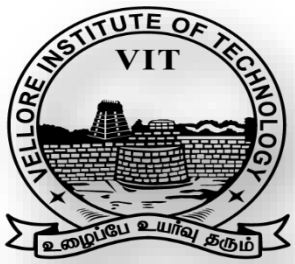

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DATA STRUCTURES AND ALGORITHMS

CSE 2003

NOISE DETECTION SYSTEM

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MAY 2020

1. ABSTRACT:

In this project we aim to develop an IOT based device that can be used to monitor or manage noise pollution. The prepared device can then be further tuned to use at any point of interests like schools, hospitals, zoo, library and any other place that requires monitoring. The produced data can be used to keep track of misuse of human power and energy. The noise detection system (NDS) is specifically designed to monitor noise produced by the machines, transports and humans themselves. The NDS will be useful in places such as school classrooms, hospitals, church and any worshiping temple or any place where noise or loud sounds are undesirable. It will help the security and maintenance staff at such places to monitor the work place. The system will also keep the record of the data generated by the system and can be reviewed any time by the managing authorities.

Keywords:

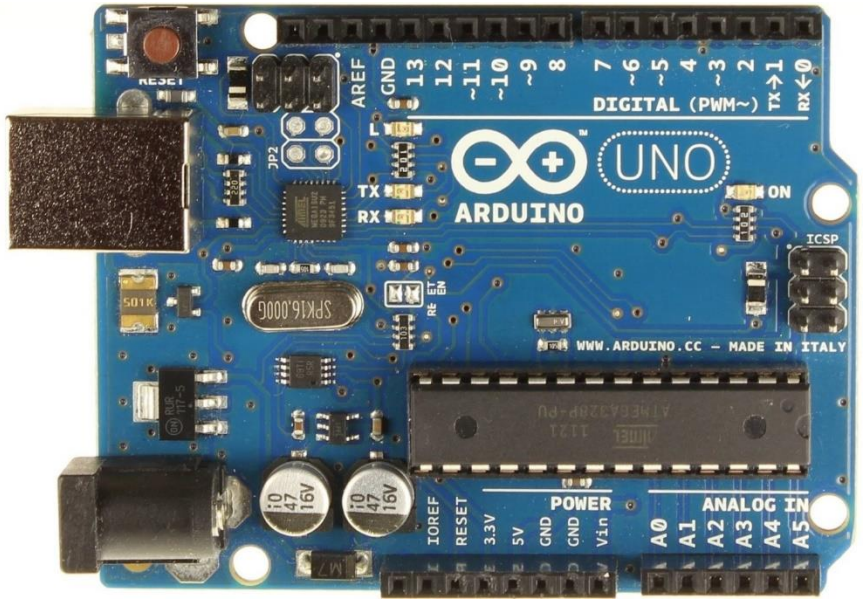
- IOT-Internet of Things
- NDS-Noise Detection System
- Noise pollution
- Monitoring
- Human power and energy

2. INTRODUCTION:

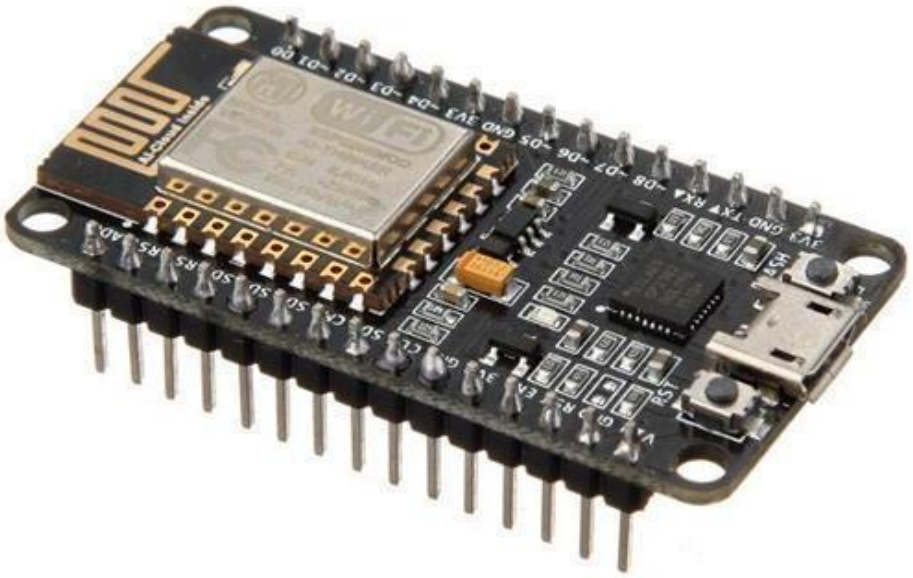
Noise Pollution, sometimes also known as sound pollution, is the propagation of noise with harmful impact on the activity of human or animal life. The sources are machines, transport and humans themselves. Due to the uncontrollable increasing population, proper monitoring of this issue is still a challenge to this world.

Hardware Used:

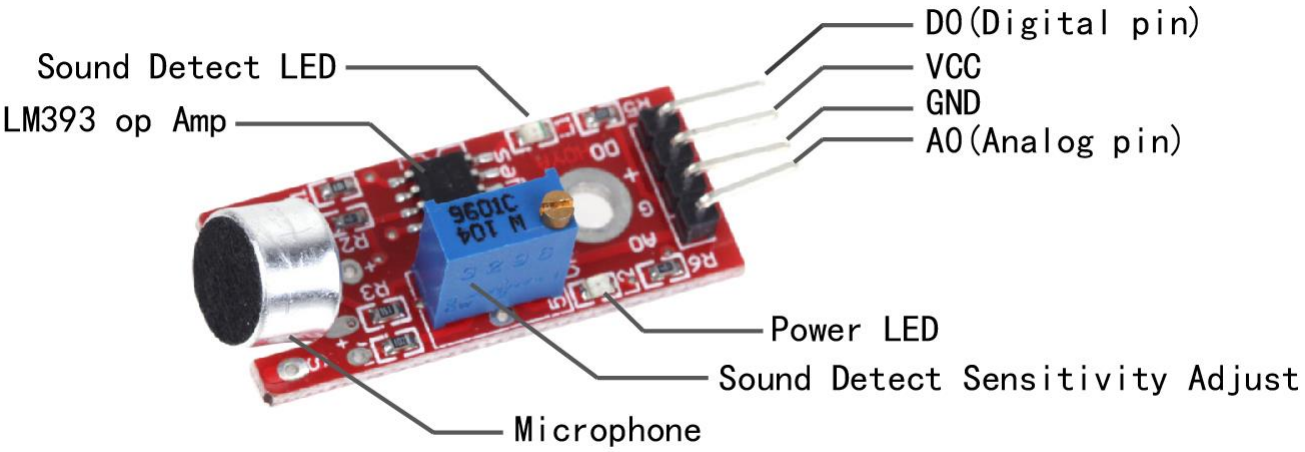
a. Arduino Uno



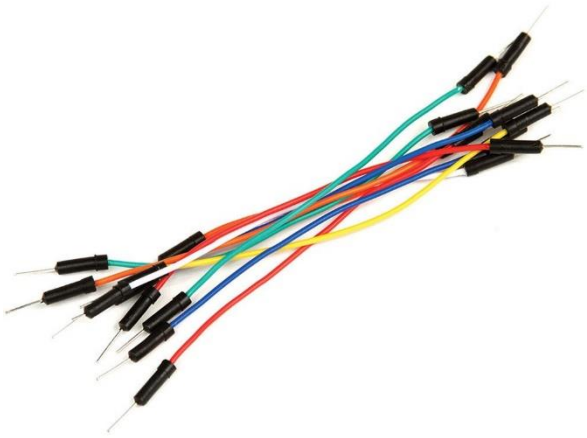
b. Node MCU



c. Sound Sensor module



d. Connecting wires with LED’s of different colours



3. **MOTIVATION**:

- ✓ In this project we aim to design an IOT device that monitors or keeps track of the noise being produced.
- ✓ To provide better monitoring and supervision on places where it is most required like hospitals, schools, etc.
- ✓ Noise/sound leaks can be found in studios, halls and conference rooms.
- ✓ To provide data over a wireless medium for people to take proper action on its basis.
- ✓ To provide warnings over uncontrolled noise and nuisance.

4. RELATED WORKS:

(Our work has been referred from the following papers)

a) Juniastel Rajagukguk in his research aims to know the noise level by using the Arduino Uno as data processing input from sensors and called as Sound Noise Level (SNL). Based on the research that could be taken conclusions noise detection tool-based arduino uno using sensors with tone decoder LM 567 designed worked well the percentage of errors of measurement noise of 0.7%.

b) The researchers Dr. Alex Harijanto and Dr. Bambang Supriadi in their paper, observed the sound frequencies in Sunan Kalijaga mosque at two different times. In the observations, we found that the intensity level in the Sunan Kalijaga mosque in the morning and the evening have a fluctuating value, depending on the number of sound sources.

5. PROPOSED WORK:

1. Product Perspective

The noise detection system is generalized and not area specific, which means that the clients have the power to use it according to their wish. It will provide different modes of function to the clients. For instance,

- MODE I is for school classroom purposes
- MODE II is for hospitals
- Further it can also be set to active or passive modes according to the users.

2. Product Function:

- The user has to register with his/her id and password with the cloud service.
- The patient has to select the mode of use.
- System should detect noise and keep logs in the server.
- NDS specifies the threshold sound decibel values for each mode.
- The user can change the threshold according to their use.
- The system can provide real time warnings if kept in active mode.

3. User Characteristics:

- The users of this system can be security staff of a hospitals, offices.

- The users of this system could be school disciplinary management who can use this system in their schools.
- NDS can also be used by the hospital staff to maintain silence and respond to an emergency call by the patients.
- The administrator who maintains the system.

4. Constraints:

- The system should be placed at the right point of interest of the room.
- The system should not be covered and obstructed.
- The system should be recalibrated after a long period of use.
- The sensor on the system should be kept clean and checked on a regular basis.
- The distance within the noise generating source and the system should only be of a few meters.
- The system has a battery life of 2-3 weeks.

5. Assumptions and Dependencies:

- User has basic knowledge of computers.
- User should have sufficient knowledge of English since the system interface will be in English.
- The system is fast.
- Internet connection is available to all the users who use this system.
- The system will have simple and easy to use interfaces.
- Has an accuracy of 95%.
- The user should have a basic knowledge of graph and data interpretation.

6. CODING:

- ✓ The hardware is connected to the system and the code is run in Arduino IDE. The coding is done in C language.
- ✓ We have used Thingspeak Cloud Service as the data storage and visualization service.

```
#include <ESP8266WiFi.h>;
```

```
#include <WiFiClient.h>;
#include <ThingSpeak.h>;
const int ledpin=4;
const int soundpin=5;
const int buzzer=2;
const char *ssid= "Voodoo13";    //WiFi to be connected
const char *password="abcde12345";    //WiFi password
const char* server="api.thingspeak.com";
WiFiClient client;
unsigned long myChannelNumber = 992869;
const char * myWriteAPIKey = "FDRJ24WFERJQHL1D";   // API Key of the project
void setup() {
  // put your setup code here, to run once:
  Serial.begin(115200);
  pinMode(ledpin,OUTPUT);
  pinMode(soundpin,INPUT);
  pinMode(buzzer,OUTPUT);
delay(10);
WiFi.begin(ssid,password);
ThingSpeak.begin(client);
}
void loop() {
  // put your main code here, to run repeatedly:
  int soundsens=digitalRead(soundpin);
  if(soundsens==HIGH){
    digitalWrite(ledpin,HIGH);
    tone(buzzer,150);
    ThingSpeak.writeField(myChannelNumber,1,200,myWriteAPIKey);
    delay(1000);
    ThingSpeak.writeField(myChannelNumber,1,0,myWriteAPIKey);
  }
```

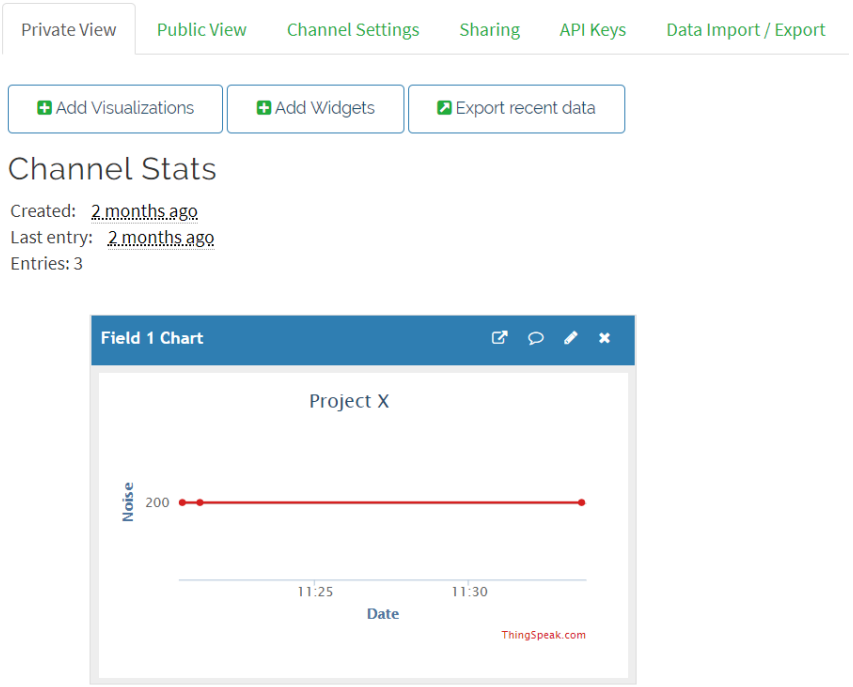
```
  digitalWrite(ledpin,LOW);
  noTone(buzzer);
}
```

This code is fed into the Node micro-controller unit using a computer system. This code is used to bridge the gap between Thingspeak cloud service Database and the data gathered by our sound sensor. It shows the visualizations and graphs of the data received by noise sensor. The signals received by the noise sensor are of Analogue nature, i.e. it can detect only high and lows.

Whenever it will detect sound, the buzzer will make a buzzing sound so that we have a acknowledgement that a sound is received.

DATA REPRESENTATION:

The analogue signal received from the noise sensor is shown in Thingspeak Database:

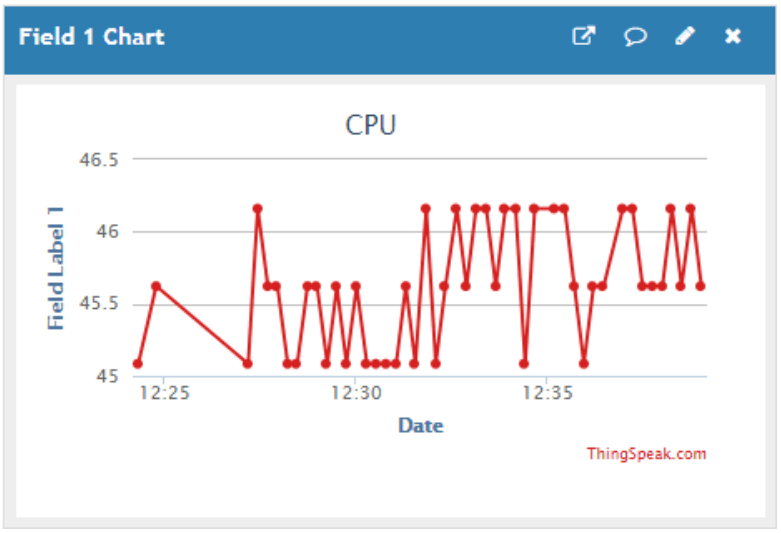


The dot represents high's, i.e. 1 and straight line represent low's, i.e. 0. This data is used to check whether a sound is received, and if it is received then at what date and time.

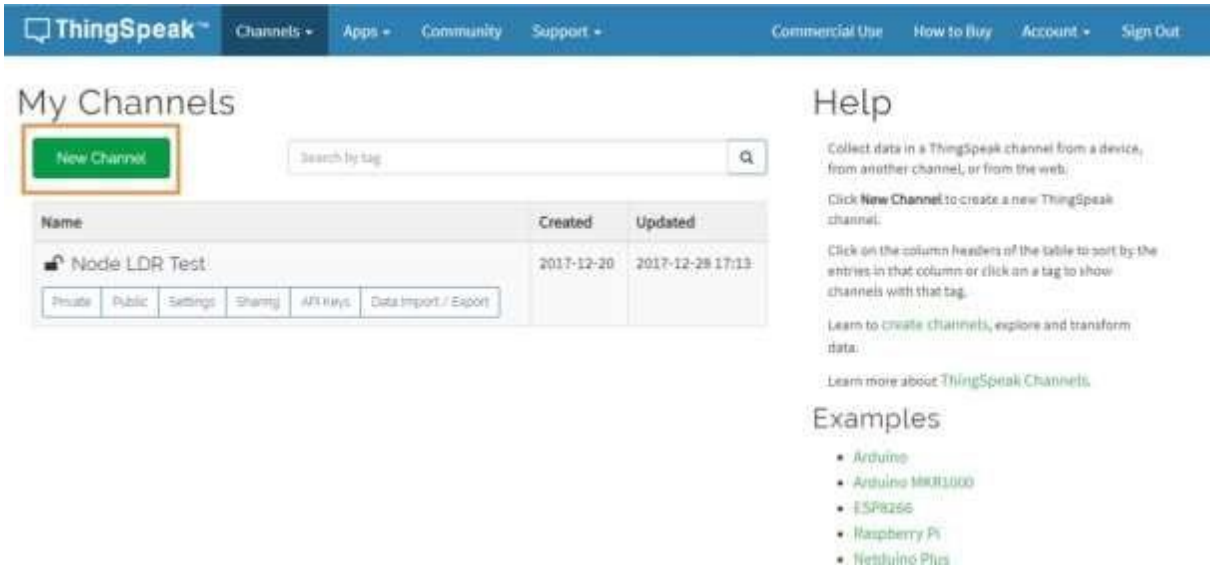
Converting the analogue signal to digital signal using arduino UNO:

Channel Stats

Created: about an hour ago
Entries: 49



Channel selection:

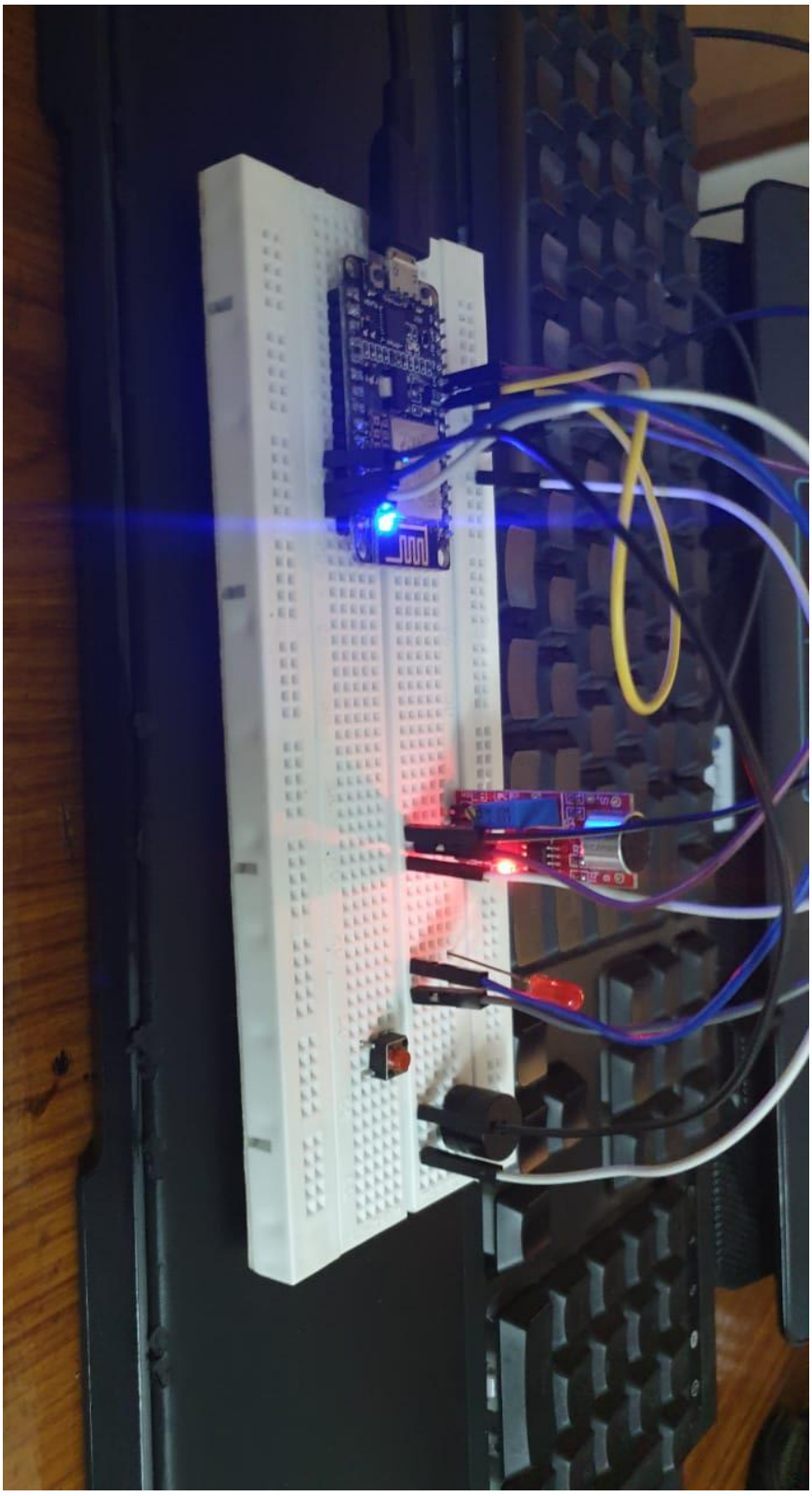


Licensing Requirements:

The usage is restricted to the account holder and the management.

7. CONCLUSION:

We were able to receive the sound in Digital fashion, that is, 0’s and 1’s. The data was stored in Thingspeak cloud service database. We were able to detect high pitched noises through the noise sensor converted it to digital format by which we were able to distinguish between high and low.



8. FUTURE WORK

In the future, for successful implementation of this work, we would be adding Arduino Uno to the project. As the frequency of sound is received in Analogue fashion via the sound sensor, Arduino will help in conversion of Analogue signals to Digital signals which would help in fine tuning of the frequency of the sound received. Conversion of the sound to Digital counterpart would help in usage of this system in different establishments like School, Hospitals etc. It will help the security and maintenance staff at such places to monitor the work place. The system will also keep the record of the data generated by the system and can be reviewed any time by the managing authorities.

Also, if possible, we will try to take this product to higher authorities for patent purposes.

9. REFERENCES:

Reference has been made from the books

a. Environment and health

b. Wikipedia

c. Detection System of Sound Noise Level (SNL) Based on Condenser Microphone Sensor by Juniastel Rajagukguk, 2018.

d. Sound Intensity Measuring Instrument Based on Arduino Board by Dr. Alex Harijanto and Dr. Bambang Supriadi, 2017.

e.https://www.researchgate.net/publication/323860827_Detection_System_of_Sound_Noise_Level_SNL_Based_on_Condenser_Microphone_Sensor