PROJECT TITLE: FLOOD MONITORING AND EARLY WARNING

PHASE 5: PROJECT DOCUMENTATION AND SUBMISSION

OBJECTIVE:

The primary objective of this project is to develop a comprehensive Flood Monitoring and Early Warning System. Flooding poses a significant threat in many regions, making it crucial to create a system that can accurately monitor and predict flood events. This project aims to achieve the following key goals:

1. **Data Collection:** Implement sensors to collect essential environmental data. These include an ultrasonic sensor for water level measurement, a DHT22 sensor for temperature and humidity, and additional sensors for rain intensity and water flow if required.

2. **Data Transmission:** Establish a reliable data transmission mechanism to securely send the collected data to the ThingSpeak cloud platform. This cloud-based system will serve as a central repository for data storage and retrieval.

3. **Real-time Monitoring:** Create a user-friendly website that will display real-time data, allowing users to track flood-related information, such as water levels, temperature, and humidity. Users can access this information on various devices, enhancing accessibility.

4. **Alerting Mechanism:** Implement an alerting system that can promptly notify users of potential flooding incidents. Alerts will be triggered based on predefined thresholds for water levels or weather conditions. The system will utilize visual and auditory cues, such as LEDs and a buzzer, for immediate notification.

5. **Public Awareness:** Provide flood-related educational content on the website, including safety tips, preparedness measures, and information about flood risks. This information will contribute to public awareness and safety.

6. Data Analytics: Analyze historical data to identify trends and patterns related to flood occurrences, which can help in better prediction and mitigation.

By achieving these objectives, this project will contribute to public safety by providing real-time flood monitoring and early warnings, enabling individuals and authorities to take timely and informed actions. The combination of data collection, transmission, real-time monitoring, and alerting mechanisms creates a holistic solution for flood management and awareness.

IOT SENSOR DEPLOYMENT:

- **WOKWI:**

Wokwi is a versatile online platform that allows you to design, simulate, and test electronic circuits in a virtual environment.

WOKWi
Simulate IoT Projects in Your Browser
Discord Community
LinkedIn Group
Simulate with Wokwi Online
Arduino (Uno, Mega, Nano)
ESP32
STM32
Pi Pico

Website: (https://wokwi.com/)

CIRCUIT DIAGRAM:

```
+-----[Buzzer]-----+
|                     |
  |   +--[GND]--[TRIG]-+
  |   |    |           |
+5V----[VCC]--[ECHO]
[GND]
|   |    |           |
  |   +-----+          |
|                     |
+-------------------+
|   |       |        |
  |   |       |        |
  |   |   +--[DATA]    |
  |   |   |            |
  |   |   +--|---+     |
|   |       |   |     |
  |   |   +---|---+    |
|   |   |   |        |
  |   +---+   +        |
  |                    |
  |   +--[LED]         |
  |   |   |            |
|   |   +--[R]-------|
|   |       |   |     |
  |   +-------+   |    |
  |                    |
+-------------------+
```

The circuit is designed for a flood monitoring and early warning system. When flooding is detected based on the ultrasonic sensor data, the LED and buzzer are activated for flood alerting.

WIRING INSTRUCTIONS:

I. Ultrasonic Sensor (HC-SR04):

- Connect the VCC (5V) pin of the sensor to the VSYS (5V) pin on the Raspberry Pi Pico.
- Connect the GND (Ground) pin of the sensor to the GND (Ground) pin on the Raspberry Pi Pico.
- Connect the TRIG pin of the sensor to GPIO pin 2 on the Raspberry Pi Pico. Connect the ECHO pin of the sensor to GPIO pin 3 on the Raspberry Pi Pico.
- Connect the VCC (5V) pin of the sensor to the VSYS (5V) pin on the Raspberry Pi Pico.
- Connect the GND (Ground) pin of the sensor to the GND (Ground) pin on the Raspberry Pi Pico.
- Connect the TRIG pin of the sensor to GPIO pin 2 on the Raspberry Pi Pico.
- Connect the ECHO pin of the sensor to GPIO pin 3 on the Raspberry Pi Pico.

II. DHT Sensor (DHT22 or DHT11):

- Connect the VCC (3.3V) pin of the sensor to the 3V3 (3.3V) pin on the Raspberry Pi Pico.
- Connect the GND (Ground) pin of the sensor to the GND (Ground) pin on the Raspberry Pi Pico.

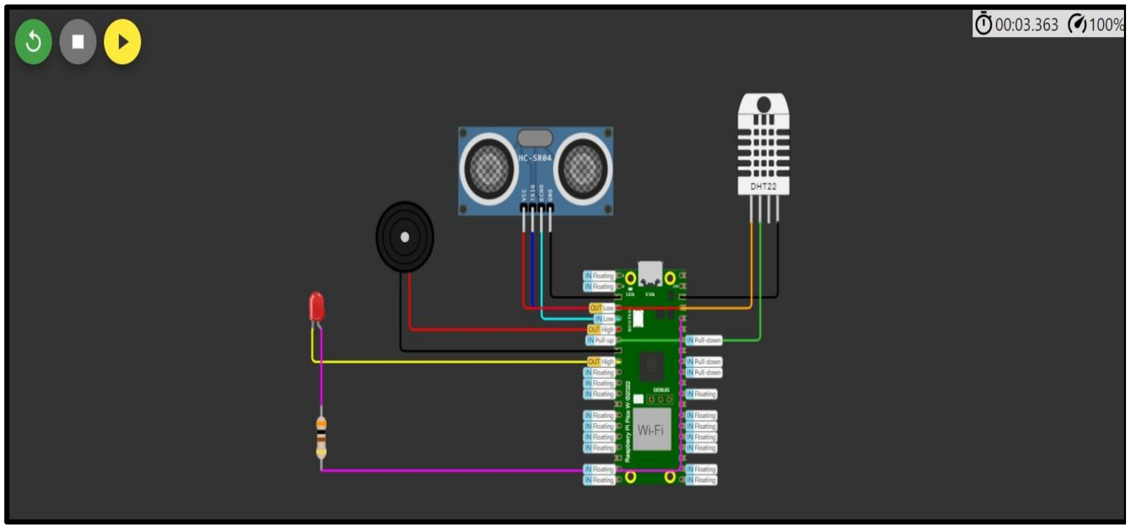
- Connect the DATA pin of the sensor to GPIO pin 5 on the Raspberry Pi Pico.

III. **Buzzer:**

- Connect one leg (either one) of the buzzer to GPIO pin 4 on the Raspberry Pi Pico.
- Connect the other leg of the buzzer to a current-limiting resistor (220330 ohms).
- Connect the other end of the resistor to a Ground (GND) pin on the Raspberry Pi Pico.

IV. **LED:**

- Connect the longer leg (anode) of the LED to GPIO pin 6 on the Raspberry Pi Pico.
- Connect the shorter leg (cathode) of the LED to a current-limiting resistor (220-330 ohms).
- Connect the other end of the resistor to a Ground (GND) pin on the Raspberry Pi Pico



WOKWI CODE DESCRIPTION:

1. **Importing Required Libraries:**

```
import time
import machine
import dht
```

This code begins by importing the necessary libraries. time is used for time-related operations, machine provides access to GPIO pins on the Raspberry Pi Pico, and dht is used for the DHT sensor.

2. **Defining GPIO Pins:**

```
TRIG_PIN = machine.Pin(2, machine.Pin.OUT)
ECHO_PIN = machine.Pin(3, machine.Pin.IN)
BUZZER_PIN = machine.Pin(4, machine.Pin.OUT)
DHT_PIN = machine.Pin(5)
LED_PIN = machine.Pin(6, machine.Pin.OUT)
```

This section defines the GPIO pins used to connect various components to the Raspberry Pi Pico.

3. **Distance Measurement Function :**

```
def distance_measurement():
        TRIG_PIN.on()
        time.sleep_us(10)
```

```
TRIG_PIN.off()      while not
ECHO_PIN.value():
          pass
pulse_start = time.ticks_us()
while ECHO_PIN.value():
pass
pulse_end = time.ticks_us()      pulse_duration =
time.ticks_diff(pulse_end, pulse_start)      distance =
pulse_duration / 58   return distance
```

This function distance_measurement measures the distance using the ultrasonic sensor (HC-SR04). It triggers the sensor, calculates the time taken for the ultrasonic pulse to return, and then converts it into distance in centimeters.

4. **Reading DHT Sensor Function:**

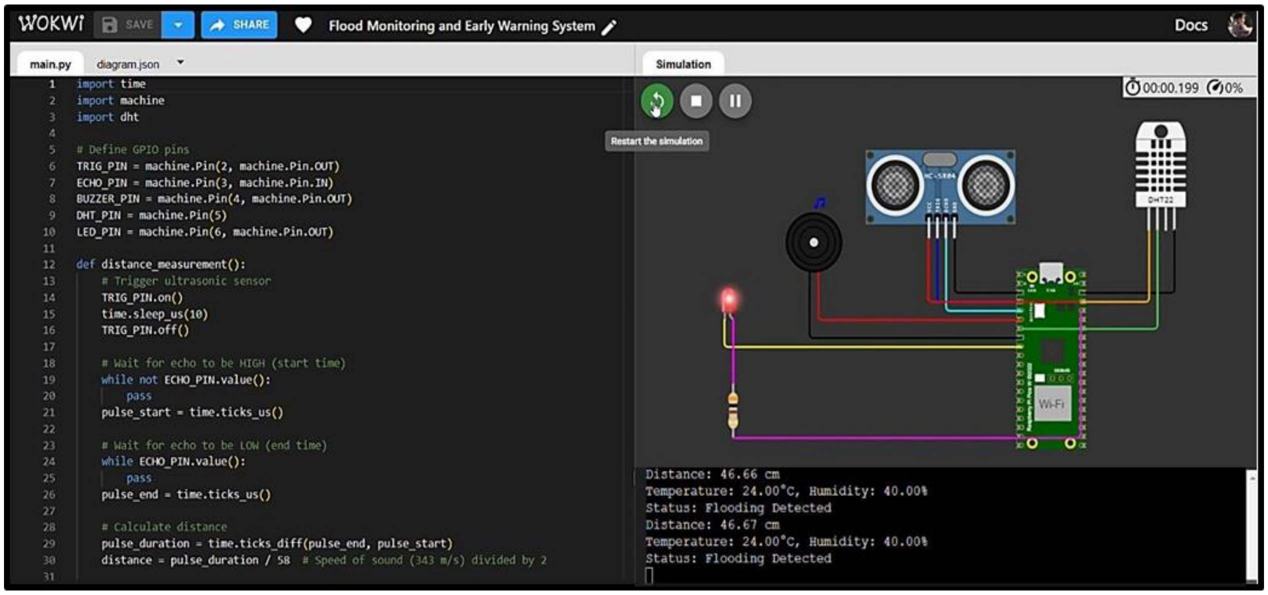
```
def read_dht_sensor():      d =
          dht.DHT22(DHT_PIN)
          d.measure()      return
          d.temperature(), d.humidity()
```

The read_dht_sensor function reads temperature and humidity data from the DHT22 sensor. It creates a DHT22 object, measures the data, and returns the temperature and humidity values.

5. **Monitoring Loop:**

```
buzz_start_time = None
while True:
        dist = distance_measurement()
        temp, humidity = read_dht_sensor()
        if dist < 50
                BUZZER_PIN.on()
                LED_PIN.on()        status =
                "Flooding Detected"
                buzz_start_time =
                time.ticks_ms()
        elif buzz_start_time is not None and
        time.ticks_diff(time.ticks_ms(), buzz_start_time) >= 60000:
        BUZZER_PIN.off()
                LED_PIN.off()
                status = "No Flooding Detected"
        else:
                status = "No Flooding Detected"
        print(f"Distance: {dist:.2f} cm")     print(f"Temperature:
        {temp:.2f}°C, Humidity: {humidity:.2f}%")   print("Status:",
        status)      time.sleep(2)
```

In this part of the code, the program enters a monitoring loop that continuously reads data from the sensors and checks the distance. It keeps track of when the buzzer was turned on. If the distance is less than 50 cm, it activates the buzzer and LED and sets the status to "Flooding Detected." If the buzzer has been on for 1 minute (60000 milliseconds), it turns off the buzzer and LED and sets the status to "No Flooding Detected." The loop then prints the distance, temperature, humidity, and the status every 2 seconds. This code is designed to simulate a flood monitoring and early warning system where the buzzer and LED alert for 1 minute when flooding is detected.



```python
import time
import machine
import dht

# Define GPIO pins
TRIG_PIN = machine.Pin(2, machine.Pin.OUT)
ECHO_PIN = machine.Pin(3, machine.Pin.IN)
BUZZER_PIN = machine.Pin(4, machine.Pin.OUT)
DHT_PIN = machine.Pin(5)
LED_PIN = machine.Pin(6, machine.Pin.OUT)

def distance_measurement():
    # Trigger ultrasonic sensor
    TRIG_PIN.on()
    time.sleep_us(10)
    TRIG_PIN.off()

    # Wait for echo to be HIGH (start time)
    while not ECHO_PIN.value():
        pass
    pulse_start = time.ticks_us()

    # Wait for echo to be LOW (end time)
    while ECHO_PIN.value():
        pass
    pulse_end = time.ticks_us()

    # Calculate distance
    pulse_duration = time.ticks_diff(pulse_end, pulse_start)
    distance = pulse_duration / 58  # Speed of sound (343 m/s) divided by 2
```

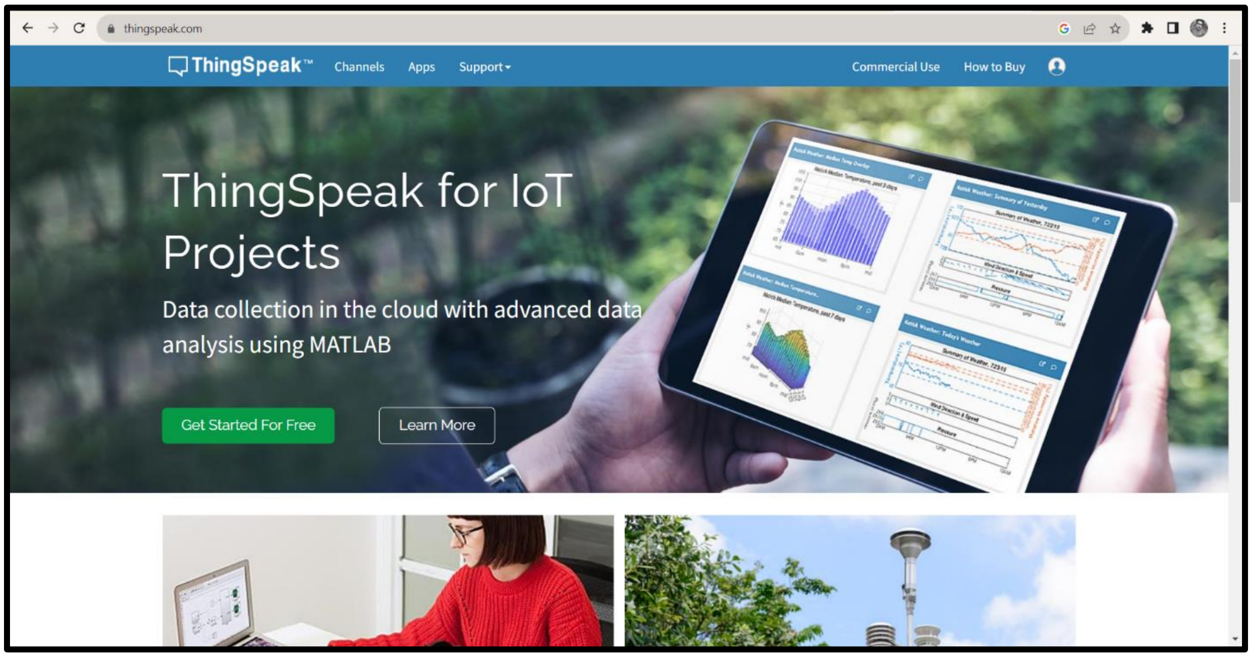
```
Distance: 46.66 cm
Temperature: 24.00°C, Humidity: 40.00%
Status: Flooding Detected
Distance: 46.67 cm
Temperature: 24.00°C, Humidity: 40.00%
Status: Flooding Detected
```

- **Distance Measurement:** The system continuously monitors and reports the distance from the sensor to the water level, providing real-time data. For example, "Distance: 45.30 cm."
- **Temperature and Humidity:** The DHT sensor provides environmental data, such as "Temperature: 23.5°C" and "Humidity: 65.2%."
- **Flood Alert:** When the system detects potential flooding (distance less than 50 cm), both the LED and buzzer are activated for 1 minute.

The section includes an alert message, such as "Flood Alert: Flooding Detected! LED and Buzzer Activated for 1 Minute.

➢ THINGSPEAK:

ThingSpeak is an open-source, web-based platform for the Internet of Things (IoT). It provides a centralized system for collecting, analyzing, and visualizing data generated by a wide range of IoT devices and sensors. ThingSpeak is particularly well-suited for applications that involve data logging, sensor monitoring, and remote data access.



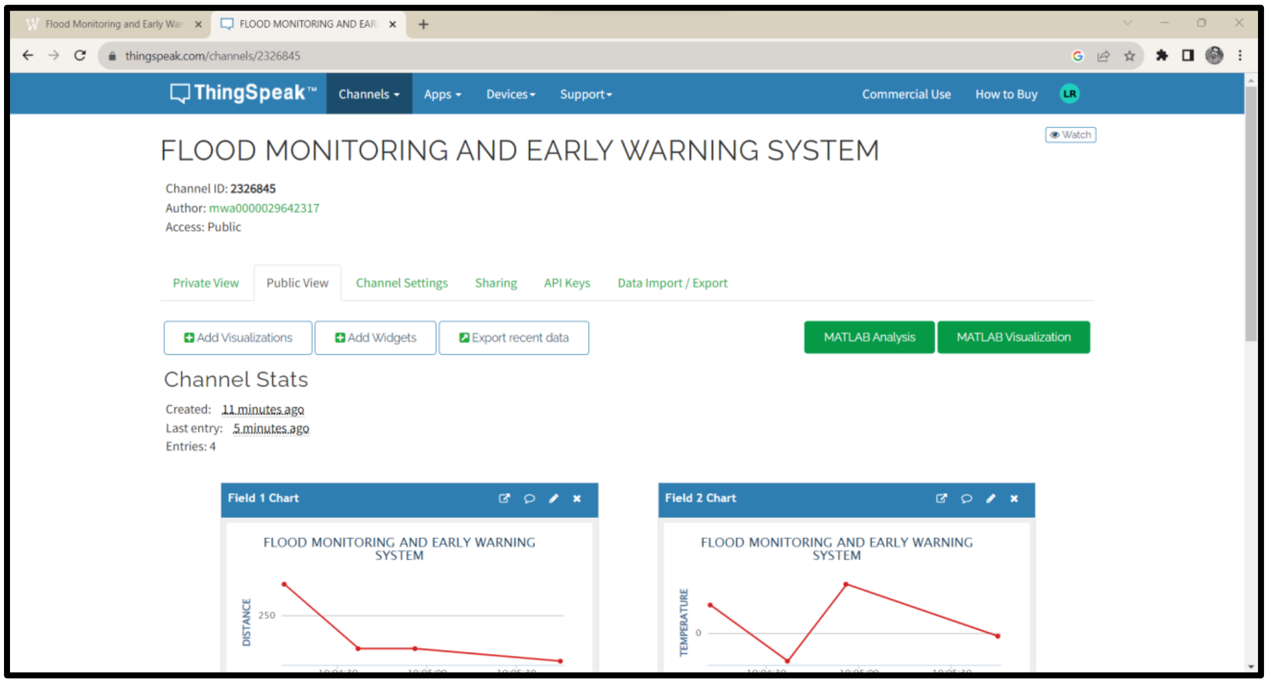
CODE IMPLEMENTATION:

This code is an IoT (Internet of Things) project that utilizes various sensors to collect environmental data and sends this data to ThingSpeak, a cloud-based platform.

```
import time
import dht
import urequests
from machine import Pin
TRIG_PIN = 2
ECHO_PIN = 3
BUZZER_PIN = 4
```

```python
DHT_PIN = 5
LED_PIN = 6
THING_SPEAK_API_KEY = "GYZTW85RNGCZSLE9"
THING_SPEAK_CHANNEL_ID = "2316433"

def distance_measurement():
    trigger = Pin(TRIG_PIN, Pin.OUT)
    trigger.on()
    time.sleep_us(10)
    trigger.off(
    echo = Pin(ECHO_PIN, Pin.IN)
    while not echo.value():
        pass
    pulse_start = time.ticks_us()
       while echo.value():
        pass
    pulse_end = time.ticks_us()
     pulse_duration = time.ticks_diff(pulse_end, pulse_start)
    distance = pulse_duration / 58
    return distance

def read_dht_sensor():
    dht_sensor = dht.DHT22(Pin(DHT_PIN, Pin.IN))
    dht_sensor.measure()
    return dht_sensor.temperature(), dht_sensor.humidity()
buzz_start_time = None

while True:
    dist = distance_measurement()
    temp, humidity = read_dht_sensor()
    status = "No Flooding Detected"
    if dist < 50:
        Pin(BUZZER_PIN, Pin.OUT).on()
        Pin(LED_PIN, Pin.OUT).on()
        status = "Flooding Detected"
        buzz_start_time = time.ticks_ms()
    elif buzz_start_time is not None and time.ticks_diff(time.ticks_ms(),
buzz_start_time) >=        Pin(BUZZER_PIN, Pin.OUT).off()
        Pin(LED_PIN, Pin.OUT).off()
    print("Distance: {:.2f} cm".format(dist))
    print("Temperature: {:.2f}°C, Humidity: {:.2f}%".format(temp, humidity))
    print("Status:", status)
    try:
        data = {
            "api_key": THING_SPEAK_API_KEY,
            "field1": dist,
            "field2": temp,
            "field3": humidity,
        }
        response = urequests.post("https://api.thingspeak.com/update.json",
json=data)
        response.close()
               feed_response =
urequests.get("https://api.thingspeak.com/channels/{}/feeds.json?results=2".forma
t(THING_SPEAK_CHANNEL_ID))
        feed_data = feed_response.json()
        feed_response.close()
        entries = feed_data.get("feeds", [])
        for entry in entries:
            print("Entry ID:", entry.get("entry_id"))
            print("Field1 Value:", entry.get("field1"))
            print("Field2 Value:", entry.get("field2"))
            print("Field3 Value:", entry.get("field3"))
            print("Created At:", entry.get("created_at"))
            print()
    except Exception as e:
        print("Error sending or reading data from ThingSpeak:", e)

    time.sleep(2)
```

This code essentially creates an IoT system that collects environmental data, detects potential flooding based on distance measurements, and sends this data to ThingSpeak for storage and visualization. The integration with ThingSpeak allows for real-time monitoring and analysis of the collected data. The code also includes error handling to ensure data transmission reliability.

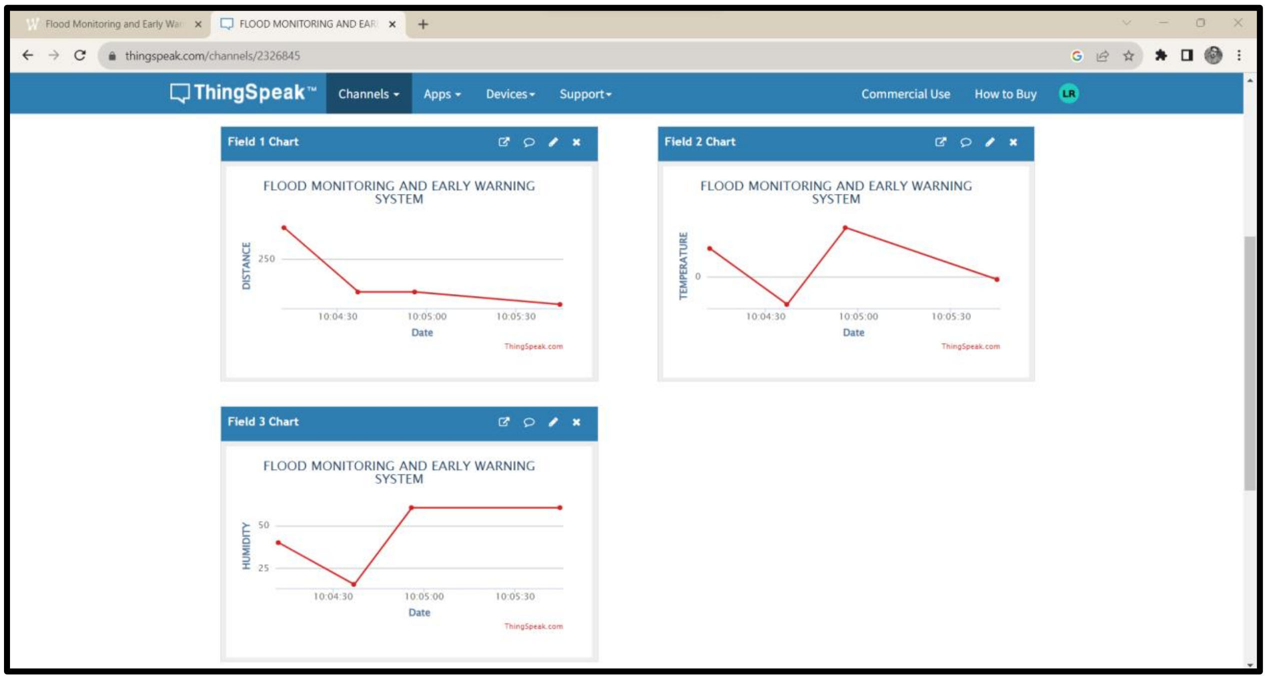


FLOOD MONITORING AND EARLY WARNING SYSTEM

Channel ID: 2326845
Author: mwa0000029642317
Access: Public

Channel Stats

Created: 11 minutes ago
Last entry: 5 minutes ago
Entries: 4

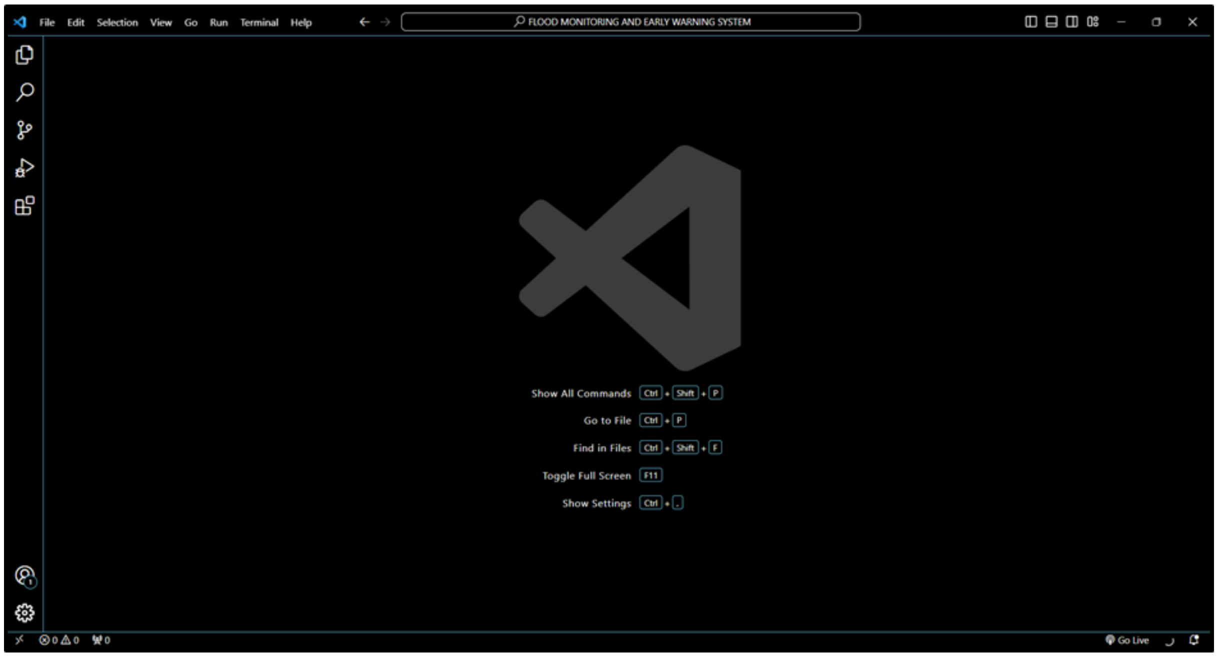


In our IoT project, ThingSpeak serves as the central hub for data management and analysis. It seamlessly connects our IoT device to the cloud, allowing real-time data collection, storage, and visualization. The IoT device, equipped with sensors for distance, temperature, and humidity, collects data at regular intervals and transmits it to ThingSpeak using HTTP POST requests. The data is organized into specific fields within a dedicated ThingSpeak channel, facilitating easy retrieval and analysis. ThingSpeak provides tools for data visualization, custom alert setups, and remote data access. Additionally, the code seamlessly integrates with ThingSpeak, and virtual testing using Wokwi ensures the reliability of data transmission and device communication. This combination of ThingSpeak, the IoT device, and code integration with Wokwi streamlines efficient data management and analysis in our project.

PLATFORM DEVELOPMENT:

VISUAL STUDIO CODE:

Visual Studio Code, often referred to as VS Code, is a popular and versatile source code editor that's widely used for software development. It's known for its flexibility, speed, and a rich ecosystem of extensions, making it a top choice for many developers.


File Edit Selection View Go Run Terminal Help
FLOOD MONITORING AND EARLY WARNING SYSTEM
Show All Commands Ctrl + Shift + P
Go to File Ctrl + P
Find in Files Ctrl + Shift + F
Toggle Full Screen F11
Show Settings Ctrl + ,
Go Live

☐ HTML

The HTML (index.html) file lays the foundation for the webpage's structure and content. It begins by defining the document type and including a reference to an external CSS stylesheet for styling.

```
<!DOCTYPE html>
<html>
<head>
    <title>Flood Monitoring And Early Warning System</title>
    <link rel="stylesheet" type="text/css" href="style.css">
</head>
<body>
    <h1>Flood Monitoring and Early Warning System</h1>
    <pre class="pre">Experience peace of mind with our advanced Flood Monitoring
and Early Warning system.
         We keep a vigilant eye on weather conditions, providing real-time alerts
to keep you and your community safe from potential flooding disasters.
         Stay ahead of the storm, take proactive measures, and safeguard what
matters most to you. Your safety is our top priority, and we've got you
covered."</pre>
    <img src="https://s01.sgp1.cdn.digitaloceanspaces.com/article/171892-
mfhhyptrto-1647955322.jpg">
    <div class="container">
        <h2 id="real">Real-time Data</h2>
        <div class="data-container">
            <div class="data-box">
```

```
 <p class="text"><strong>Distance:</strong></p>
                <p class="load">Loading...</p>
            </div>
            <div class="data-box">
                <p class="text"><strong>Temperature:</strong></p>
                <p class="load">Loading...</p>
            </div>
            <div class="data-box">
                <p class="text"><strong>Humidity:</strong></p>
                <p class="load">Loading...</p>
            </div>
        </div>
        <div id="alertbox">
        <h2 id="alerttext">Alerts:</h2>
        <p class="alert" id="alertMessage">Loading...</p>
        </div>
    </div>
    <p id="end">&nbsp;</p>
    <pre id="quote">"Alert today, alive tomorrow. Our system keeps you ahead of
disaster."</pre>
    <p id="end">&nbsp;</p>
</body>
</html>
```

The main content of the page is divided into several key sections:

1. **Header Section:**

The page opens with a prominent `<h1>` heading that boldly announces the system's name, "Flood Monitoring and Early Warning System." Below the heading, a `<pre>` element presents a detailed description of the system's purpose. This description is thoughtfully formatted with line breaks and consistent spacing, ensuring a clear and organized presentation. An `<img>` tag is used to display an image that likely represents a flood-related scenario.

2. **Data Display Section:**

This section, encapsulated within a `<div>` element with the class "container," provides a visually distinct area for the real-time data display. It starts with an `<h2>` subheading labeled "Real-time Data." Within this sub-section, the actual data is organized using a flexbox container structure. Each data point (e.g., distance, temperature, humidity) is contained within a `<div>` element with the class "data-box." Each "data-box" consists of a label (e.g., "Distance:") and a placeholder text (e.g., "Loading...") to indicate that the data will be dynamically loaded. Following the real-time data display, there's a dedicated section with the ID "alertbox," which includes an "Alerts" heading and a placeholder message.

- **CSS STYLING:**

The CSS stylesheet(style.css), linked in the HTML file, provides the visual styling for the page.

```
body {
    font-family: Arial, sans-serif;
    text-align: center;
    bgcolor:"#e3e0ff";
```

```css
}


.container {
    margin: 20px;
}


h1 {
    font-size: 50px;
    background-color: aquamarine;
    font-family: Georgia, 'Times New Roman', Times, serif;
    color: #060000;
}
.pre {
    color:#03038f;
    font-size:22px;
    font-family: 'Franklin Gothic Medium', 'Arial Narrow', Arial, sans-serif;
}


#real {
    font-family: Georgia, 'Times New Roman', Times, serif;
    background-color: aquamarine;
    font-size: 40px;
}
.data-container {
    display: flex;
    justify-content: space-around;
```

```
}


.data-box {
    border: 2px solid #8cf0ec;
    padding: 10px;
    margin: 10px;
}


.alert {
    color: rgb(88, 243, 93);
}
.text {
    color: rgb(4, 4, 126);
}
.load {
    color: rgb(100, 219, 133);
}


#alertbox {
    margin-top: 35px;
    border: 3px solid #ff0000;
    width:99%px;
    height:170px;
    color:rgb(4, 4, 126);
    font-weight: 500;
    font-size: 25px;
    font-family: Georgia, 'Times New Roman', Times, serif[];

}

#alerttext {

    background-color: #ff0000;

}

#quote {

    font-family: 'Courier New', Courier, monospace;

    font-weight: bolder;

    font-size: 20px;

    color: rgba(0, 128, 255, 0.997);

}

#end {

    background-color: aquamarine;

    font-size: 2px;

}
```

It significantly contributes to the overall look and feel of the webpage. Notable styling choices include setting the font family and text alignment for the entire page. Specific elements receive distinct styling, such as the `<h1>` header, which features a background color, increased font size, and a specific font color.

The `<pre>` element defining the system's description is styled with a unique font size and color. The real-time data display containers and their content are styled, specifying border styles, padding, and margin. The alert message receives styling that includes color and font properties. The "Alerts" section is visually enhanced with a border, background color, and distinctive font styling.

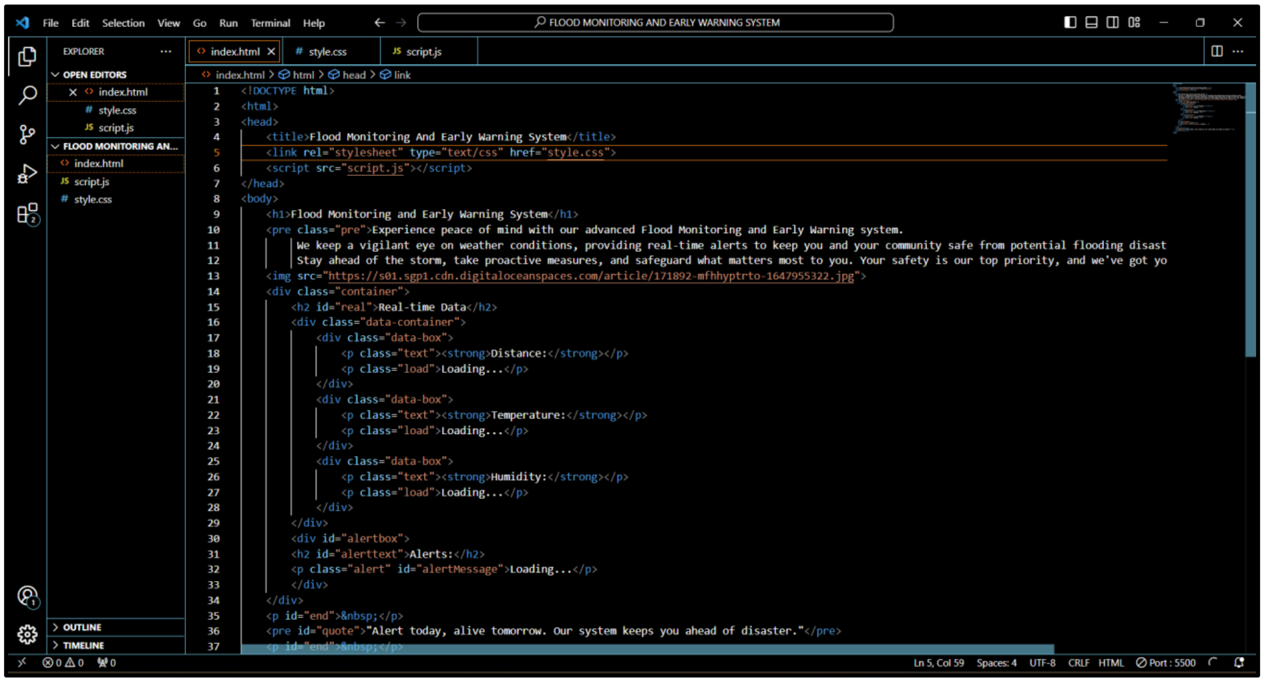
To add vertical spacing for a neat and organized presentation, this section employs non-breaking spaces ( ). It also features an inspirational quote presented in a preformatted paragraph with its own unique styling.

☐ JAVASCRIPT:

JavaScript is a programming language that enhances web pages by enabling interactive features, dynamic content updates, and communication with web servers. It plays a vital role in modern web development, making websites more engaging and responsive.

```
<script>
    function fetchDataFromThingSpeak() {
        var thingSpeakUrl =
"https://api.thingspeak.com/channels/2326845/feeds.json?results=1";
        fetch(thingSpeakUrl)
            .then(response => response.json())
            .then(data => {
                if (data.feeds && data.feeds.length > 0) {
                    var latestData = data.feeds[0];
                    document.querySelector(".load.distance").textContent =
"Distance: " + latestData.field1 + " cm";
                    document.querySelector(".load.temperature").textContent =
"Temperature: " + latestData.field2 + "°C";
                    document.querySelector(".load.humidity").textContent =
"Humidity: " + latestData.field3 + "%";

                    if (latestData.field1 < 50) {
                        document.querySelector("#alertMessage").textContent =
"Flooding Detected!";
                        document.querySelector("#alertbox").style.backgroundColor
= "red";
                    } else {
                        document.querySelector("#alertMessage").textContent = "No
Flooding Detected";
                        document.querySelector("#alertbox").style.backgroundColor
= "transparent";
                    }
                }
            })
            .catch(error => {
                console.error("Error fetching data from ThingSpeak:", error);
            });
    }
    fetchDataFromThingSpeak();
    setInterval(fetchDataFromThingSpeak, 5000);
</script>
```

This JavaScript code fetches real-time data from a ThingSpeak channel and updates an HTML webpage. It periodically retrieves the latest information, including distance, temperature, and humidity, and displays it on the page. Additionally, it provides an alert message and background color change based on specific data conditions, making it useful for monitoring and alerting in applications such as flood detection systems.



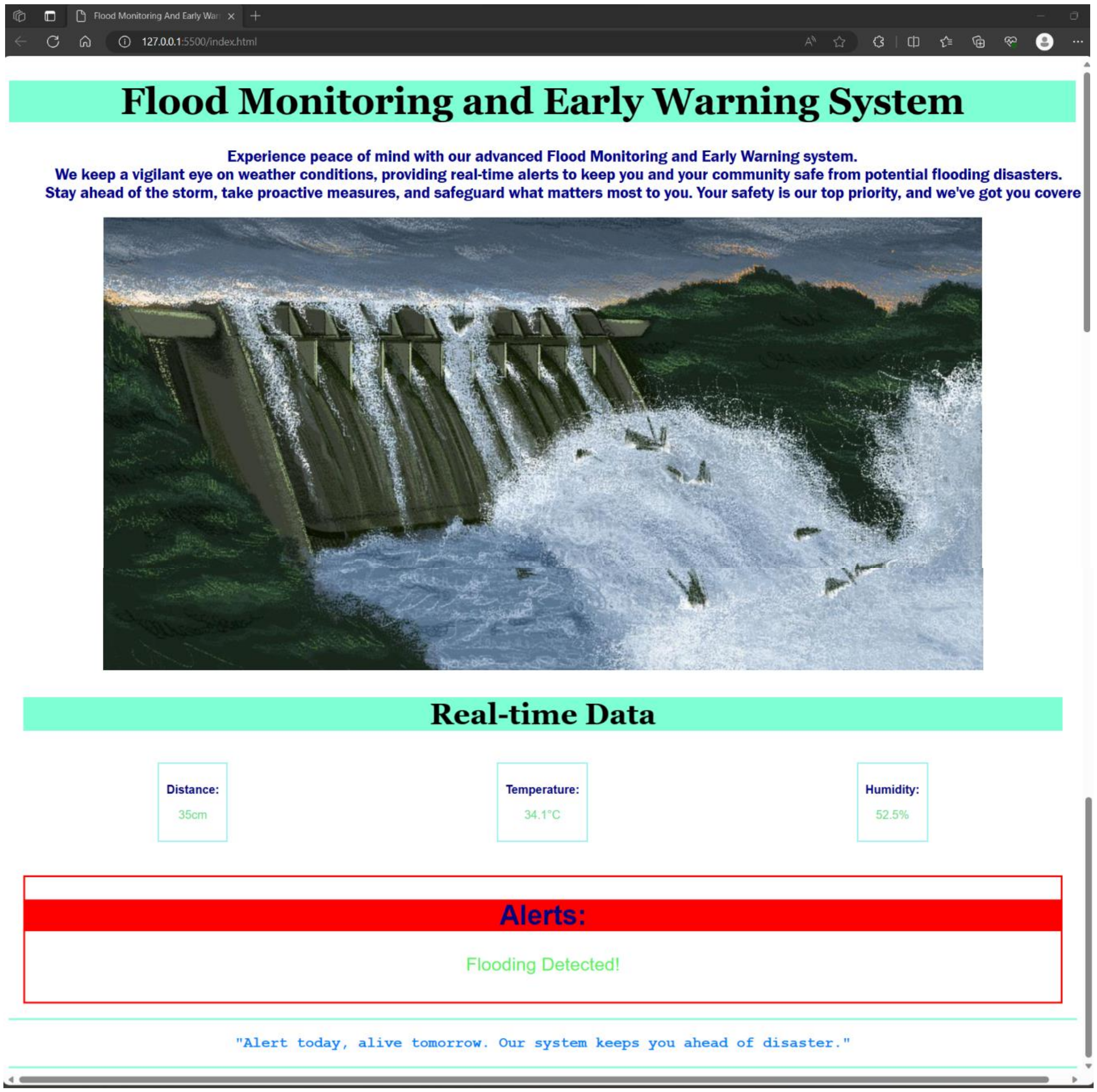
```html
<!DOCTYPE html>
<html>
<head>
    <title>Flood Monitoring And Early Warning System</title>
    <link rel="stylesheet" type="text/css" href="style.css">
    <script src="script.js"></script>
</head>
<body>
    <h1>Flood Monitoring and Early Warning System</h1>
    <pre class="pre">Experience peace of mind with our advanced Flood Monitoring and Early Warning system.
        We keep a vigilant eye on weather conditions, providing real-time alerts to keep you and your community safe from potential flooding disast
        Stay ahead of the storm, take proactive measures, and safeguard what matters most to you. Your safety is our top priority, and we've got yo
    <img src="https://s01.sgp1.cdn.digitaloceanspaces.com/article/171892-mfhhyptrto-1647955322.jpg">
    <div class="container">
        <h2 id="real">Real-time Data</h2>
        <div class="data-container">
            <div class="data-box">
                <p class="text"><strong>Distance:</strong></p>
                <p class="load">Loading...</p>
            </div>
            <div class="data-box">
                <p class="text"><strong>Temperature:</strong></p>
                <p class="load">Loading...</p>
            </div>
            <div class="data-box">
                <p class="text"><strong>Humidity:</strong></p>
                <p class="load">Loading...</p>
            </div>
        </div>
        <div id="alertbox">
        <h2 id="alerttext">Alerts:</h2>
        <p class="alert" id="alertMessage">Loading...</p>
        </div>
    </div>
    <p id="end">&nbsp;</p>
    <pre id="quote">"Alert today, alive tomorrow. Our system keeps you ahead of disaster."</pre>
    <p id="end">&nbsp;</p>
```

File Edit Selection View Go Run Terminal Help
FLOOD MONITORING AND EARLY WARNING SYSTEM
EXPLORER
OPEN EDITORS
index.html
style.css
script.js
FLOOD MONITORING AN...
index.html
script.js
style.css
OUTLINE
TIMELINE
index.html > html > head > link
Ln 5, Col 59 Spaces: 4 UTF-8 CRLF HTML Port : 5500

RESULT ANALYSIS:

❖ FLOODING:

The flood monitoring parameter, a central component of flood monitoring and early warning systems, is closely tied to the "Distance" data collected by sensors. In the provided JavaScript code integrated with ThingSpeak, this parameter serves as a critical indicator of potential flooding. It assesses the "Distance" value and, when it falls below a predefined threshold (e.g., less than 50 centimeters), triggers an alert, signaling the presence of flooding. This adaptable parameter, with its associated alert logic, offers a flexible solution to monitor and respond to flood events, allowing for user customization to suit specific requirements and enhance flood preparedness and safety.



Flood Monitoring and Early Warning System

Experience peace of mind with our advanced Flood Monitoring and Early Warning system.
We keep a vigilant eye on weather conditions, providing real-time alerts to keep you and your community safe from potential flooding disasters.
Stay ahead of the storm, take proactive measures, and safeguard what matters most to you. Your safety is our top priority, and we've got you covere

Real-time Data

Distance: 35cm

Temperature: 34.1°C

Humidity: 52.5%

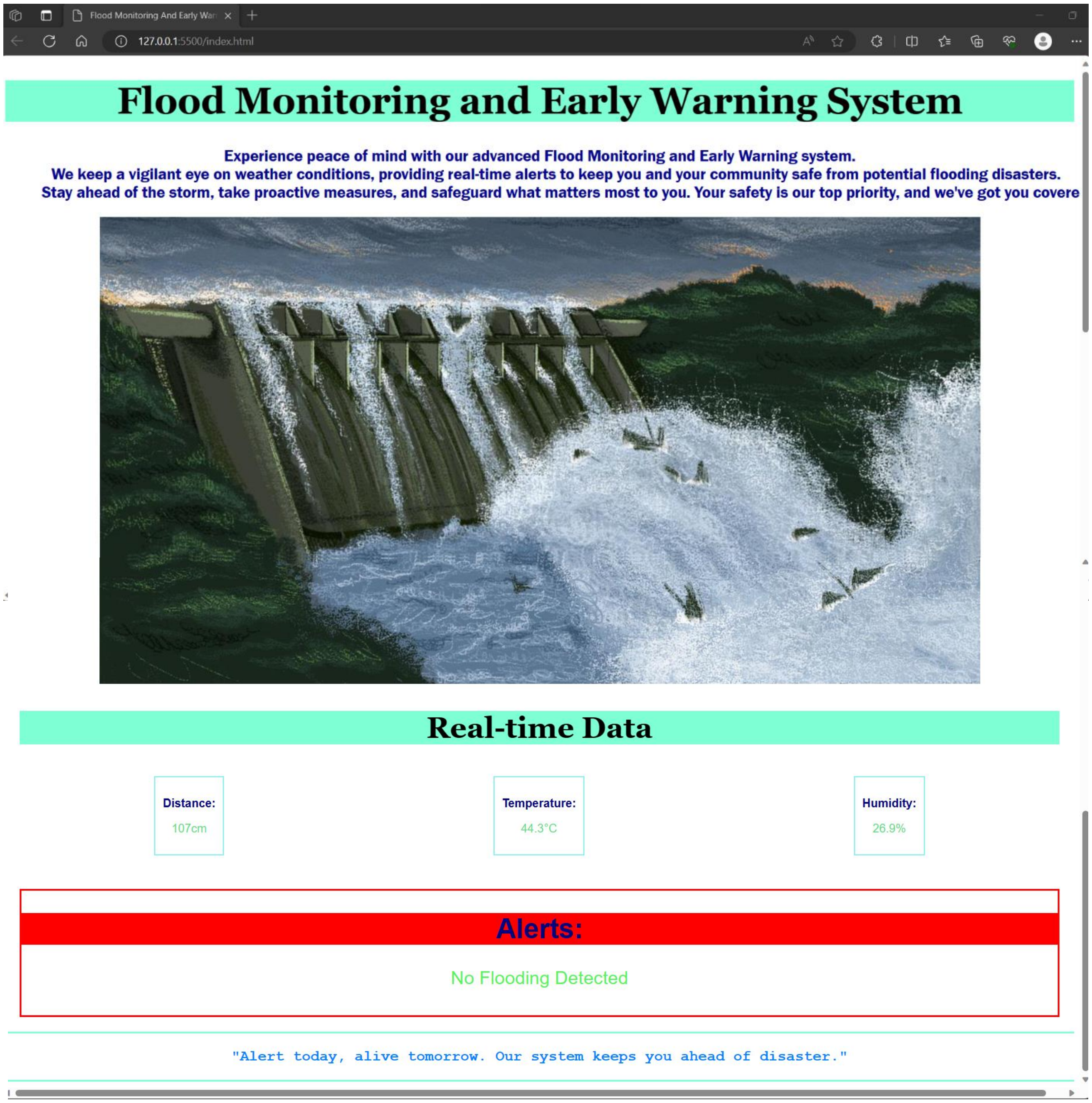
Alerts:

Flooding Detected!

"Alert today, alive tomorrow. Our system keeps you ahead of disaster."

❖ NO FLOODING:

The non-flooding parameter, as integrated into the JavaScript code with ThingSpeak, serves as a key indicator to distinguish situations where flooding is not detected. By evaluating the "Distance" data and ensuring it remains above a predefined threshold (e.g., 50 centimeters or higher), the system operates without triggering flood alerts, maintaining normal functioning until such conditions change, providing a balanced and effective approach to flood monitoring and early warning.



Flood Monitoring And Early War

127.0.0.1:5500/index.html

Flood Monitoring and Early Warning System

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Real-time Data

Distance:	Temperature:	Humidity:
107cm	44.3°C	26.9%

Alerts:

No Flooding Detected

"Alert today, alive tomorrow. Our system keeps you ahead of disaster."

EXPLANATION:

The Flood Monitoring and Early Warning System offers a holistic approach to environmental monitoring and flood detection. It commences with the acquisition of critical sensor data, which includes the ultrasonic sensor measuring the distance to objects and the DHT22 sensor providing temperature and humidity readings. The core of the system lies in its data processing and alert logic, where the distance parameter plays a pivotal role. When this parameter falls below a predefined threshold, typically set at less than 50 centimeters, the system identifies it as a potential flooding event. This crucial detection triggers a multi-faceted alert system.

The alert system operates at multiple levels. On the website, it dynamically updates the user interface, changing the background color to red and displaying an alert message declaring "Flooding Detected." This provides a clear and immediate visual indication to users. Simultaneously, at the hardware level, a buzzer emits an audible warning, and an LED offers a visual signal, ensuring that alerts are communicated effectively.

In the absence of flooding conditions, the system gracefully returns to a non-alert state, maintaining a normal operating mode. This adaptive behavior enables users to distinguish between safe and potentially hazardous environmental conditions.

Furthermore, the system integrates with ThingSpeak, an IoT platform, to provide real-time data access and analysis. This seamless integration enhances the project's data logging and visualization capabilities, allowing users to monitor environmental changes conveniently.

What sets this system apart is its high degree of user customization. Users can adjust the threshold for flooding detection, the duration required to trigger alerts, and even the content of alert messages. This flexibility empowers users to tailor the system to their specific monitoring needs, ensuring it aligns perfectly with their environmental conditions.

In summary, the Flood Monitoring and Early Warning System offers a comprehensive and adaptable solution for real-time flood detection and alerts. Its ability to seamlessly integrate data from sensors to a dynamic website and offer customizable parameters makes it a valuable tool for enhancing safety and preparedness in flood-prone areas.

CONCLUSION:

The real-time Flood Monitoring and Early Warning System serves as a critical asset in enhancing public safety and emergency response coordination. Its capacity to deliver timely alerts and early warnings empowers individuals and communities to take proactive measures, reducing the risk of casualties, property damage, and economic losses. The system's prompt notification of authorities optimizes resource allocation, enhancing the efficiency of emergency services. Furthermore, it fosters a culture of preparedness, building community resilience and reducing panic during actual flooding incidents. Notably, this system not only minimizes human suffering and property damage but also generates valuable data for long-term flood mitigation and urban planning, ultimately contributing to a more resilient and prepared society in flood-prone areas.