Project Title: Environmental Monitoring

Phase 5: Project Documentation & Submission

Objectives:

The primary goal of the "Environmental Monitoring in Parks" project is to establish a real-time environmental monitoring system using IoT devices to collect, analyze, and display crucial environmental data within public parks. The key objectives encompass:

1. Real-time Monitoring: Implement continuous and accurate data collection of environmental parameters such as temperature and humidity.

2. User Accessibility: Provide park visitors with easy access to real-time environmental data through a mobile application developed using MIT App Inventor.

3. Platform Development: Employ Firebase for data storage, management, and accessibility, ensuring the information is reliably available for visitors and park management.

4. Code Implementation: Integration of sensors with microcontrollers (ESP32, Arduino) to collect data, then transmit it to Firebase for storage, followed by its retrieval and display via MIT App Inventor-created mobile application.

IoT Device Deployment:

The project involves the strategic deployment of IoT devices, mainly temperature and humidity sensors, within specific locations in public parks. These sensors are connected to microcontrollers such as the ESP32 and Arduino, which collect data and transmit it to Firebase, ensuring accurate and real-time environmental information. The choice of IoT devices and their positioning is crucial to ensure comprehensive coverage of the park's environmental conditions.

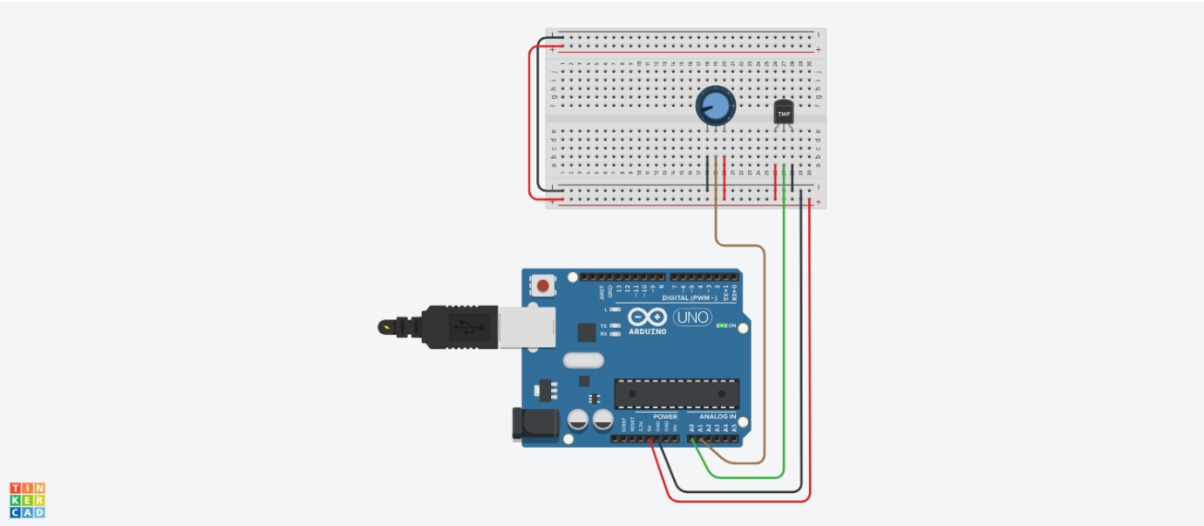
Platform Development and Code Implementation:

The project's technical backbone consists of Firebase, a robust cloud-based platform, utilized for storing and managing the collected environmental data. Firebase Realtime Database or Firestore is integrated into the system to enable seamless storage, retrieval, and display of real-time data. This data is then accessed and presented to park visitors through a mobile application created using MIT App Inventor. The implementation involves developing a user-friendly interface that fetches data from Firebase and displays it to users for informed decision-making regarding outdoor activities within the park.

Tinkercad:

In our endeavour to revolutionize Environmental Monitoring in Parks, Tinkercad emerged as our digital ally, allowing us to virtually construct, test, and validate intricate IoT device setups, empowering a seamless and accurate development process for a more informed and enjoyable outdoor experience.

Circuit Connection:



Sample code:

```
const int temperaturePin = A0;   // Analog pin for the temperature sensor
const int humidityPin = A1;      // Analog pin for the humidity simulation potentiometer

int humiditySensorOutput = 0;
int rawValue = 0;
double voltage = 0;
double tempC = 0;
double tempF = 0;

void setup() {
  Serial.begin(9600);
}

void loop() {
  // Read temperature sensor
  rawValue = analogRead(temperaturePin);
  voltage = (rawValue / 1023.0) * 5000; // Convert to millivolts
  tempC = (voltage - 500) * 0.1; // Apply an offset
  tempF = (tempC * 1.8) + 32; // Convert to Fahrenheit
```

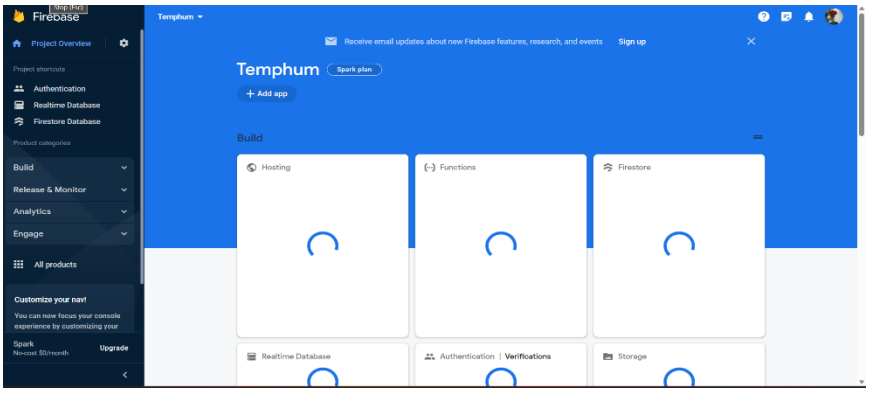
```
  Serial.print("Raw Value = ");
  Serial.print(rawValue);
  Serial.print("\t Millivolts = ");
  Serial.print(voltage, 0); // Print voltage with no decimal places
  Serial.print("\t Temperature in Celsius = ");
  Serial.print(tempC, 1); // Print temperature with 1 decimal place
  Serial.print("\t Temperature in Fahrenheit = ");
  Serial.println(tempF, 1); // Print temperature in Fahrenheit with 1 decimal place

  // Read humidity simulation from the potentiometer
  humiditySensorOutput = analogRead(humidityPin);
  int mappedHumidity = map(humiditySensorOutput, 0, 1023, 10, 70); // Map to a humidity range

  Serial.print("Humidity: ");
  Serial.print(mappedHumidity);
  Serial.println("%");

  delay(5000);  // Wait for 5 seconds before the next reading
}
```

Sample Output:

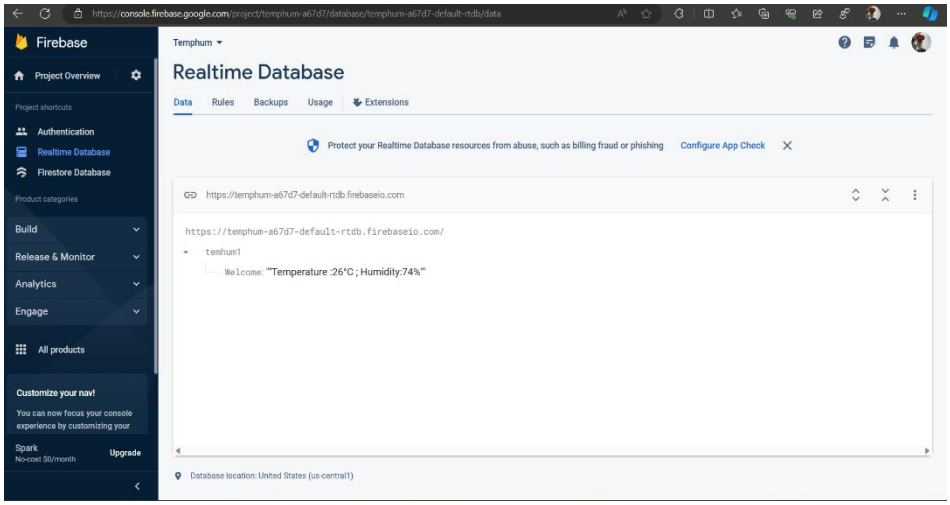
```
Raw Value = 153  Millivolts = 748       Temperature in Celsius = 24.8   Temperature in Fahrenheit = 76.6
Humidity: 15%
```

Firebase Flatform:

Firebase became our digital vault, storing real-time environmental data in our Environmental



Monitoring in Parks project, ensuring seamless accessibility and reliability for park visitors, enabling informed outdoor engagements.



Firebase Data Display:

Database url: https://temphum-a67d7-default-rtdb.firebaseio.com/

App Development:

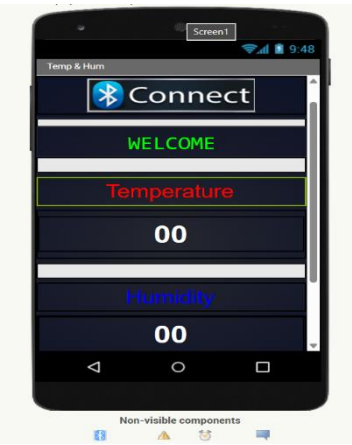
Utilizing "MIT App Inventor," create a mobile application.

MIT App Inventor:

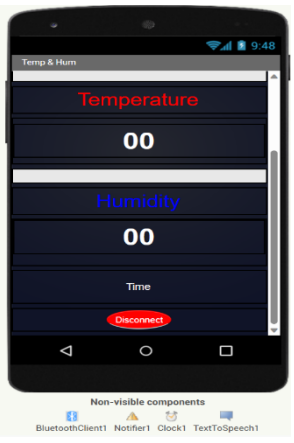
In our project, we harnessed the power of MIT App Inventor to design and deploy a user-friendly mobile application, enabling park visitors to access real-time environmental data. This intuitive interface, integrated with Firebase, offered immediate insights into temperature and humidity, aiding visitors in making informed decisions for a more enjoyable park experience.

Design View:

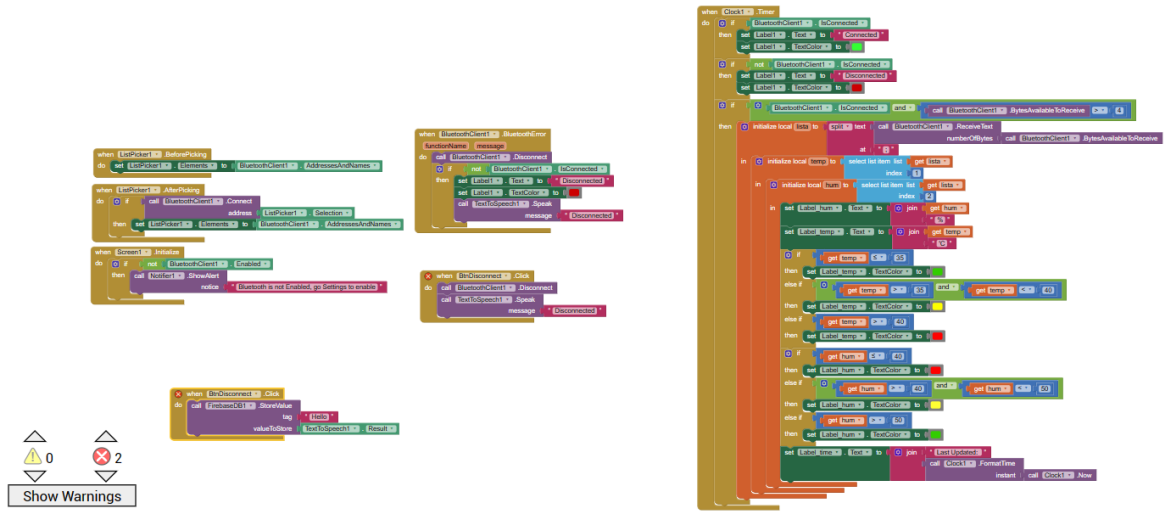
Upper Screen:



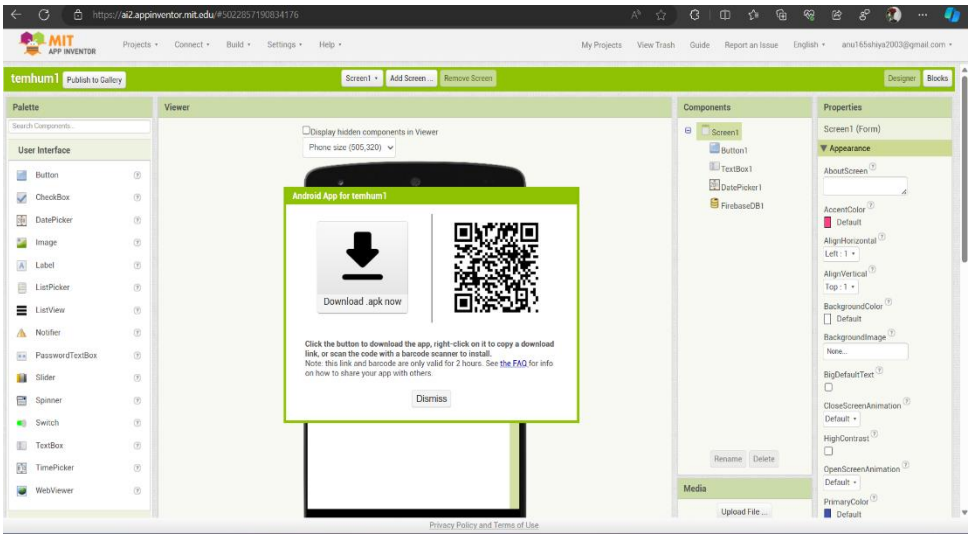
Lower Screen:



Block View:



Using "MIT App Inventor," we can use our generated application on our mobile device by either scanning the QR code or entering the six digits**.**



Download the application as android application and download in mobile phone and check the application. This application is used to monitor the noise level in the place where the sensor deployed.

Benefits to Park Visitors and Outdoor Activities:

Visitor Empowerment:

The real-time environmental monitoring system significantly benefits park visitors by offering immediate access to critical environmental data. Visitors can make informed decisions about their park activities based on real-time temperature and humidity conditions. This information enhances their park experience, enabling them to plan outdoor activities

effectively, whether it's a hike, a picnic, or a leisurely walk, ensuring a more comfortable and enjoyable visit.

Promotion of Outdoor Activities:

By having access to live environmental data, visitors are encouraged and empowered to engage in outdoor activities confidently. Understanding the prevailing environmental conditions allows for better planning and enhances safety measures, promoting a higher frequency of park visits and a more positive experience for all visitors.

The integration of real-time data accessibility through Firebase and MIT App Inventor has elevated the park experience, fostering a stronger connection between visitors and the outdoor environment, consequently encouraging outdoor engagements and activities.

Conclusion:

The Environmental Monitoring in Parks project amalgamated cutting-edge technologies such as IoT devices, Firebase, MIT App Inventor, and Tinkercad to create a comprehensive system that provides real-time environmental data to park visitors. Through meticulous IoT device deployment and leveraging Firebase's storage capabilities, coupled with the user-friendly interface designed via MIT App Inventor, this initiative significantly enhanced the park experience. The integration of Tinkercad for simulation ensured thorough testing, reducing errors and streamlining the development process. Altogether, this project not only provided immediate environmental insights but also promoted informed decision-making for outdoor activities, fostering a safer and more enjoyable park experience for all visitors.