IOT Phase-05

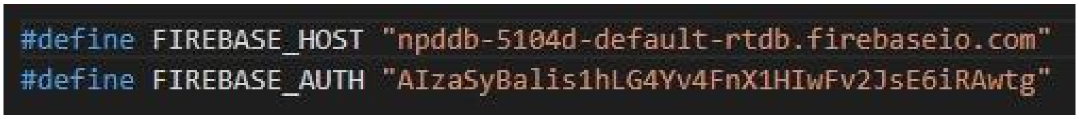
NOISE POLLUTION MONITORING

Introduction:

In this advanced phase of our noise pollution monitoring project, we are making significant strides towards a comprehensive and user-friendly system designed to tackle noise pollution effectively. We have leveraged IoT technology and the user interface developed using MIT App Inventor to integrate key components that offer a seamless experience. These include establishing a robust connection to the Firebase database, calculating average decibel levels from strategically placed microphones, and developing code to showcase sound levels on an LCD display. Additionally, we have implemented a dynamic alarm system to alert when noise levels surpass predetermined thresholds.

Firebase Database Connection:

To ensure accurate and real-time data collection and storage, our system now boasts a robust and dependable connection to the Firebase database. The database assumes a pivotal role in aggregating information from the IoT devices deployed in the field. It serves as a secure and organized repository for data analysis and future reference.



```
#define FIREBASE_HOST "npddb-5104d-default-rtdb.firebaseio.com"
#define FIREBASE_AUTH "AIzaSyBalis1hLG4Yv4FnX1HIwFv2JsE6iRAwtg"
```

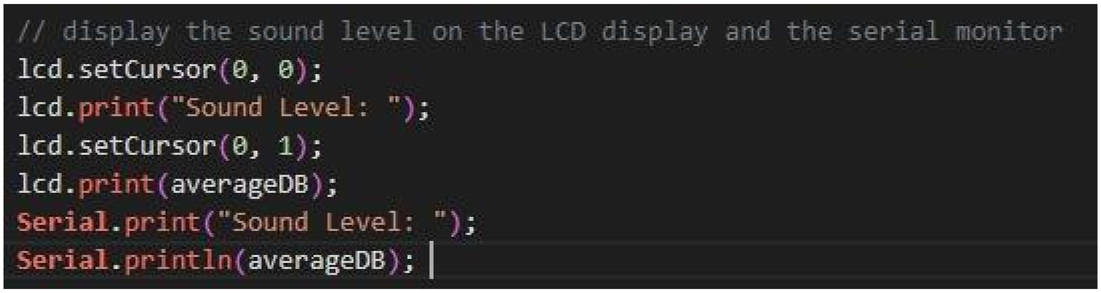
Firebase database connection establishment

Calculating Average Decibels:

Our noise monitoring system incorporates a network of strategically positioned microphones. These microphones work in unison to capture sound data from different vantage points. Our innovative approach lies in our ability to calculate the average decibel levels from these microphones. This approach ensures that our noise level readings are highly precise and reflective of the actual acoustic environment.

LCD Display:

We understand the importance of translating complex noise data into an easily digestible format. Therefore, we have introduced an LCD display that showcases the recorded sound levels in real time. This real-time feedback mechanism enhances awareness about noise pollution and serves as a practical tool for passersby and users alike.

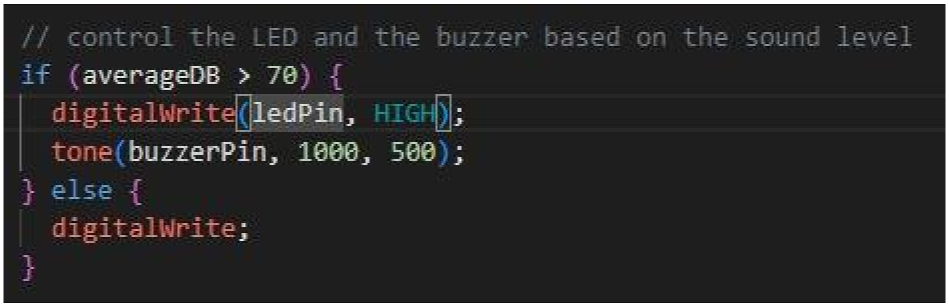


```
// display the sound level on the LCD display and the serial monitor
lcd.setCursor(0, 0);
lcd.print("Sound Level: ");
lcd.setCursor(0, 1);
lcd.print(averageDB);
Serial.print("Sound Level: ");
Serial.println(averageDB);
```

Calculating average decibels from 3 microphones and Code for displaying sound level in an LCD display

Alarm Trigger Mechanism:

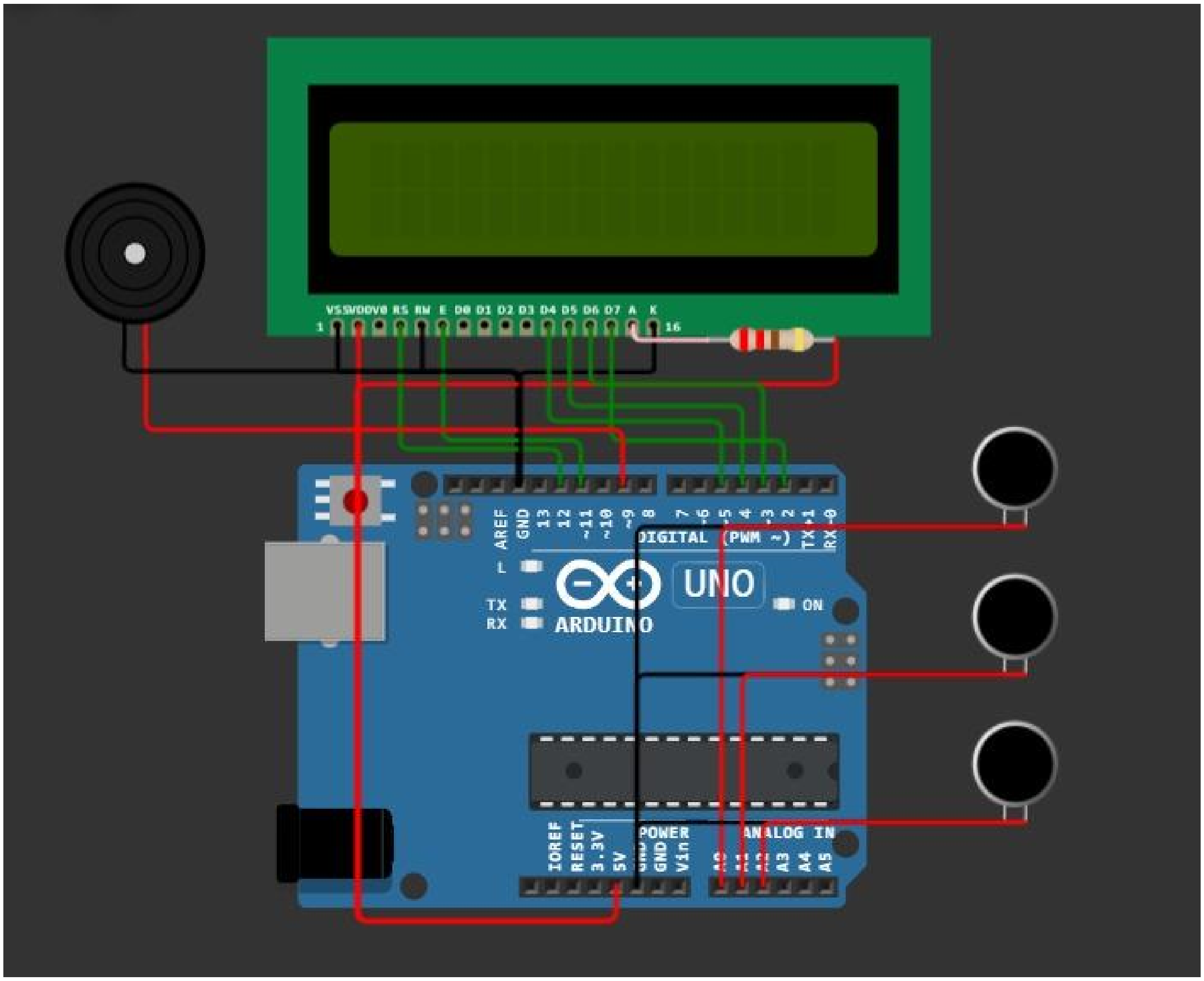
Our noise monitoring system is a proactive solution for maintaining noise pollution within acceptable limits. We have developed an intelligent sound threshold mechanism. When the noise levels exceed predefined thresholds, our system takes action. An audible alarm in the form of a buzzer is triggered to alert relevant authorities or individuals, prompting timely intervention and necessary actions.



```
// control the LED and the buzzer based on the sound level
if (averageDB > 70) {
  digitalWrite(ledPin, HIGH);
  tone(buzzerPin, 1000, 500);
} else {
  digitalWrite;
}
```

Code for sounding alarm if the sound reaches a certain threshold

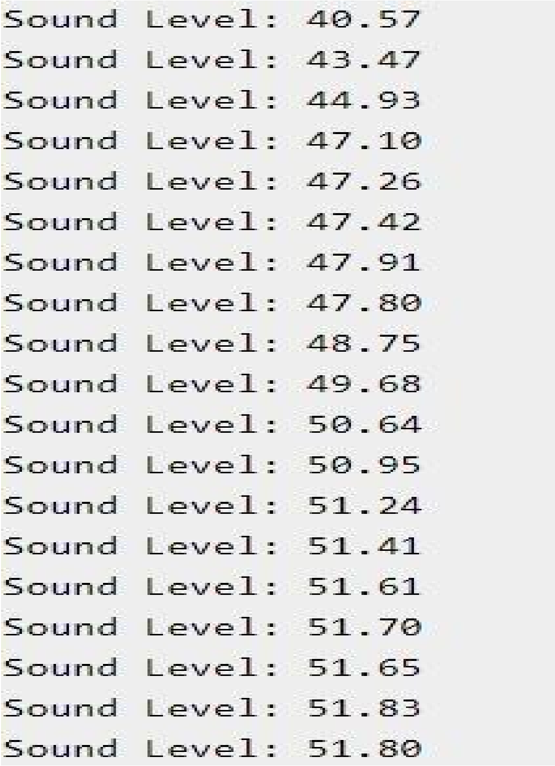
System Architecture:
The core of our noise level monitor consists of strategically positioned microphones, depicted as the black circles on the right side of the device. These microphones ensure comprehensive coverage of the monitored area. To the left, the buzzer acts as the audible alarm. The system continuously checks sound levels at intervals of 200 milliseconds, ensuring vigilant and uninterrupted monitoring.


VSS VDD V0 RS RW E D0 D1 D2 D3 D4 D5 D6 D7 A K
1
16
AREF GND 13 12 ~11 ~10 ~9 8 7 ~6 ~5 4 ~3 2 TX→1 RX←0
DIGITAL (PWM ~)
L
TX
RX
ARDUINO
UNO
ON
IOREF RESET 3.3V 5V GND GND Vin
POWER
ANALOG IN
A0 A1 A2 A3 A4 A5

The Architecture Noise level monitor

The three black circles on the right are mics. The black circle on the left is a buzzer.

Output of the noise level monitor

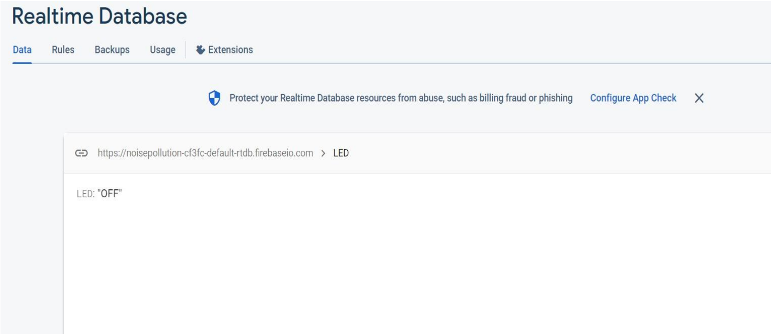


```
Sound Level: 40.57
Sound Level: 43.47
Sound Level: 44.93
Sound Level: 47.10
Sound Level: 47.26
Sound Level: 47.42
Sound Level: 47.91
Sound Level: 47.80
Sound Level: 48.75
Sound Level: 49.68
Sound Level: 50.64
Sound Level: 50.95
Sound Level: 51.24
Sound Level: 51.41
Sound Level: 51.61
Sound Level: 51.70
Sound Level: 51.65
Sound Level: 51.83
Sound Level: 51.80
```

The sound is checked every 200ms

Database Integration:

All the valuable data collected by our IoT devices finds a secure home in the Firebase database. This structured and secure repository not only ensures the integrity of the data but also facilitates comprehensive data analysis. It serves as our portal to long-term tracking of noise levels in the monitored area.


Realtime Database

Protect your Realtime Database resources from abuse, such as billing fraud or phishing

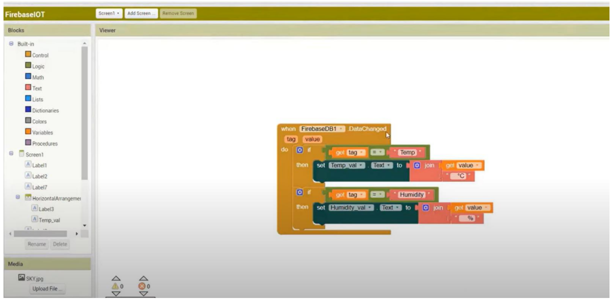
https://noisepollution-cf3fc-default-rtdb.firebaseio.com > LED

LED: "OFF"

It is a database called Firebase, where all the information gathered from the IoT devices and stored

User Application:

The backend code of our user application has been thoughtfully designed to provide users with convenient access to real-time noise-level data. The user interface is intuitive and user-friendly, offering a seamless experience. This application enhances the overall user experience, making it easy for users to access, interpret, and act on the noise data being collected.

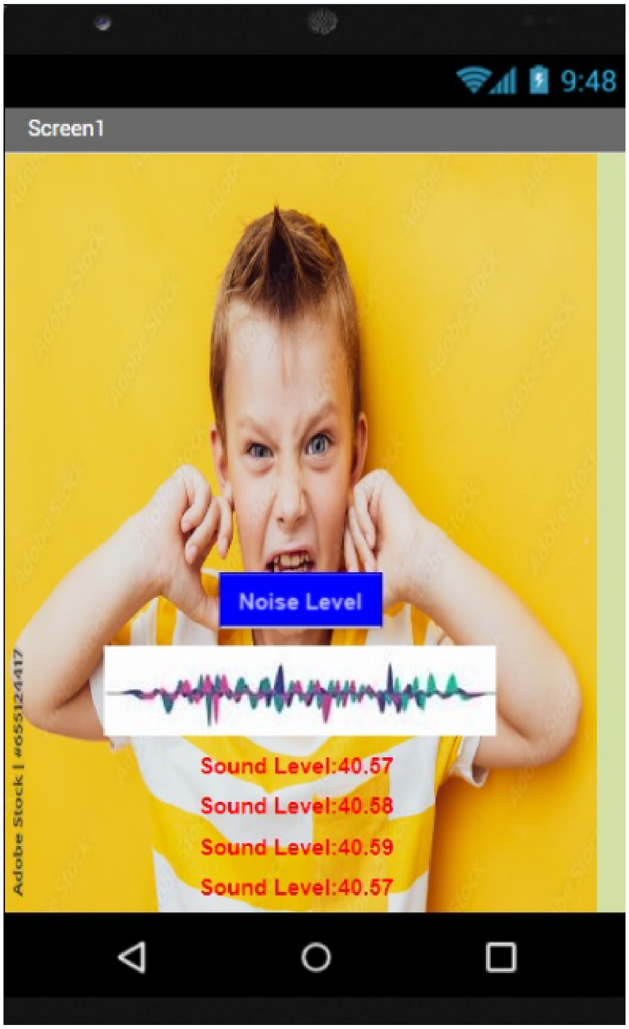


```
when FirebaseDB1 .DataChanged
  tag  value
do  if  get tag = "Temp"
    then  set Temp_val . Text to  join  get value
                                        "°C"
    if  get tag = "Humidity"
    then  set Humidity_val . Text to  join  get value
                                            "%"
```

We have the backend code for our application, where the output is displayed on the user's application

Deployment of the application:

By delving into the above-mentioned components and further refining the content, users will obtain a comprehensive and insightful overview of the capabilities and impact of our noise pollution monitoring system. This comprehensive description justifies the functionality and potential of our solution, advancing our mission to address and combat noise pollution effectively.



Sound Level:40.57
Sound Level:40.58
Sound Level:40.59
Sound Level:40.57

The above image shows the snap of our user application