A5. The pins can read the signal from the analog sensor and convert it to a digital value.
7) *Main Microcontroller:* Each board has its microcon- troller considered as the brain of your board. The main IC on each is slightly different from others boards.
8) *ICSP pin:* ICSP is an AVR tiny programming header for the board that consists of the parts such as MOSI, RESET, VCC, MISO, SCK, and GND. It is often referred to as an SPI, considered as an expansion of the output.
9) *Power LED:* This LED should be lighted up when one plugs the board into a power source for indicating powering up correctly. If the light does not turn on, it refers to something is wrong with the connection.
10) *TX and RX LEDs:* On the board, find two labels TX and RX. Firstly, the digital pins 0 and 1 indicate the pins responsible for serial communication. Second, the TX and RX led.
11) *Digital I/O:* The board has 14 digital I/O pins of which six provide PWM output. The mentioned pins can be config- ured to work as input pins to read logic values or as digital output pins to control different modules like LEDs.[4]
12) *AREF:* AREF is termed as Analog Reference. It is gen- erally used to set external reference voltage as the upper limit for the analog input pins.

B. Sensors

Arduino UNO supports various sensors that are applicable in various robotic projects. The name of the sensors are as follow,

1) *Ultrasonic Sensor:* An ultrasonic sensor is an instrument that is used to measure the distance to an object by using ultrasonic sound waves.
2) *IR Sensor:* An IR sensor is an electronic device that mea- sures and detects infrared radiation from its surrounding environment.
3) *Soil Moisture Sensor:* A soil moisture sensor measures the amount of water in the soil of a particular. The sensor can be stationary such as handheld probes.
4) *Temperature Sensor:* A temperature sensor is a device that is used to detect that measures hotness and coldness that can be converted into an electrical signal.
5) *Photoresist or Sensor:* A photoresistor is a passive com- ponent. It decreases resistance concerning the receiving luminosity on the component's sensitive surface.

6) *Motion Sensor:* Motion detectors can be used to sense movement and take action like setting off an alarm, switching a light off/on, etc.
7) *Shock Switch:* The shock sensor module can be wired to the Arduino board by using the 10k resistor on the module, as either a pull-up or pull-down resistor.
8) *Passive Buzzer:* The Passive Buzzer is the slightly shorter one, with the electronics exposed on the bottom.
9) *Reed Switch Module:* Reed Switch Module for Arduino board is a small electrical switch that can be operated by an applied magnetic field, commonly used as a proximity sensor.

C. *Applications in Robotics*

It's already used in various robotics projects i.e.

1) Arduino-Based Floor Cleaning Robot using Ultrasonic Sen-sor.
2) Real-Time Face Detection and Tracking Robot using Ar- duino.
3) Arduino Based Fire Fighting Robot
4) Hand Gesture Controlled Robotic Arm using Arduino NanoBoard.
5) Fingerprint-based Car Ignition System using Arduino andRFID.
6) DIY Self-Balancing Robot using Arduino.
7) Obstacle Avoiding Robot using Arduino and UltrasonicSensor.
8) Line Follower Robot using Arduino.
9) Bluetooth Controlled Car using Arduino.
10) Mobile Phone Controlled Car using G-Sensor and Arduino.

D. *Limitation of Arduino Board*

1) AVR microcontroller cannot be understood.
2) It is unable to run more than one program at a particulartime.
3) It will be difficult to modify Shields & Sketches.
4) The board has limited memory to store some particulardata during the process of running.
5) Lack of communications, peripherals & programming lan-guage which are the build-in functionality of the board.

IV. PUBLIC AWARENESS ROBOT: BASIC ARCHITECTURE

Our purpose is to design such a type of robot which may follow the human spread an awareness message tell them to take hand sanitizer the mask from its back. It also tells them to grab the black part (situated on its neck) with two fingers according to your body temperature; it allows you to enter/depart to/from the place.

A. *Existing Module*

The project work is based on Human Following Robot with some extensions i.e. by adding some special features to make it usablefor real-life application purposes.

1) *Human Following Robot:* Human following is a tech- nique used by robots and autonomous vehicles to follow a human within a specific range. In this case, communication between the human and the robot is the most significant factor where a sensor is needed to ensure its measure of success.

On that model, add some extension such as -

a) Provide Hand Sanitizer & Mask
b) Detect Body Temperature & broadcast entry/depart mes-sage through its speaker.

B. *Structure & Components*

1) *Basic Components*

a) Thick Thermocol Board (2 pcs)
b) Ultrasonic Sensor (1 pc)
c) IR Sensor (3 pcs)

d) Arduino UNO Board (2 pcs)
e) Motor dual shaft Wheels (4 pcs)
f) Servo Motors (2 pcs)
g) LM 35
h) Speaker & TIP 122 Transistor
i) Battery & USB Cable
j) Hand Sanitizer & Mask
k) L293D Motor Driver Shield
l) Jumper Wires



Figure 3: Required Components

C. Prototype Structure Design:

The structure is the 1st initial model of the Public Aware- ness Robot, which is based on the human following robot.
For making this, have to use two thick polystyrene boards& cut them accordingly. Now place all the four motors asits main actuator for movements i.e. front, left, right.
By placing one Servo motor as its head movement actu-ator & on its above, placed one ultrasonic sensor, acts as front object detection and two IR sensors, acts as left andright object detection.

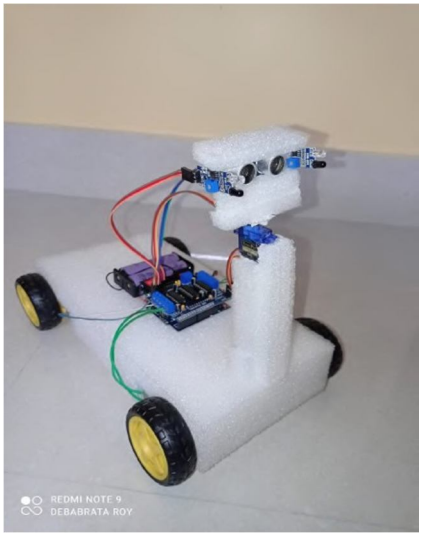


Figure 4: Prototype Module

It is constructed with the help of one Arduino UNO & one L293D Motor Driver Shield. The motor driver helps to make the project flexible & extensible to include morefunctionality.

D. Final Structure

The final structure is constructed upon that initial model of Public Awareness Robot. Now, it is used in the public areato spread awareness messages & provide the functionality, described earlier.

1) Additional Functionality

a) Hand Sanitizer & Mask: For making this exten- sion, use one IR sensor on the neck of the sanitizerbottle & place one Servo motor on the body of the bottle. By using the same servo for both the pur- poses of providing hand sanitizer & mask distribu-tion.



Figure 5: Final Structure

b) Measure Body Temperature & Broadcast Mes-sage: For making this extension, have to use one LM35 on the neck of the robot to measure body temperature, one TP 122 transistor& Speaker tospread the broadcast message for entry/depart, and also awareness message along with it.

E. Circuit Design

1) Basic Model with Hand Sanitizer

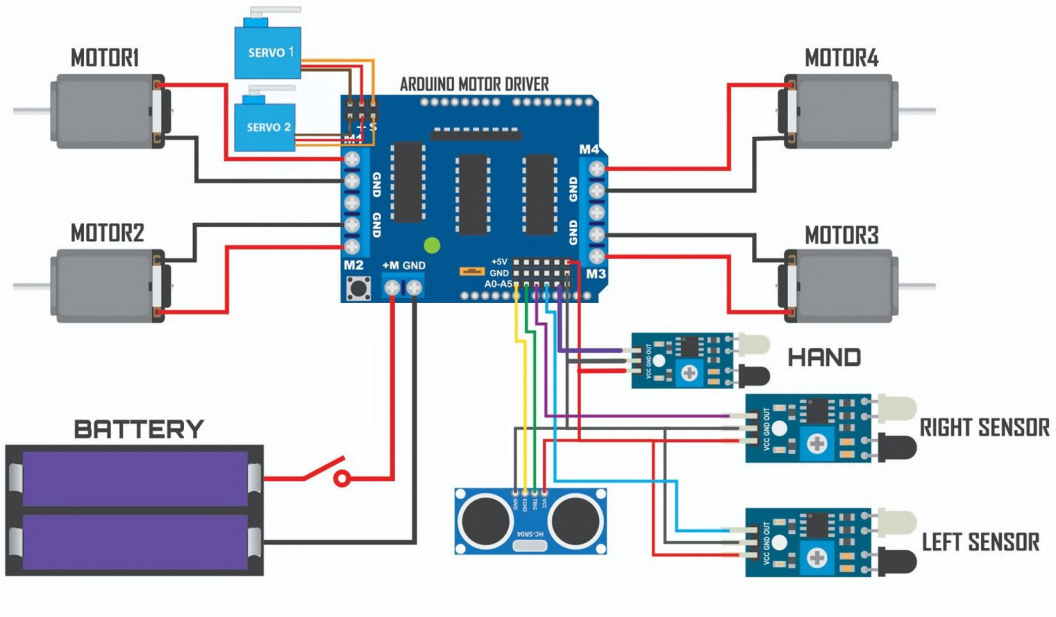


Figure 6: Basic Circuit Diagram

2) Sound & Temperature Model

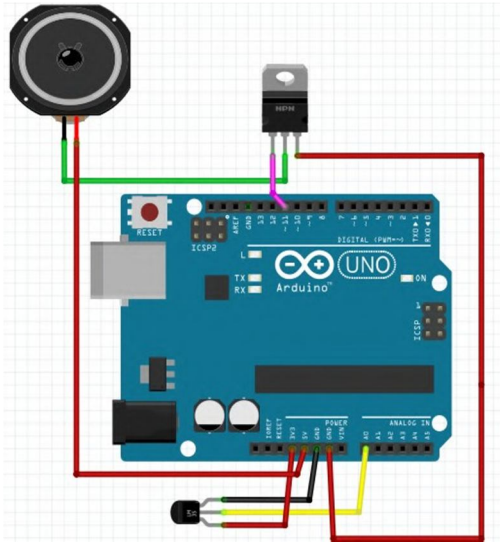


Figure 7: Sound & Temperature Circuit Diagram

V. ALGORITHM & FLOW-CHART DESIGN

The algorithm and flowchart are two types of tools to explainthe process of a program. Here the discussion is about the differ- ences between an algorithm and a flowchart and how to create a flowchart to illustrate the algorithm visually i.e. graphical rep- resentation.

They are two different tools that are very much helpful for creating new programs. An algorithm is a step-by-step analysis of one process, whereas a flowchart explains the steps of a pro- gram graphically with proper direction flow of data from one block to another.[**5**]

A. Algorithm

1) Basic Model with Hand Sanitizer Algorithm

a) Step 1: set all the pins as the input/output signals forthe sensors.
b) Step 2: set servo pins
c) Step 3: move the head full 180 and set again 90, whichis controlled by servo1
d) Step 4: measure the actual distance by the ultrasonicsensor
e) Step 5: if it detects any object within 10cm to 50cmonly by the ultrasonic sensor, then move forward.
f) Step 6: if detects any object of its left side only byleft IR sensor, then move left.
g) Step 7: if detects any object of its right side only bythe right IR sensor, then move right.
h) Step 8: Otherwise, release all motors.
i) Step 9: if the IR sensor (on the back) senses any ob- ject, then only move the servo2 to 90, otherwise set it 1.

2) Sound & Temperature Module Algorithm

a) Step 1: set the three audios for three different pur- poses
b) Step 2: set pins for the audio LM35 sensor
c) Step 3: read the temperature from the pin A0
d) Step 4: translate it to Fahrenheit
e) Step 5: if detect the temperature is above 99, then play the FEVER message.
f) Step 6: if detect the temperature within 86 to 98, then play ENTER MALL message.
g) Step 7: Otherwise, play awareness message.

B. Flow Chart Design

1) Flow Chart of Basic Model with Hand Sanitizer

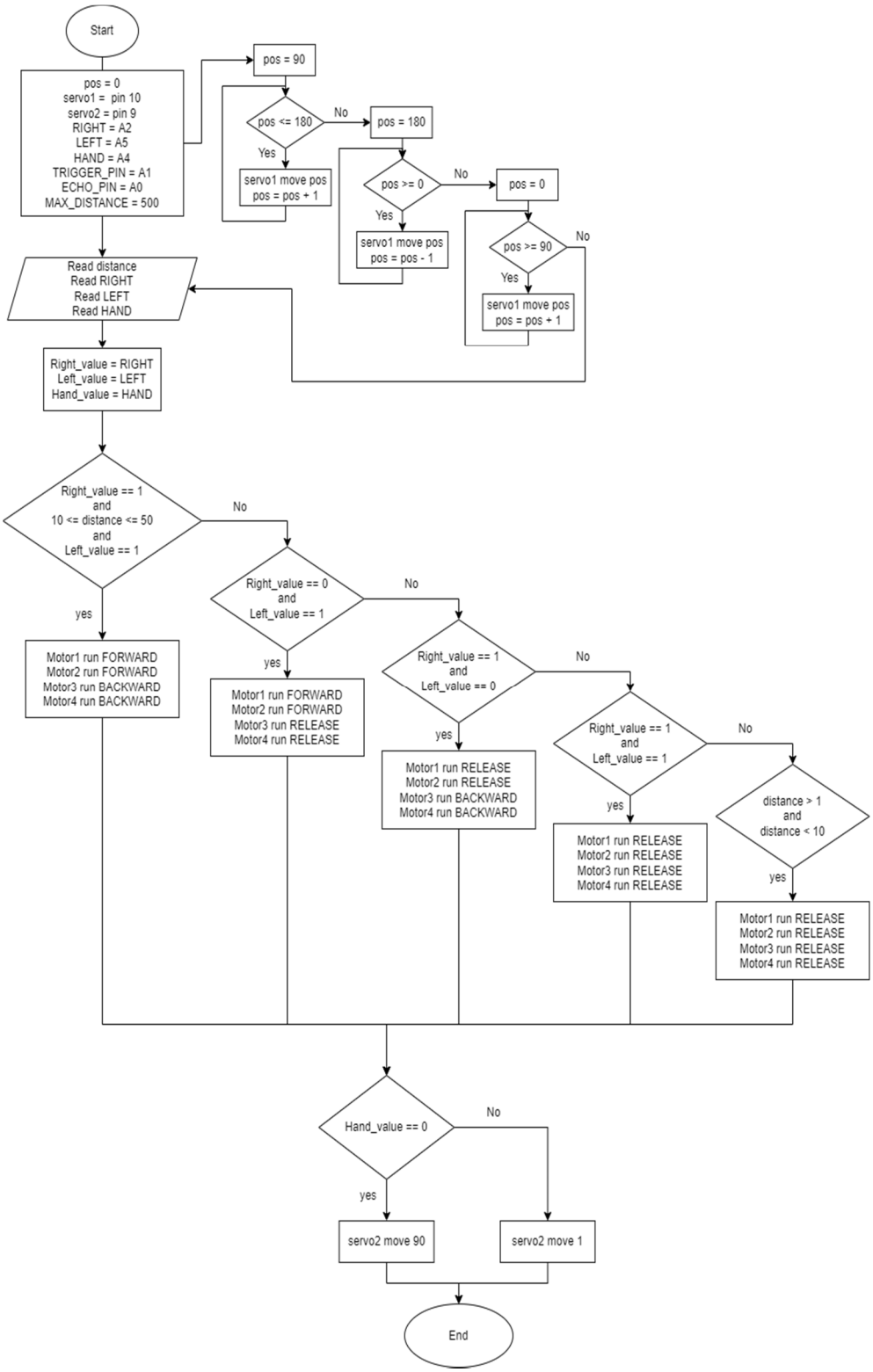


Figure 8: Basic Model Control Flow Chart

2) Flow Chart of Sound & Temperature Module

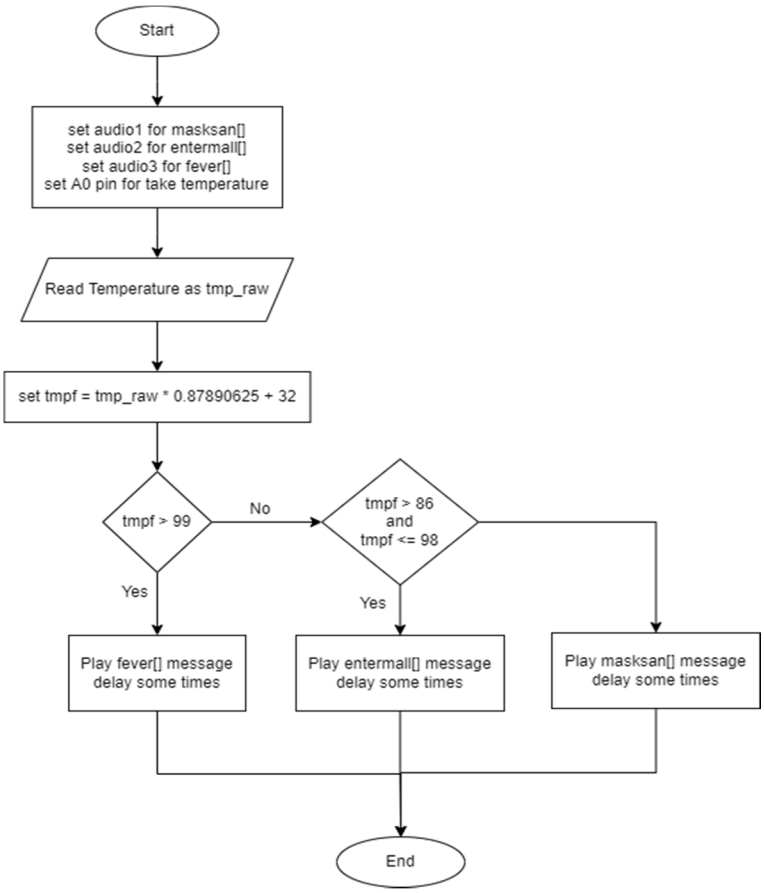


Figure 9: Sound & Temperature Flow Chart

VI. TESTING & IMPLEMENTATION

The sub-modules and the entire model have been tested by my- self several times. Firstly, it gave some errors because of coding or sometimes for loose connection. But, now it is working fine & all of its functionality doing well as our requirements.

The robot can also get a good review from our locality. It is re- alized that it is very much beneficial for public areas like malls, markets, etc.

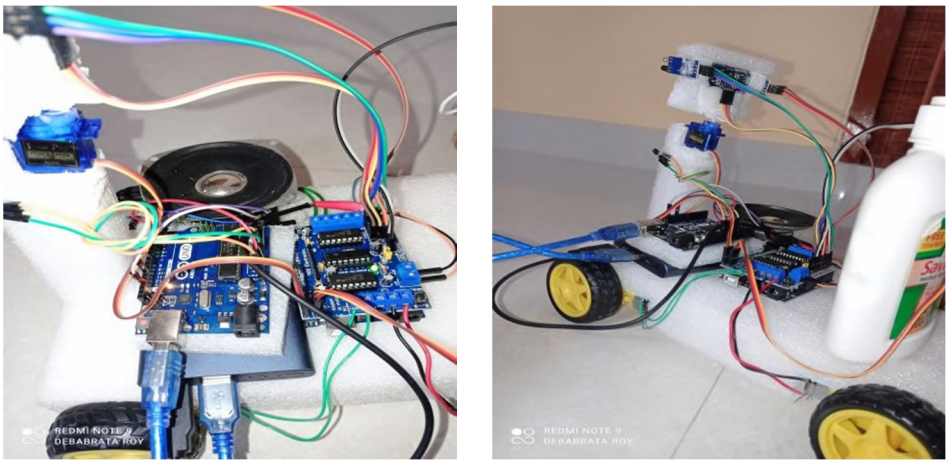


Figure 10: Properly Working Module

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VII. MODEL ANALYSIS

The entire model is too good for use in various real-world areas. The robot can go towards the object when it detects something by its sensors and spread the message when the required condi- tion is matched with the current condition.
The Robot can be upgraded, by using one camera placed on its head position as its main sensor to detect only human beings. In the future, the LM35 sensor can be replaced by an MLX90614 contactless infrared temperature sensor. The robot can include one display to monitor the temperature & the total number of viewers by its observation throughout the area.



Figure 11: Work on a rugged surface

VIII. CONCLUSION

This model can be used in a big project to minimize human ef-forts & also the temperature detection tools and so on. I just design a simple, small & sample copy of my desired model and I think this concept can be used in the future. It can also be use-ful at the Educational Institute entry point, Bank entry point, Jewellery Shop, Exam Center, etc.

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Appendix A
LINK & RESOURCES

1) Arduino UNO
   https://www.arduino.cc/en/guide/introduction https://www.tutorialspoint.com/arduino/arduino board descr-iption.htm
2) Algorithm and Flowchart
   https://www.edrawsoft.com/explain-algorithm-flowchart.html
3) Sanitizer Sprinkler Robot
   https://iopscience.iop.org/article
4) Flowchart Maker Online Diagram Software
   https://app.diagrams.net/
5) Circuit Design App for Makers
   https://www.circuito.io/

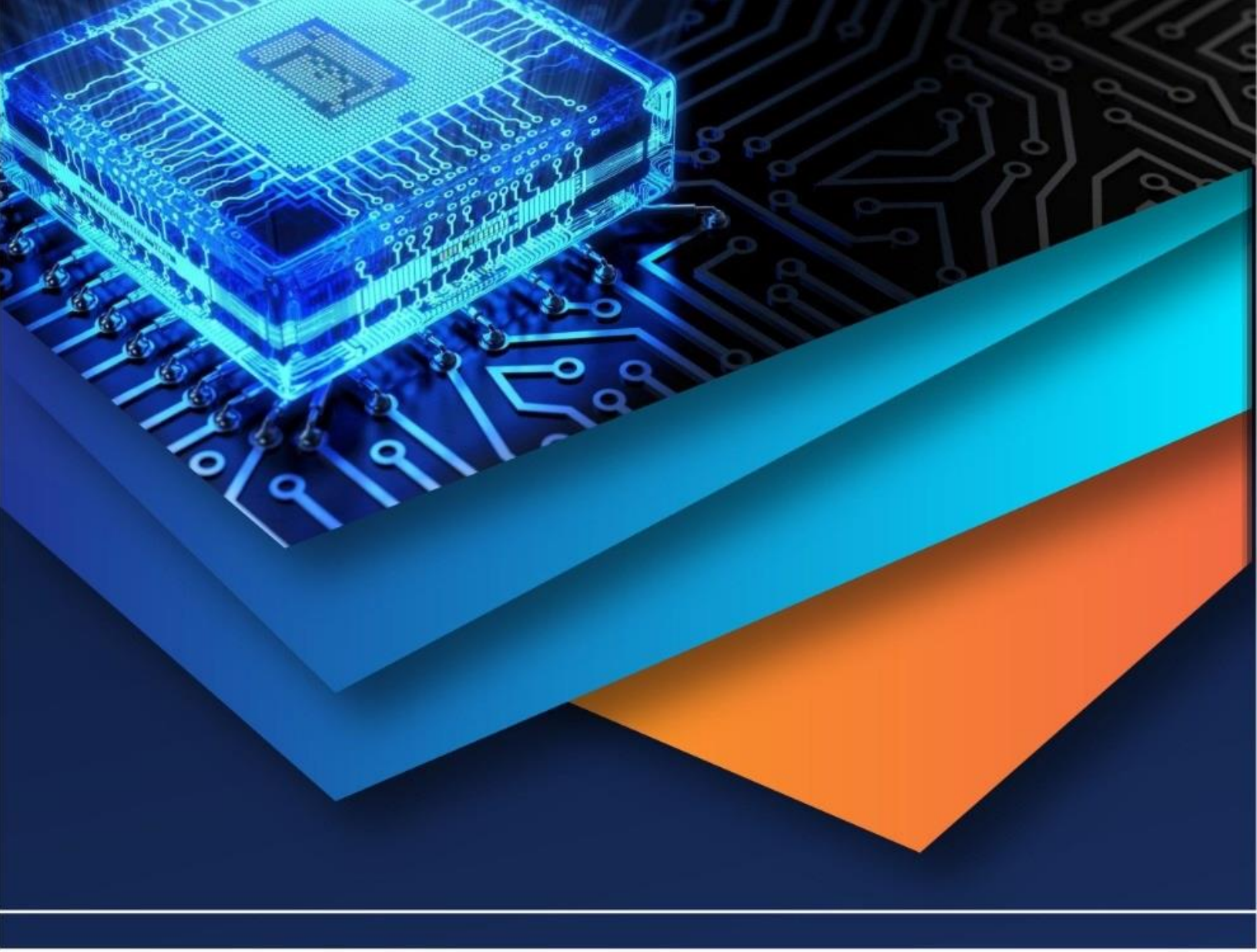
Appendix B
BIOGRAPHICAL SKETCH

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Education

- MCA (Gold Medalist) from National Institute of Technol-ogy, Agartala with CGPA of 9.50
- B.Sc (Computer Science) Gold Medalist from University ofNorth Bengal with 79%
- (10+2) from Siliguri Boys High School with 81.8%
- Madhyamik from Siliguri Boys High School with 90%

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