Phase 5: Project Documentation & Submission

IOT:

1. **IoT Device Setup:**
   - Objective 1: Develop or select appropriate IoT devices and sensors for water quality monitoring, usage tracking, and touchless dispensing.
   - Ensure seamless integration of IoT devices into the water fountain system, enabling real-time data collection and communication with the central platform.

2. **Platform Development:**
   - Objective 3: Create a centralized platform that collects and processes data from the IoT devices. This platform could be cloud-based and capable of handling large amounts of data.
   - Implement a user-friendly interface accessible via web or mobile for users to interact with the fountain, check water quality, receive updates, and customize settings.
   - Develop an analytics dashboard for administrators to monitor fountain usage, water quality trends, and system performance.

3. **Code Implementation:**
   - Objective 6: Develop the necessary firmware and software for IoT devices to collect, transmit, and manage data effectively.
   - Implement security measures to protect the data and communication between devices and the platform, ensuring user privacy and system

integrity.

- Create an API or SDK for potential third-party integration, allowing for future expansions or collaborations with other systems.

4. **Integration and Testing:**
   - Objective 9: Integrate the IoT devices with the developed platform and ensure seamless communication and data exchange.
   - Perform extensive testing for reliability, accuracy, and security of the entire system, both in controlled environments and real- world scenarios.
5. **Scalability and Maintenance:**
   - Objective 11: Design the system with scalability in mind, ensuring it can accommodate additional features or an increased number of connected fountains in the future.
   - Develop a maintenance plan to regularly update software, replace components, and ensure the system's long-term functionality.

SMART WATER FOUNTAION

1. **Planning and Conceptualization:**
   - Project Scope Definition: Define the objectives and scope of the smart water fountain project. Determine features like touchless operation, water quality monitoring, and user interaction capabilities.
   - Requirement Gathering: Identify the required components, including IoT devices, sensors, and connectivity technology.

2. **Design and Component Selection:**
    - Select IoT Devices and Sensors: Choose appropriate sensors for water quality (pH, turbidity, temperature), flow sensors, and motion sensors for touchless operation.
    - Device Architecture Design: Plan the connection and communication structure between IoT devices, the fountain, and the central IoT platform.

3. **IoT Device Setup:**
    - Acquisition and Installation: Procure the selected IoT devices and sensors. Install and configure them within the water fountain structure.
    - Integration: Ensure proper integration and functionality of the devices for seamless data collection and transmission.

4. **IoT Platform Development:**
    - Backend Infrastructure: Develop a robust cloud-based backend infrastructure to handle the data generated by the fountain's IoT devices.
    - Database Setup: Establish a database structure for storing and managing the sensor data.
    - User Interface Development: Create a user-friendly web or mobile interface for user interaction and data visualization.

5. **Code Implementation:**
    - Firmware Development: Develop firmware for the IoT devices to

collect, process, and transmit data efficiently.

- Platform Software Development: Build software for
- the platform to manage and display data for users and administrators.

6. **Integration and Testing:**
    - Devices-Platform Integration: Ensure seamless communication between the IoT devices and the central platform.
    - Thorough Testing: Conduct comprehensive testing to ensure reliability, accuracy, and security of the system, including stress testing and real-world simulations.

7. **Deployment and User Experience:**
    - Installation: Install the smart water fountain in the intended location.
    - User Training: Educate users about the features and functionality of the fountain.
    - Feedback Collection: Gather user feedback for iterative improvements.

8. **Maintenance and Upkeep:**
    - Scheduled Maintenance: Create a maintenance schedule for regular updates, component replacements, and system checks to maintain the fountain's functionality.
    - Security Updates: Continuously monitor and update security measures to protect user data and the system from potential vulnerabilities.

9. Documentation and Scaling:

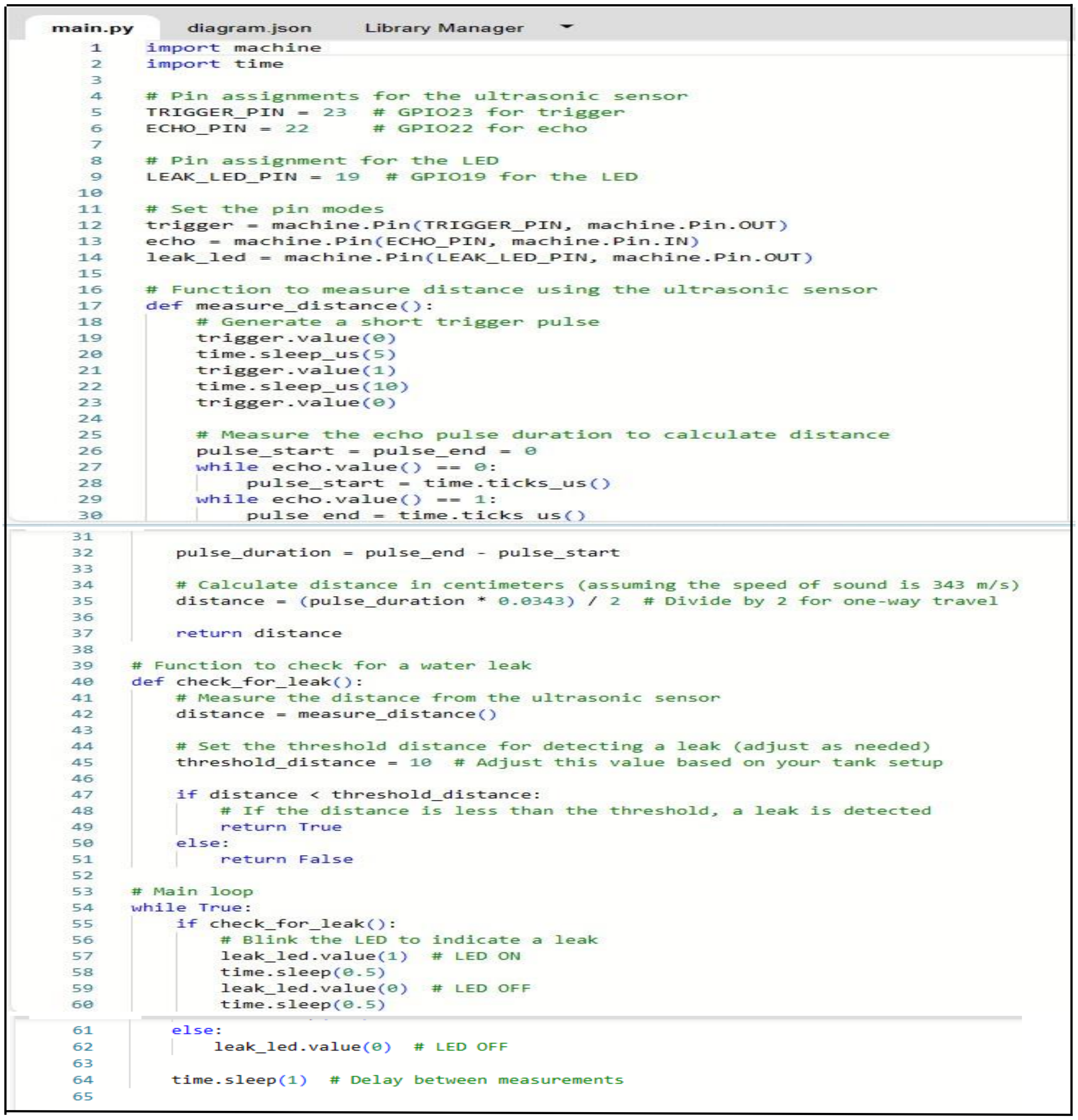
- Documentation: Record the development process, component details, codes, and maintenance protocols for future reference and troubleshooting.
- Scalability Plan: Prepare the system for potential scalability, considering additional features and expanding the network to accommodate more fountains.

10. Sustainability and Environmental Impact:

- Water Conservation Analysis: Utilize the collected data to analyze water usage patterns and identify areas for conservation.
- Energy Efficiency Measures: Implement energy-saving practices, potentially integrating renewable energy sources for a sustainable operation

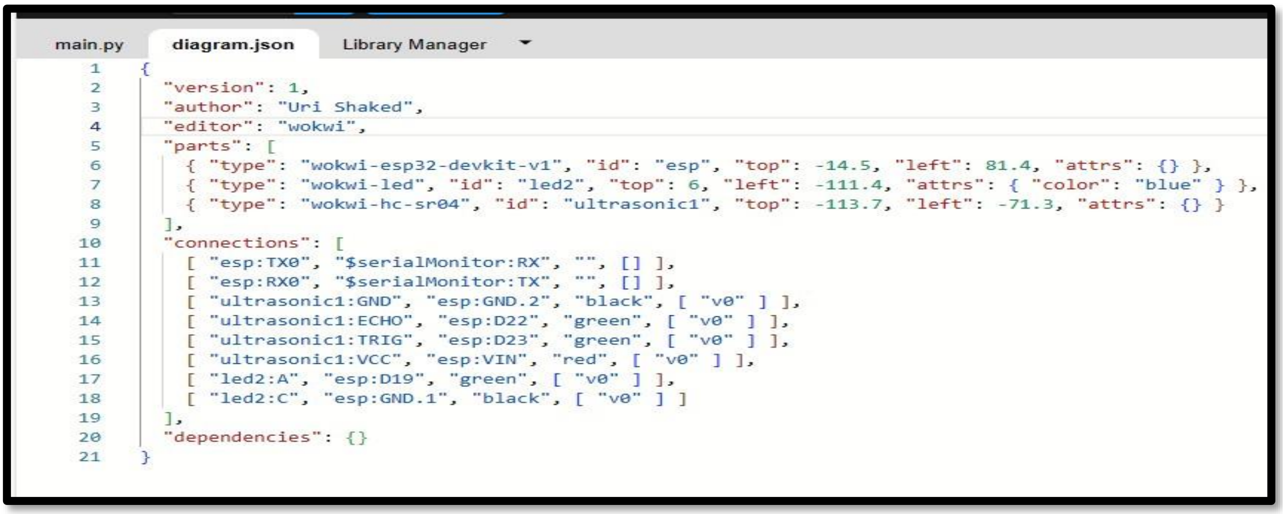
Smart Water Fountain using the Wokwi simulator

code: main.py



```python
import machine
import time

# Pin assignments for the ultrasonic sensor
TRIGGER_PIN = 23  # GPIO23 for trigger
ECHO_PIN = 22     # GPIO22 for echo

# Pin assignment for the LED
LEAK_LED_PIN = 19  # GPIO19 for the LED

# Set the pin modes
trigger = machine.Pin(TRIGGER_PIN, machine.Pin.OUT)
echo = machine.Pin(ECHO_PIN, machine.Pin.IN)
leak_led = machine.Pin(LEAK_LED_PIN, machine.Pin.OUT)

# Function to measure distance using the ultrasonic sensor
def measure_distance():
    # Generate a short trigger pulse
    trigger.value(0)
    time.sleep_us(5)
    trigger.value(1)
    time.sleep_us(10)
    trigger.value(0)

    # Measure the echo pulse duration to calculate distance
    pulse_start = pulse_end = 0
    while echo.value() == 0:
        pulse_start = time.ticks_us()
    while echo.value() == 1:
        pulse_end = time.ticks_us()

    pulse_duration = pulse_end - pulse_start

    # Calculate distance in centimeters (assuming the speed of sound is 343 m/s)
    distance = (pulse_duration * 0.0343) / 2  # Divide by 2 for one-way travel

    return distance

# Function to check for a water leak
def check_for_leak():
    # Measure the distance from the ultrasonic sensor
    distance = measure_distance()

    # Set the threshold distance for detecting a leak (adjust as needed)
    threshold_distance = 10  # Adjust this value based on your tank setup

    if distance < threshold_distance:
        # If the distance is less than the threshold, a leak is detected
        return True
    else:
        return False

# Main loop
while True:
    if check_for_leak():
        # Blink the LED to indicate a leak
        leak_led.value(1)  # LED ON
        time.sleep(0.5)
        leak_led.value(0)  # LED OFF
        time.sleep(0.5)
    else:
        leak_led.value(0)  # LED OFF

    time.sleep(1)  # Delay between measurements
```

Simulation and diagram



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    [ "esp:RX0", "$serialMonitor:TX", "", [] ],
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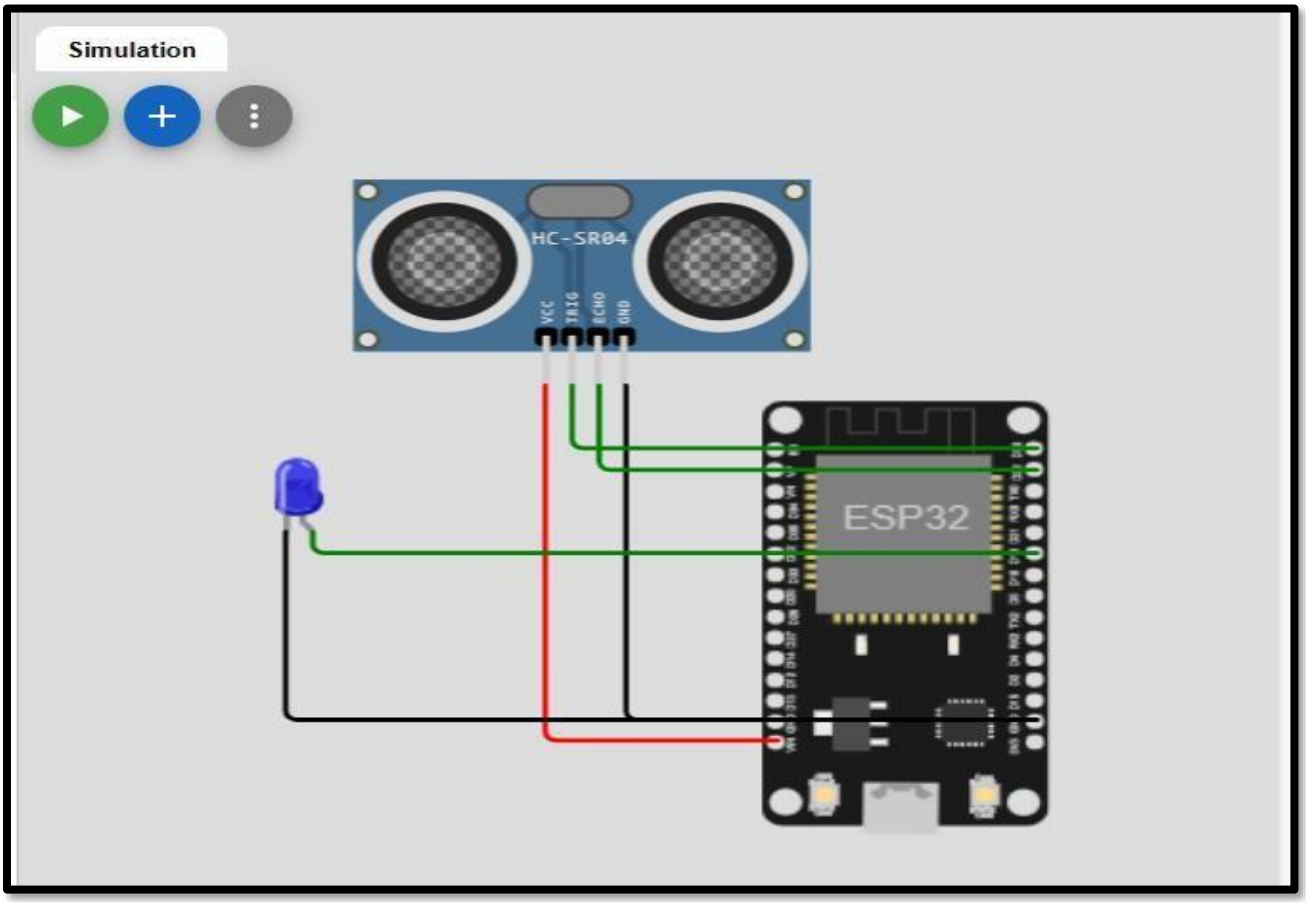
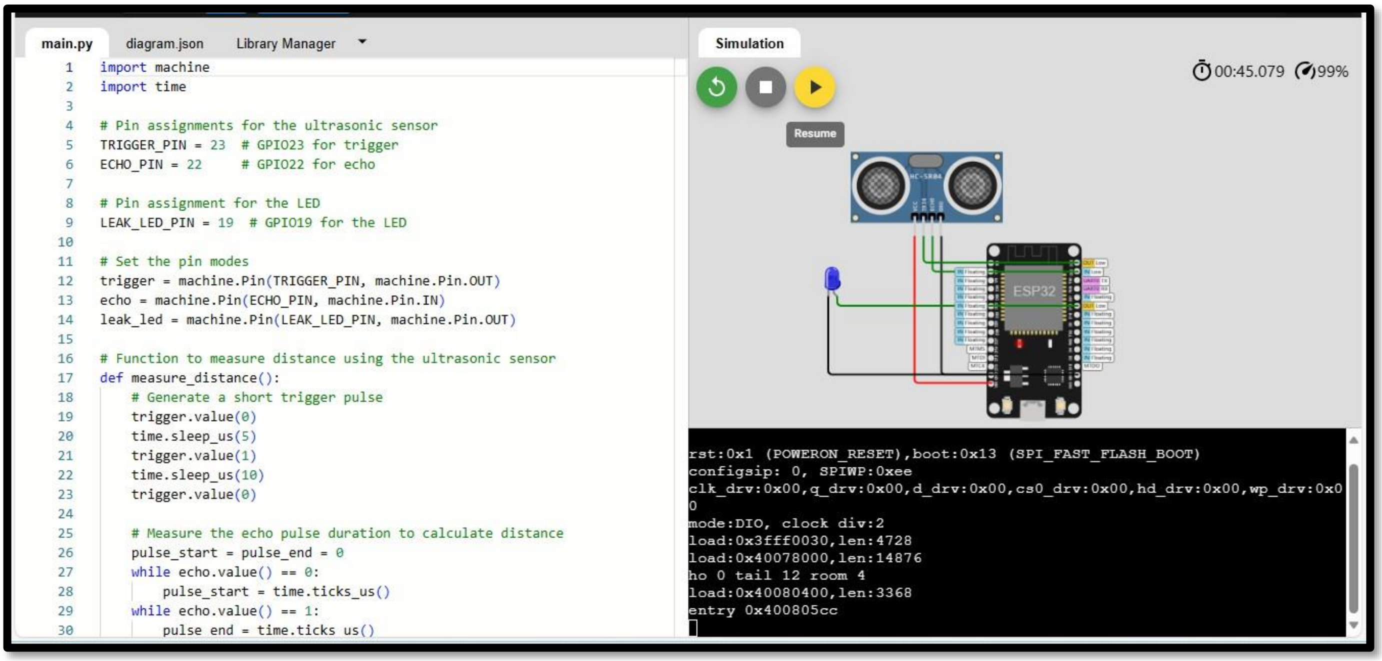
    [ "ultrasonic1:ECHO", "esp:D22", "green", [ "v0" ] ],
    [ "ultrasonic1:TRIG", "esp:D23", "green", [ "v0" ] ],
    [ "ultrasonic1:VCC", "esp:VIN", "red", [ "v0" ] ],
    [ "led2:A", "esp:D19", "green", [ "v0" ] ],
    [ "led2:C", "esp:GND.1", "black", [ "v0" ] ]
  ],
  "dependencies": {}
}
```

CIRCUIT :-



STIMULATION



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    while echo.value() == 1:
        pulse_end = time.ticks_us()
```

```
rst:0x1 (POWERON_RESET),boot:0x13 (SPI_FAST_FLASH_BOOT)
configsip: 0, SPIWP:0xee
clk_drv:0x00,q_drv:0x00,d_drv:0x00,cs0_drv:0x00,hd_drv:0x00,wp_drv:0x0
0
mode:DIO, clock div:2
load:0x3fff0030,len:4728
load:0x40078000,len:14876
ho 0 tail 12 room 4
load:0x40080400,len:3368
entry 0x400805cc
```