ARDUINO UNO BASED SOCIAL DISTANCING HAT

A PROJECT REPORT

OF

BACHELOR OF TECHNOLOGY

IN

DIGITAL ELECTRONICS

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CANDIDATES' DECLARATION

We, VEDANT KOHLI & YASH
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hereby declare that the project Dissertation titled " ARDUINO UNO BASED SOCIAL DISTANCING HAT" which is submitted by us to the Department of COMPUTER ENGINEERING, Delhi Technological University, Delhi in partial fulfilment of the requirement for the award of the degree of Bachelor of Technology, is original and not copied from any source without proper citation. This work has not previously formed the basis for the award of any Degree, Diploma Associateship, Fellowship or other similar title or recognition.

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ABSTRACT

This paper presents, as its name suggests, an Arduino Uno based social distancing hat. To achieve the desired objective, the electronics components used were an Arduino board, ultrasonic sensors buzzer, resistor and jumper wires. The basic principle behind this is project is that when the ultrasonic sensors detect the presence of a given person within the range specified in the code uploaded to the Arduino, a buzzer rings in order to notify such situation.

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CHAPTER 1: INTRODUCTION

1.1. GENERAL

The ongoing pandemic, Covid-19 has put the world at a standstill. So many ways have been implemented to reduce the chances of contracting this air bone virus and one of it has been social distancing especially in public spaces. One of the many ways of reducing the spread of this virus is by social distancing. Although, maintaining the right gap for social or physical distancing is not always easy especially when outside and involved. Based on such thought the following project was designed, an Arduino based social distancing alarm hat meant for Covid-19 pandemic or similar diseases outbreak.

This project fall in the category of case study and solutions to real time social and economic problems.

1.2. OBJECTIVES

The project had as its objectives the following aspects:

- To implement a social distancing hat;
- To explain the working principle of the system;
- To delimitate the advantages, disadvantages and applications for the project;
- To present possible solutions, if any, to solve or mitigate the impact of the disadvantages.

1.3. METHODOLOGY

Following is the methodology implemented for the realization of the project:

- Exploratory research;

- Qualitative research;
- Bibliographic research.

CHAPTER 2: LITERATURE REVIEW & PROJECT'S DESCRIPTION

2.1. LITERATURE REVIEW

2.1.1. Arduino Uno R3 board

An Arduino Uno R3 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 ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button (Arduino, n.d.).

In simple terms, an Arduino Uno R3 can be defined as open-source platform used for writing, compiling and uploading codes to the microcontrollers, consisting of hardware, which is the actual physical board, and a software, The Arduino IDE, where the code is written. The code is written in C++, and it is introduced in the microcontroller through an USB cable.

Figure 1: Arduino Uno R3 board

2.1.2. Ultrasonic sensor HC- SR04

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. It uses a transducer to send and receive ultrasonic pulses that relay

back information about an object's proximity. High-frequency sound waves reflect from boundaries to produce distinct echo patterns.

The working principle of this module is simple. It sends an ultrasonic pulse out at 40kHz which travels through the air and if there is an obstacle or object, it will bounce back to the sensor. By calculating the travel time and the speed of sound, the distance can be calculated.

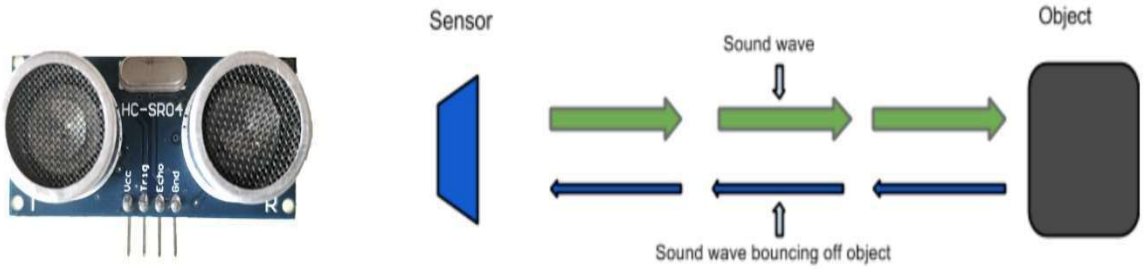


Figure 2: Ultrasonic sensor and its basic working principle

Following is the Pin description of an ultrasonic sensor

Table 1: HC-SR04 pinout description

Pin Name	Description
V_{CC}	The Vcc pin powers the sensor, typically with +5V
Trigger	Trigger pin is an Input pin. This pin has to be kept high for 10us to initialize measurement by sending US wave.
Echo	Echo pin is an Output pin. This pin goes high for a period of time which will be equal to the time taken for the US wave to return back to the sensor.
Ground	This pin is connected to the Ground of the system.

According to Cytron Technologies user's manual for the HC-SR04 ultrasonic sensor, following are its features:

- Power Supply: +5V DC
- Quiescent Current: <2mA
- Working Current: 15mA
- Effectual Angle: <15°
- Ranging Distance: 2cm – 400 cm/1" 13ft
- Resolution: 0.3 cm
- Measuring Angle: 30 degree

- Trigger Input Pulse width: 10uS
- Dimension: 45mm x 20mm x 15mm.

2.1.3. Buzzer

The buzzer is a sounding device that converts audio signals to sounds signals. A buzzer can be mechanical, electromechanical or piezoelectric. It has two pins, one positive and one negative, and it is powered with DC.

Figure 3: Buzzer

Depending on how a buzzer is driven, it can be classified as an active buzzer or a passive buzzer. An active buzzer generates the sound itself, whereas a passive buzzer needs a signal source that provides the sound signal.

According to Components 101, following are some of the features and specifications for a buzzer:

- Rated Voltage: 6V DC
- Operating Voltage: 4-8V DC
- Rated current: <30mA
- Sound Type: Continuous Beep
- Resonant Frequency: ~2300 Hz
- Small and neat sealed package
- Breadboard and Perf board friendly

It is mainly used in alarms computers printers and other electronic devices to produce sound.

2.2. PROJECT'S DESCPRITION

2.2.1. Components and materials used

The implementation of the project was done using the following electronic components:

- Arduino Uno R3 board;
- HC-SR04 ultrasonic sensor;
- Passive buzzer;
- Resistor;
- Jumper wires;
- 9V battery;
- 9V battery connector.

Following is the table of cost breakdown for the acquisition of the above-mentioned components and materials:

Table 2: Components and materials cost

ITEM	QUNATIY	PRICE PER UNIT	TOTAL PRICE
Ultrasonic sensor (HC-SR04)	3	₹59	₹177
Arduino Uno R3 board	1	₹375	₹375

Passive buzzer	1	₹15	₹15
1kΩ resistor	1	₹3	₹3
Buzzer	1	₹19	₹19
Male-to-male jumper wires	1 pack	₹65	₹65
Male-to-female jumper wires	1 pack	₹79	₹79
9V battery	1	₹15	₹15
9V battery connector	1	₹4	₹4
GRAND TOTAL			₹752

2.2.2. Working explanation

The main aim of the cap is to make sure a proper distance is maintained among individuals so that community spread of virus can be diminished. Here ultrasonic sensors are installed on the front sides of the cap so it that measure the minimum distance to be maintained by the individual in 180 degrees. Also, a buzzer is installed which alerts the individual by giving a buzzer upon not maintaining a minimum distance. The reason to design this social distancing reminder in form of a cap is that compared to a band or a belt this would of easy use. As cap is a commonly used item by every person be it a child or an adult. In case of a band, the band may not measure the distance in 180 degrees. And the sensors should be exposed so, in case of a belt the person must tuck his shirt which may not be comfortable to everyone.

We are using 1 ultrasonic sensors which is placed at the of the cap as shown in the cad design. so using this we can maintain proper social distance among individuals. If the proper social distance is not maintained in three directions this cap will alert the person. To alert the person we are using buzzer.

Following is the circuit diagram:

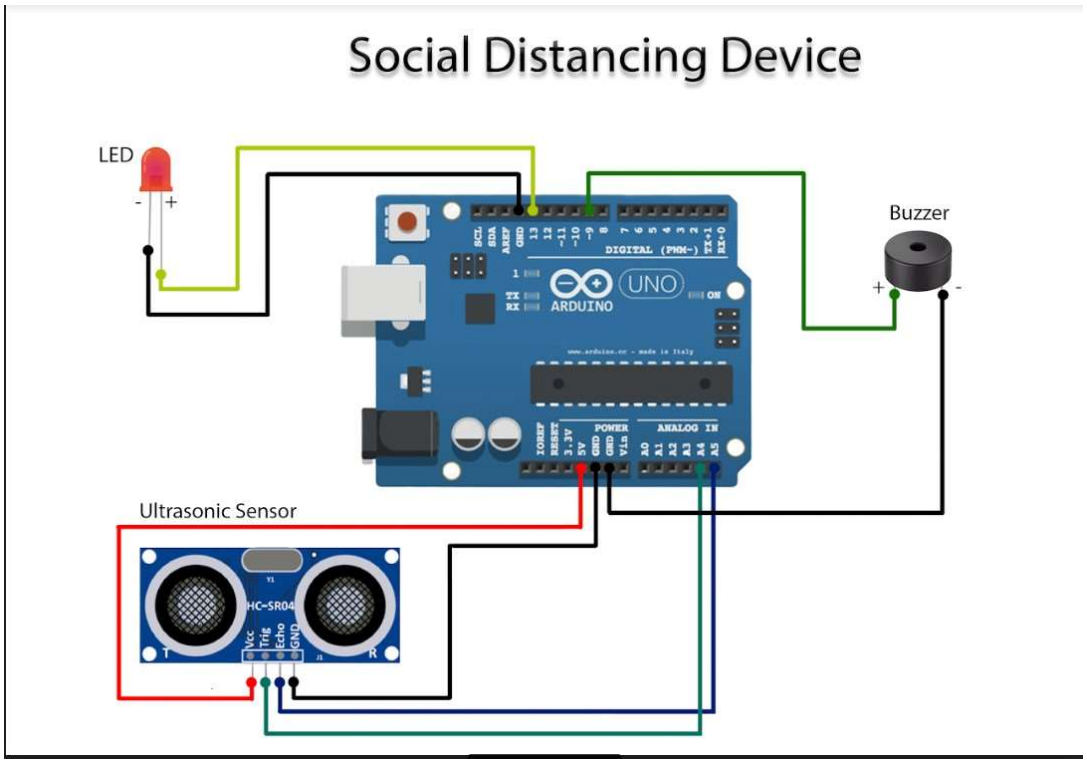


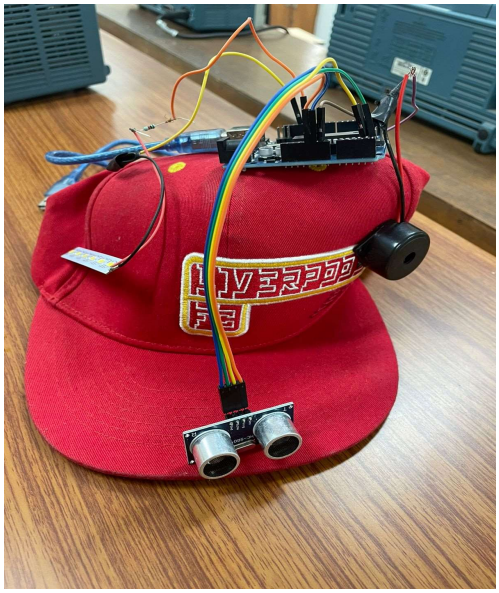
Figure 4: Project's circuit diagram

When the sensor is triggered (a short 10µs pulse to the trigger input pin 2 from Arduino Uno board), the transmitter sends a high-frequency sound signal at 40kHz. The transmitted signal reflects back from the nearby object and is picked up by the receiver.

The output of HC-SR04 (echo-pin 3) is a pulse where the width of the pulse proportional to the distance of the object. The width of the pulse can be calculated by the pulseIn( ) function in the code. Arduino program calculates the distance of the objects in all its four directions.

Here, 1 ultrasonic sensors are placed in the front direction and connected to Arduino Uno. sensor collects the distance of the object in all four directions and compares it with the distance safety value defined in the program. When the user comes too close to another person in any of the directions, a buzzing sound is produced.

Following are the images of the assembled prototype:



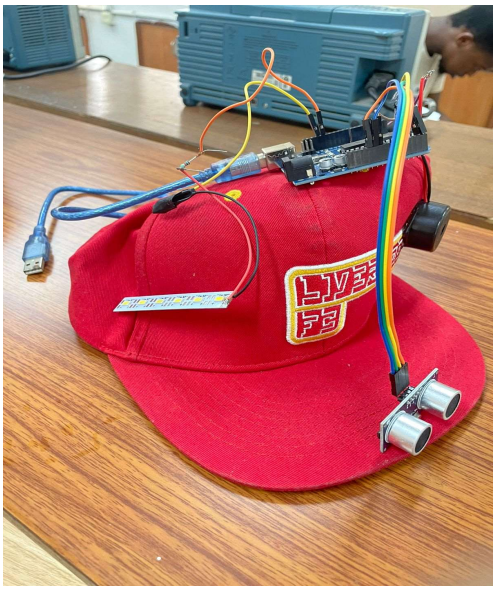


Figure 5: Prototype

CODE FOR ARDUINO:-

```
const int pingTrigPin = A4;
const int pingEchoPin = A5;
int led=13; //Buzzer to PIN 4
int buz1=9;
void setup() {
Serial.begin(9600);
pinMode(led, OUTPUT);
pinMode(buz1, OUTPUT);
}
void loop()
{
long duration, cm;
pinMode(pingTrigPin, OUTPUT);
digitalWrite(pingTrigPin, LOW);
delayMicroseconds(2);
digitalWrite(pingTrigPin, HIGH);
delayMicroseconds(5);
digitalWrite(pingTrigPin, LOW);
pinMode(pingEchoPin, INPUT);
duration = pulseIn(pingEchoPin, HIGH);
cm = microsecondsToCentimeters(duration);
if(cm&lt;=50 &amp;&amp; cm&gt;0) // distance yaha set krna h
{

int d= map(cm, 1, 300, 10, 1000);
digitalWrite(led, HIGH);
digitalWrite(buz1, HIGH);
delay(50);
digitalWrite(led, LOW);
digitalWrite(buz1, LOW);
delay(d);
}
```

```
Serial.print(cm);
Serial.print(&amp;quot;cm&amp;quot;);
Serial.println();
delay(40);
}
long microsecondsToCentimeters(long
microseconds)
{
return microseconds / 29 / 2;
}
```

CHAPTER 3: DISCUSSION AND CONCLUSION

3.1.DISCUSSION

3.1.1. Advantages of the project

Following are the advantages of the project:

- The project idea is cost effective
- It is common for any gender
- It can be easily implemented in any Cap model.

3.1.2. Disadvantages of the project

Following are the disadvantages of the project:

- For developing nations with high population, social distancing is still questionable and thus this project is close to impossible.
- In office space, If the caps notify us through buzzer sound, then it will create noisy environment in office. And also, user might feel uncomfortable.
- In public places, the environment noise will be higher than the buzzer sound. For example, let consider the person travelling in public transports, where the noise will be higher and the person might miss to recognize it.

3.1.3. Applications of the project

Following are the applications for this project:

- office uses.
- Schools.
- recreational activities e.g., concerts.
- public places.

3.2. CONCLUSION

From the report it can be said that the project reached the objectives initially proposed, and that even though the project presents some disadvantages, its advantages have a greater impact on its implementation, working and an application.

The main idea of social distancing cap project was to serves as a social distancing reminder. Using this product will help in reducing the spread of the as this ensures the proper maintenance of distance among individuals

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