IOT PROJECT REPORT

IoT-Based COVID safety activity monitoring for school kid

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Abstract

The worldwide outbreak of COVID-19 has deeply changed the way we interact with each other. It is essential to practice social distancing measures in our day to day life. As countries are looking at how to resume business activities after exiting from lockdown, maintaining social distancing measures are gaining importance in the minds of the people. It is really a challenging task for the organizations to enforce social distancing guidelines. The technological advancements in the field of Internet of Things (IoT) should be exploited in designing a cost-effective wearable device which enforces social distancing measures. In this paper, we introduce an affordable IoT-based solution aiming to increase COVID-19 indoor safety, covering several relevant aspects: contactless temperature sensing social distancing check. Contactless. Its capabilities are real-time alarms, accessible by anyone, and capable of monitoring for a long time. It uses ultrasonic waves to monitor distances. It saves data in the thingspeak to take disciplinary action against someone who breaks protocol temperature sensing subsystem relies on Arduino Uno using infrared sensors.

1. Introduction

Since the last days of the previous year, the occurrence of novel infectious flu-alike respiratory disease COVID-19 caused by SARS-Cov-2 virus (also known as coronavirus) has affected almost every aspect of people's lives globally. First it was discovered in China, but spread quickly to other continents in just a few weeks. According to , until Aug 21th, 2021, the total number of identified cases was 212,312,640 while taking 4,440,103 lives worldwide. Common symptoms of coronavirus disease include fever, tiredness, sore throat, nasal congestion , loss of taste and smell . In most cases, it is transmitted directly (person to person) through respiratory droplets, but also indirectly via surfaces . Incubation period could be quite long and varies (between 14 and 27 days in extreme cases) . Furthermore, even asymptomatic persons (almost 45% of cases) can spread the disease making the situation even worse. Therefore, the usage of face masks and sanitizers has shown positive results when it comes to disease spread reduction however, the crucial problem is the lack of approved vaccines and medication. Due to these facts, many protection and safety measures were taken by governments in order to reduce the disease spread, such as obligatory indoor mask wearing, social distancing, quarantine, self-isolation, limiting citizens' movement within country borders and abroad, often together with prohibition and cancellation of huge public events and gatherings. Despite the fact that the pandemic seemed weaker at some points, most safety regulations are still applied due to unstable situations. From workplace behavior to social relations, sport and entertainment, coronavirus disease poses many changes to our everyday routine, habits and activities.In this paper, a cost-effective IoT-based system aiming to help organizations respect the COVID-19 safety rules and guidelines in order to reduce the disease spread is

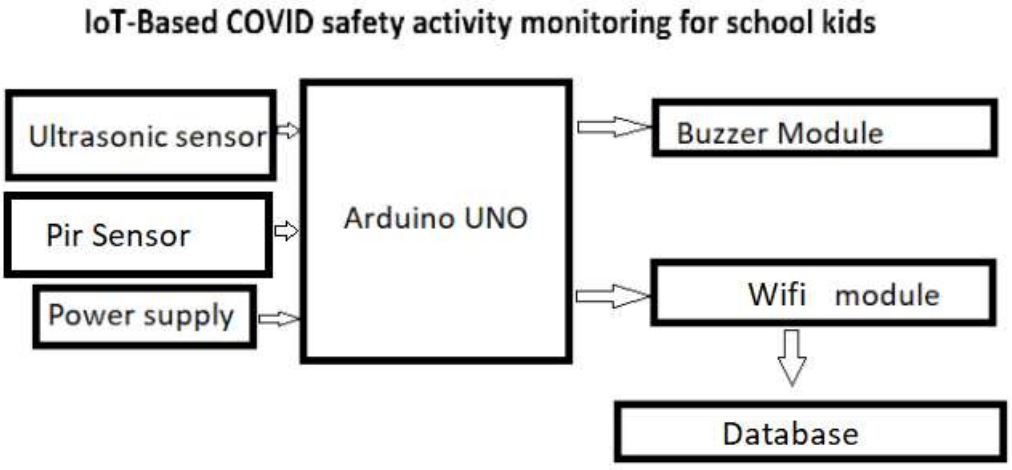
presented. We focus on most common indoor measures - people with high body temperature should stay at home, wearing masks is obligatory and the distance between persons should be at least 1.5-2 meters. Our prototype is designed considering these situations.

2. Objectives:

- One of the main objectives when designing the system was minimizing the cost and making a scalable social distancing monitoring system.
- Create a realtime database which can be analysed later.

3. Methodologies:

- The proposed module takes input from the ultrasonic sensor and pir sensor, which gives a signal if any living object comes in front of it within 1 meter.
- It alerts the buzzer and keeps it ringing for 3 seconds.
- The microcontroller sends a distance data to thingspeak server.
- **BLOCK DIAGRAM :**



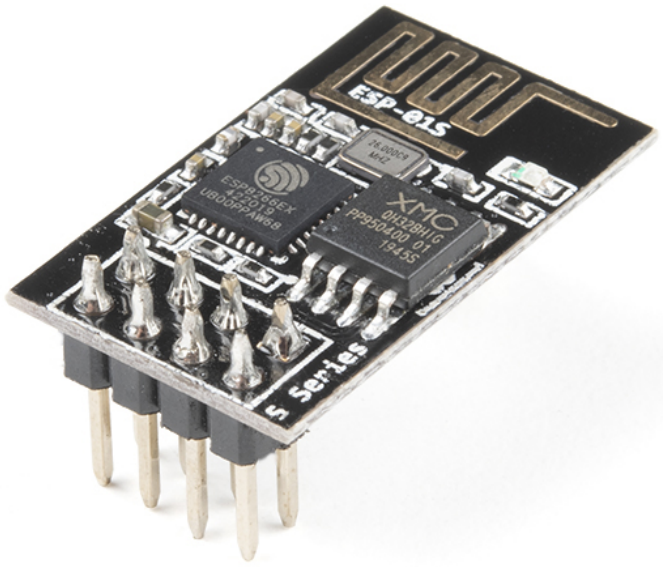
Various hardware components used:

(A) Microcontroller: Arduino UNO:

The **Arduino UNO** is the best board to get started with electronics and coding. If this is your first experience tinkering with the platform, the UNO is the most robust board you can start playing with. The UNO is the most used and documented board of the whole Arduino family.

(B) Communication module: WIFI module, esp8266:

The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all WiFi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.



(C) Sensors: Ultrasonic Sensor, Pir sensor:

PIR sensors detect occupants' presence by sensing the difference **between heat emitted by moving people and background heat**. Ultrasonic sensors detect the presence of people by sending out ultrasonic sound waves into a space and measuring the speed at which they return.

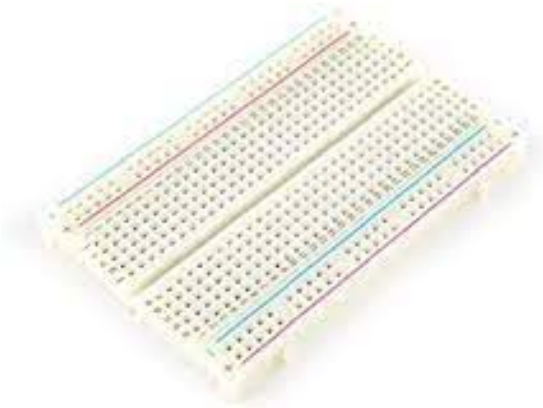
(D) Data: Text format message.

(E) Buzzer:

The buzzer is **a sounding device that can convert audio signals into sound signals**. It is usually powered by DC voltage. It is widely used in alarms, computers, printers and other electronic products as sound devices

(F) Breadboard:

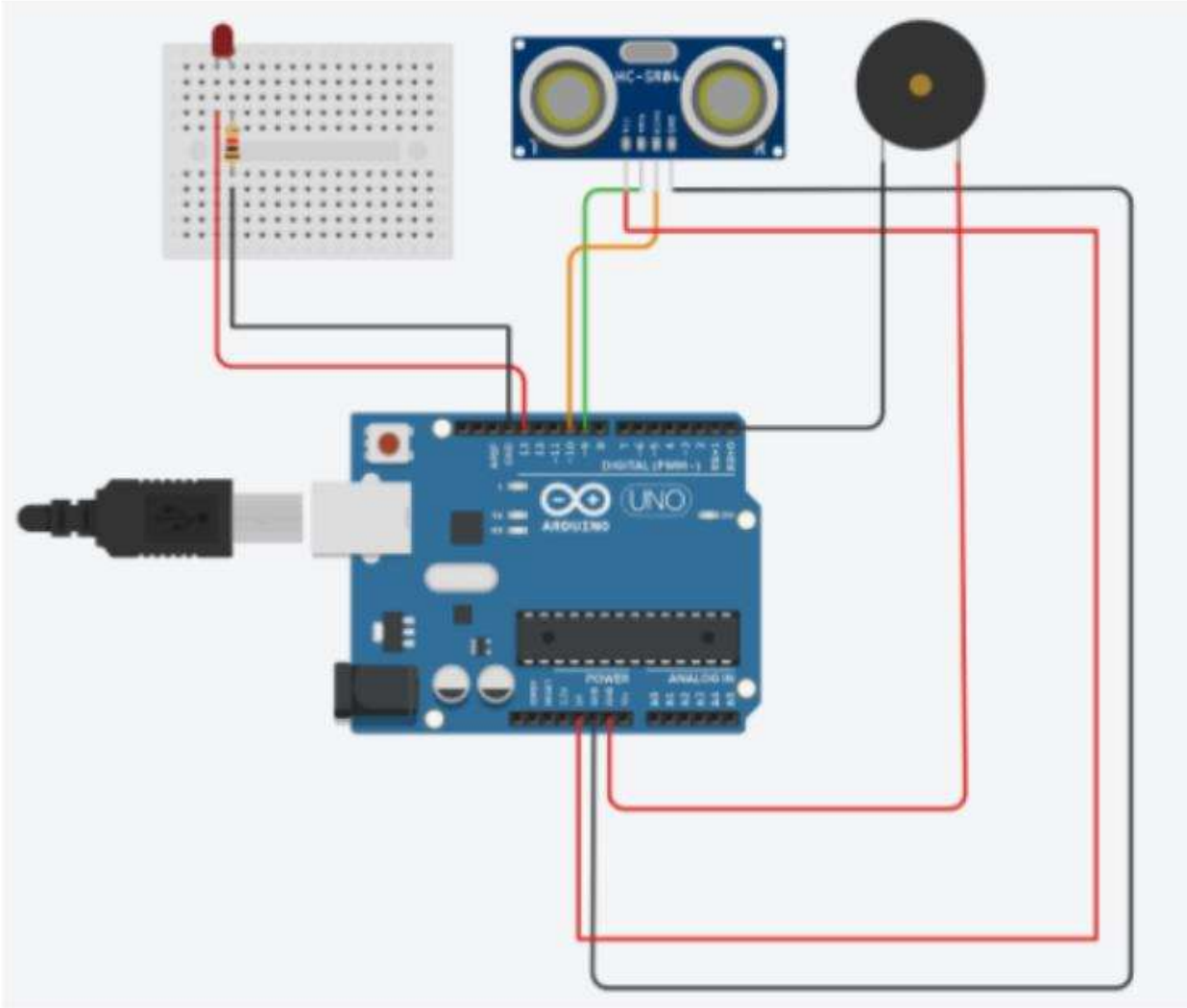
Breadboards are used **to help you connect components to complete your basic circuit**. The reason it's called breadboard dates back to when electronics components were much bigger and people would actually use wooden breadboards (boards used to cut bread) to connect electronic circuits

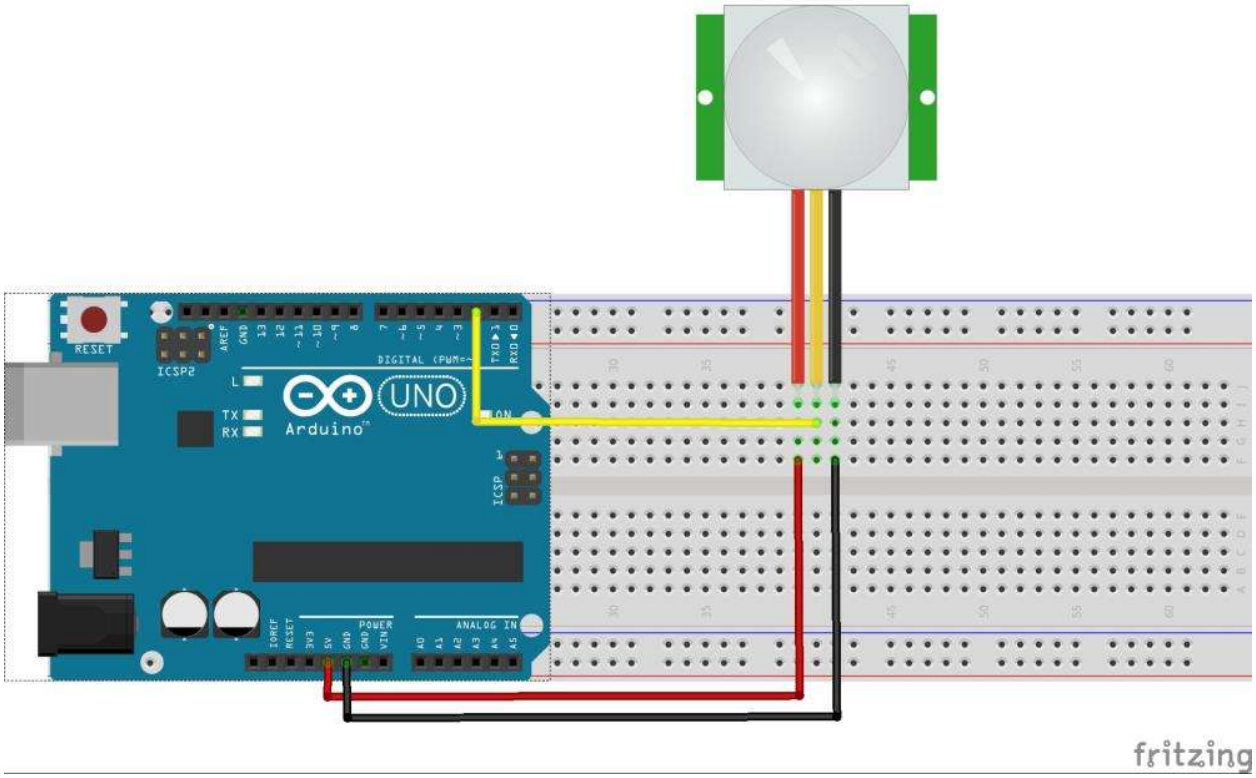


ThingSpeak Cloud:

ThingSpeak is a cloud based data platform which is used to send and receive the data in real time using HTTP protocol. It is used in Iot applications to store and monitor the data from anywhere in the world over the internet.

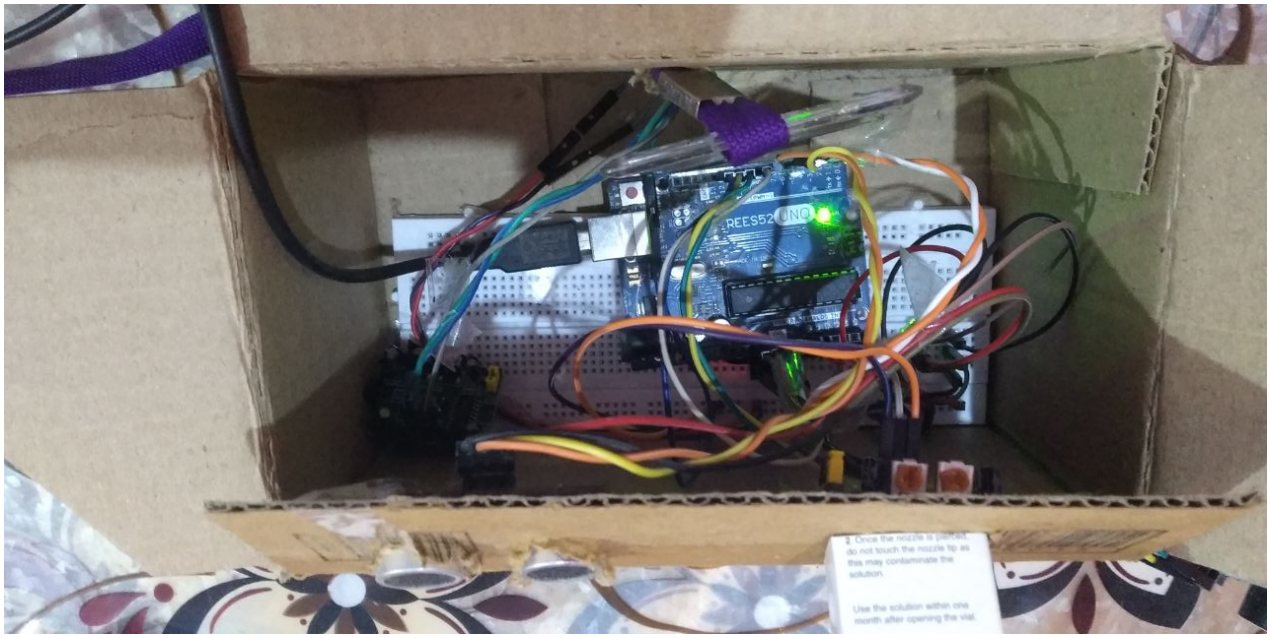
Sensor node diagram :

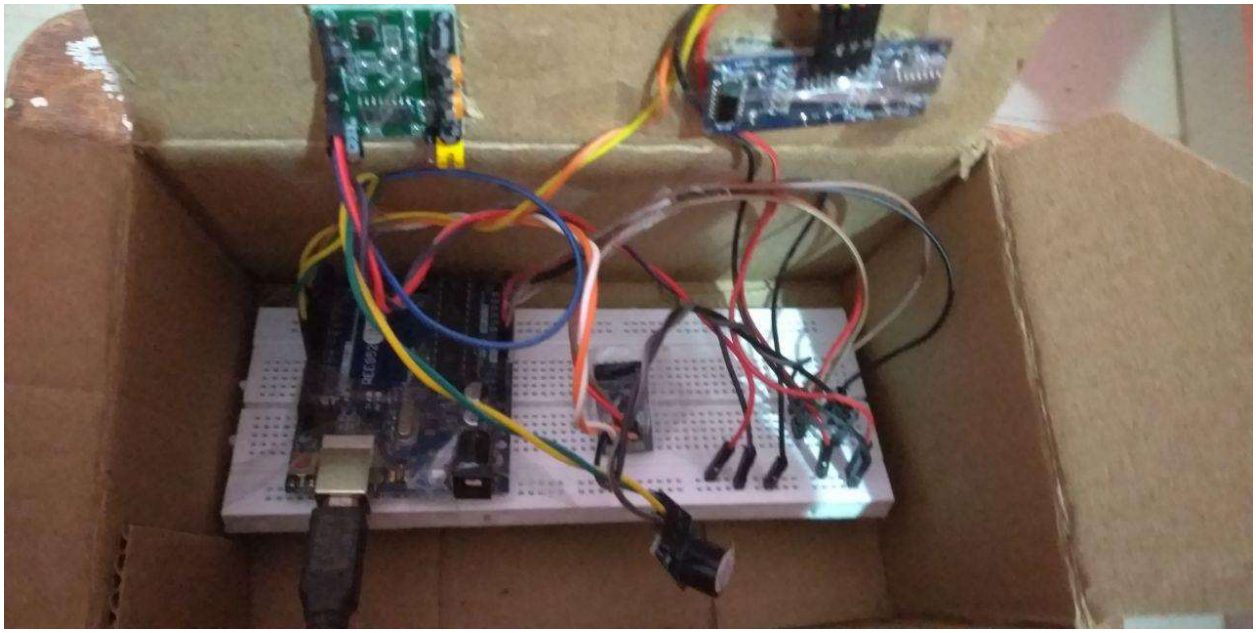



RESET
ICSP2
UNO
Arduino
TX
RX
DIGITAL (PWM~)
POWER
ANALOG IN
ICSP
fritzing

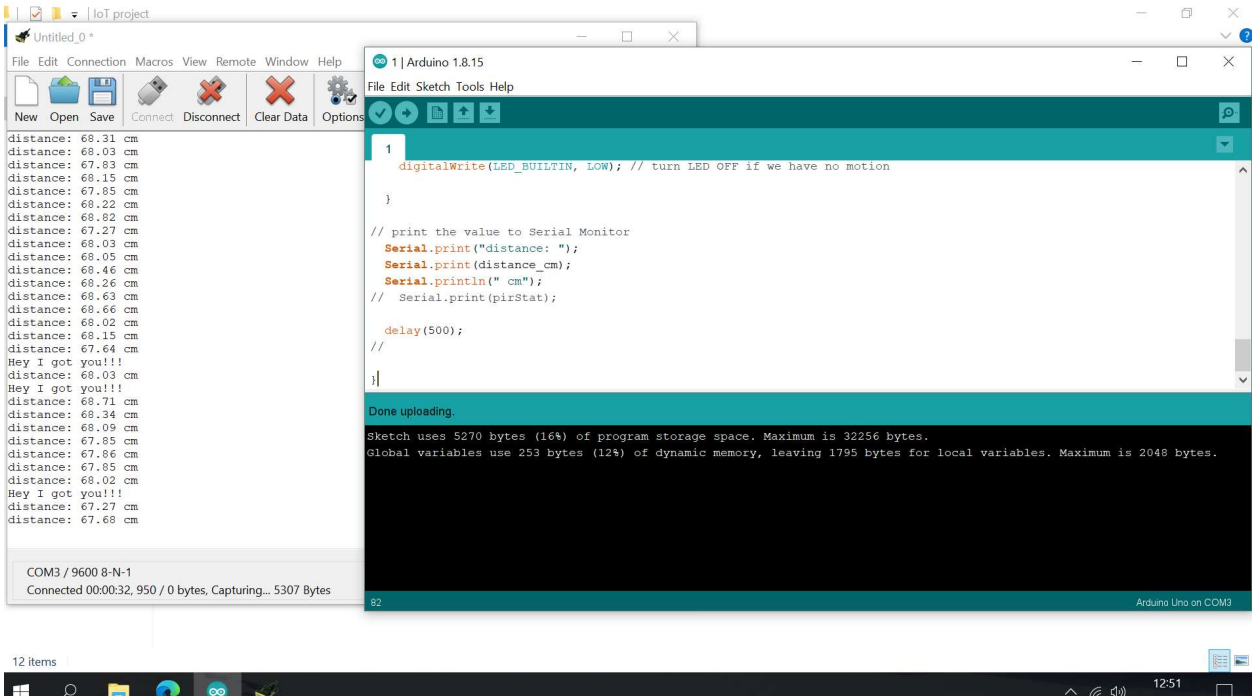
4. RESULTS


amazon pay
Pay using cards, UPI, EMI, netbanking, balance
Scan here for
EXCITING OFFERS !

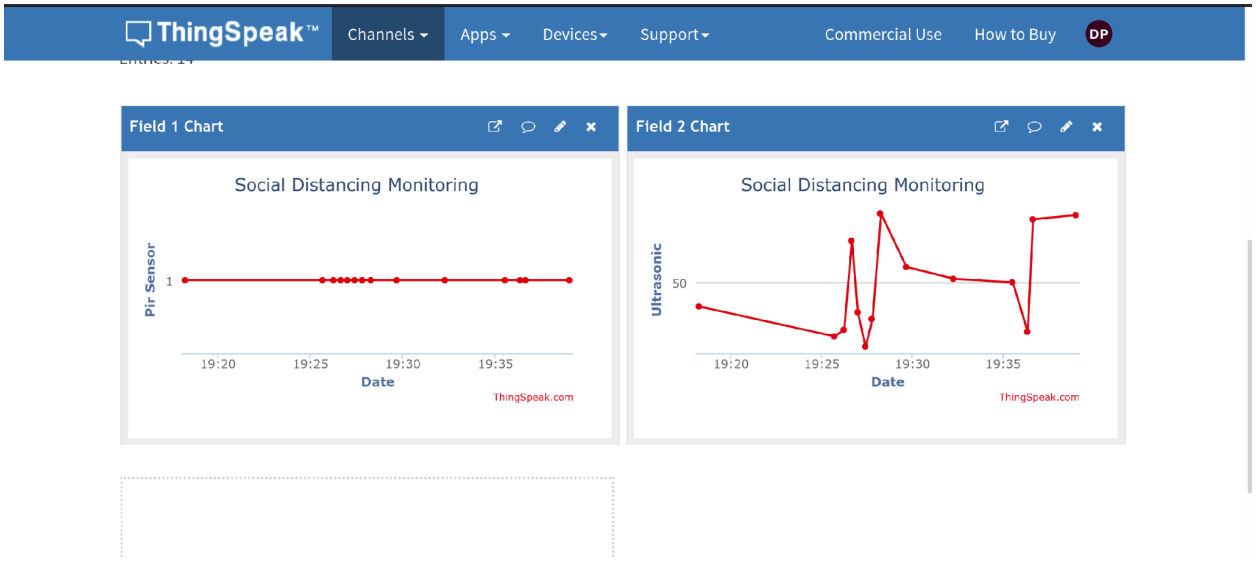




Prototype of our project



Serial monitor



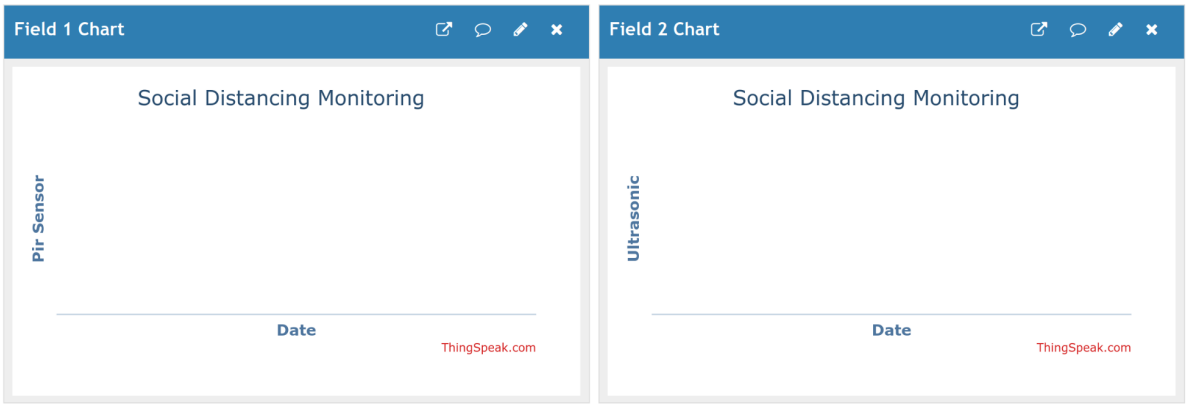
UI of our ThingSpeak server

It works on the principle that living animals (humans) emit heat in the form of infrared radiation which is detected by a pir sensor. Ultrasonic sensor measures distances using ultrasonic waves. When the distance is less than one meter and pir sensor detects humans, the buzzer is activated and data is sent to thingspeak server.

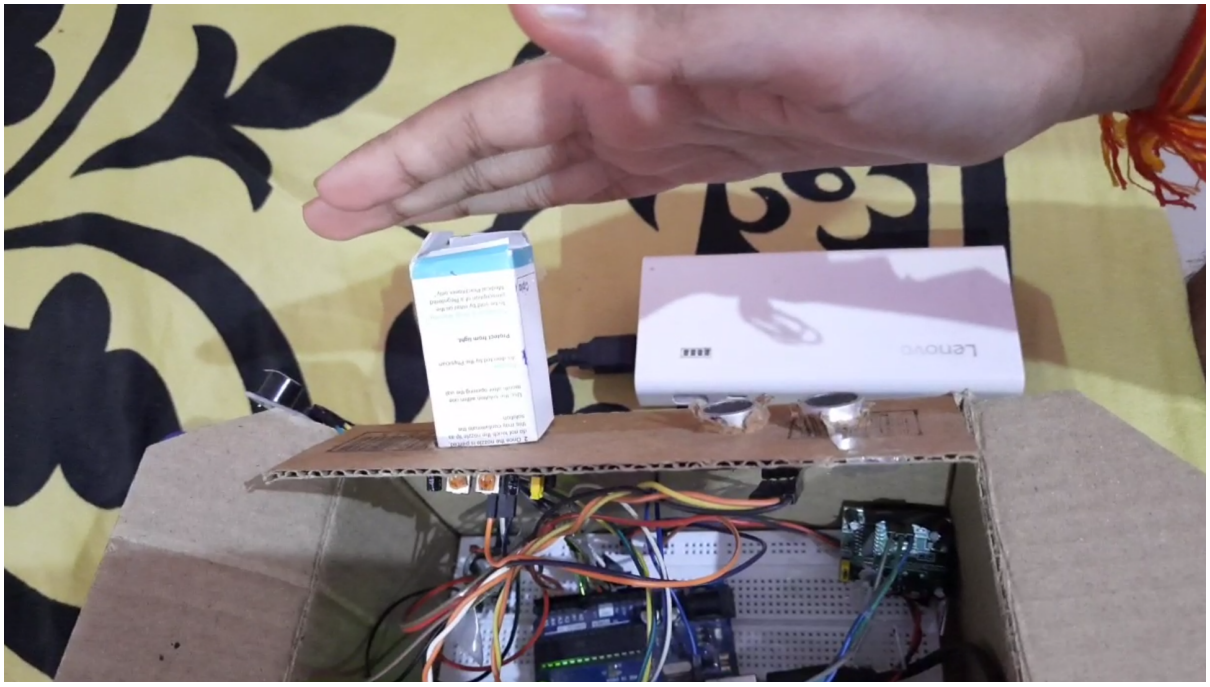
- Initially when no one is in front of the device.

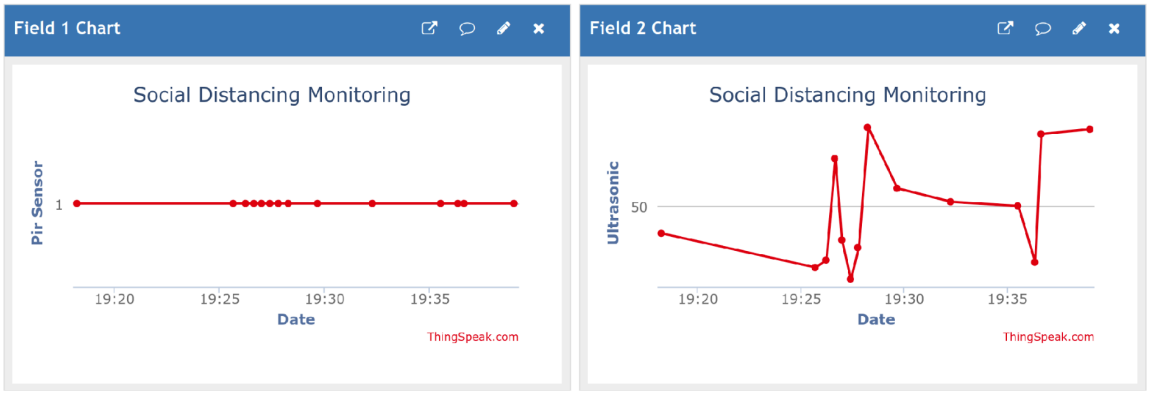
Channel Stats

Created: about a month ago
Entries: 0



- When tested with people.





We can see that when people come in front of the device it buzzes and sends the data to thingspeak server.

5. Comparison with existing solutions

- This system is an IoT based solution that will send data to cloud servers for continuous monitoring of distances.
- It also stores the data for future reference which will be later helpful as it can be used to determine the number of instances people encounter others in close proximity.

- This system can be deployed in schools and other crowded places, for remote monitoring of people and determining potential covid hotspots which will prevent the early spread of virus and cut down cost.

6. Conclusion

IoT provides an extensive integrated network for people to fight the COVID-19 pandemic. The COVID-19 pandemic has forced many countries to impose country wide lockdown for several months. Keeping in mind the business activities, the unlock phase has begun in several parts of the countries with stringent measures such as social distancing and restricted activities. It is an uphill task for the organizations to enforce social distancing guidelines. In this paper, an IoT enabled headband is designed which alerts the people at the vicinity in case of social distancing violation besides sending data to thingspeak. Using data analytics, suitable policy can be developed to curb the spread of the pandemic. The system can be extended easily with minimal time and is quickly adaptable to different situations.

7. Learning outcomes

- Firstly, we learnt to connect various hardware components, i.e sensors, and then interfacing them with the Arduino UNO microcontroller.
- Secondly, we learnt to code with Arduino to make the hardwares actually work.
- Third, we got to know about the ThingSpeak cloud server which was used to store our sensor data and also to monitor data in real time.
- And finally, we learnt to integrate the Arduino microcontroller to the cloud, so that our data that was acquired with it could be sent to the cloud through the internet by using the ESP8266 Wi-Fi module.

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Code

```
//esp8266 wifi

#include <SoftwareSerial.h>

#define RX 2

#define TX 3
```

```
#define DEBUG true

String AP = "2.4";    // AP NAME

String PASS = "Tony@ynoT"; // AP PASSWORD

String API = "XNK0H64O9SG9R804";   // Write API KEY

String HOST = "api.thingspeak.com";

String PORT = "80";

int countTrueCommand;

int countTimeCommand;

boolean found = false;

int valSensor = 1;


SoftwareSerial esp8266(RX,TX);

//


const int buzzer =11; //buzzer to arduino pin 9

const int buzzerPr =10;


//ultrasonic sensor

int trigPin = 5;          // TRIG pin

int echoPin = 7;        // ECHO pin


float duration_us, distance_cm;
```

```
//

//pir sensor
int pirPin = 8;                 // PIR Out pin
int pirStat = 0;                // PIR status
//




void setup() {
//buzzer
  pinMode(buzzer, OUTPUT); // Set buzzer - pin 9 as an output
  pinMode(buzzerPr, OUTPUT);
//ultrasonic sensor
  // begin serial port
  Serial.begin (9600);


  // configure the trigger pin to output mode
  pinMode(trigPin, OUTPUT);
  // configure the echo pin to input mode
  pinMode(echoPin, INPUT);
//
//pir sensor
```

```
 pinMode(pirPin, INPUT);   
  pinMode(LED_BUILTIN, OUTPUT);
//
//esp
  esp8266.begin(115200);
  sendCommand("AT",1000,DEBUG);
  sendCommand("AT+CWMODE=1",1000,DEBUG);
  sendCommand("AT+CWJAP=\""+ AP +"\",\""+ PASS +"\"",1000,DEBUG);
//
}



void loop() {

//ultrasonic sensor
  // generate 10-microsecond pulse to TRIG pin
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);

  // measure duration of pulse from ECHO pin
  duration_us = pulseIn(echoPin, HIGH);
```

```
  // calculate the distance
  distance_cm = 0.017 * duration_us;
//

pirStat = digitalRead(pirPin);
// print the value to Serial Monitor
  Serial.print("distance: ");
  Serial.print(distance_cm);
  Serial.println(" cm");
  Serial.print(pirStat);

  delay(50);
//

//pir sensor------------------------


  if(distance_cm<=100 && pirStat == HIGH){

      digitalWrite(buzzerPr,HIGH);
      tone(buzzer, 120); // Send 1KHz sound signal...
      delay(3000);          // ...for 1 sec
```

```
      digitalWrite(buzzerPr,LOW);


      digitalWrite(LED_BUILTIN, HIGH);  // turn LED ON
      Serial.println("Hey I got you!!!");


      //esp
      String getData = "GET /update?api_key="+ API
+"&field1="+pirStat+"&field2="+distance_cm;
      sendCommand("AT+CIPMUX=1",1000,DEBUG);
      sendCommand("AT+CIPSTART=0,\"TCP\",\""+ HOST +"\","+
PORT,1000,DEBUG);
      sendCommand("AT+CIPSEND=0," +String(getData.length()+4),1000,">");
      esp8266.println(getData);delay(1500);countTrueCommand++;
      sendCommand("AT+CIPCLOSE=0",1000,DEBUG);
      //



  }
  else if (pirStat==0){
      digitalWrite(LED_BUILTIN, LOW); // turn LED OFF if we have no motion


  }
}
```

```
void sendCommand(String command, const int timeout, boolean debug)
{
  Serial.print("AT Command ==> ");
  Serial.print(command);
  Serial.println("        ");

  String response = "";
  esp8266.println(command);
  long int time = millis();
  while ( (time + timeout) > millis())
  {
        while (esp8266.available())
        {
        char c = esp8266.read();
        response += c;
        }
  }
  if (debug)
  {
        //Serial.print(response);
  }
  return response;
```

}

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