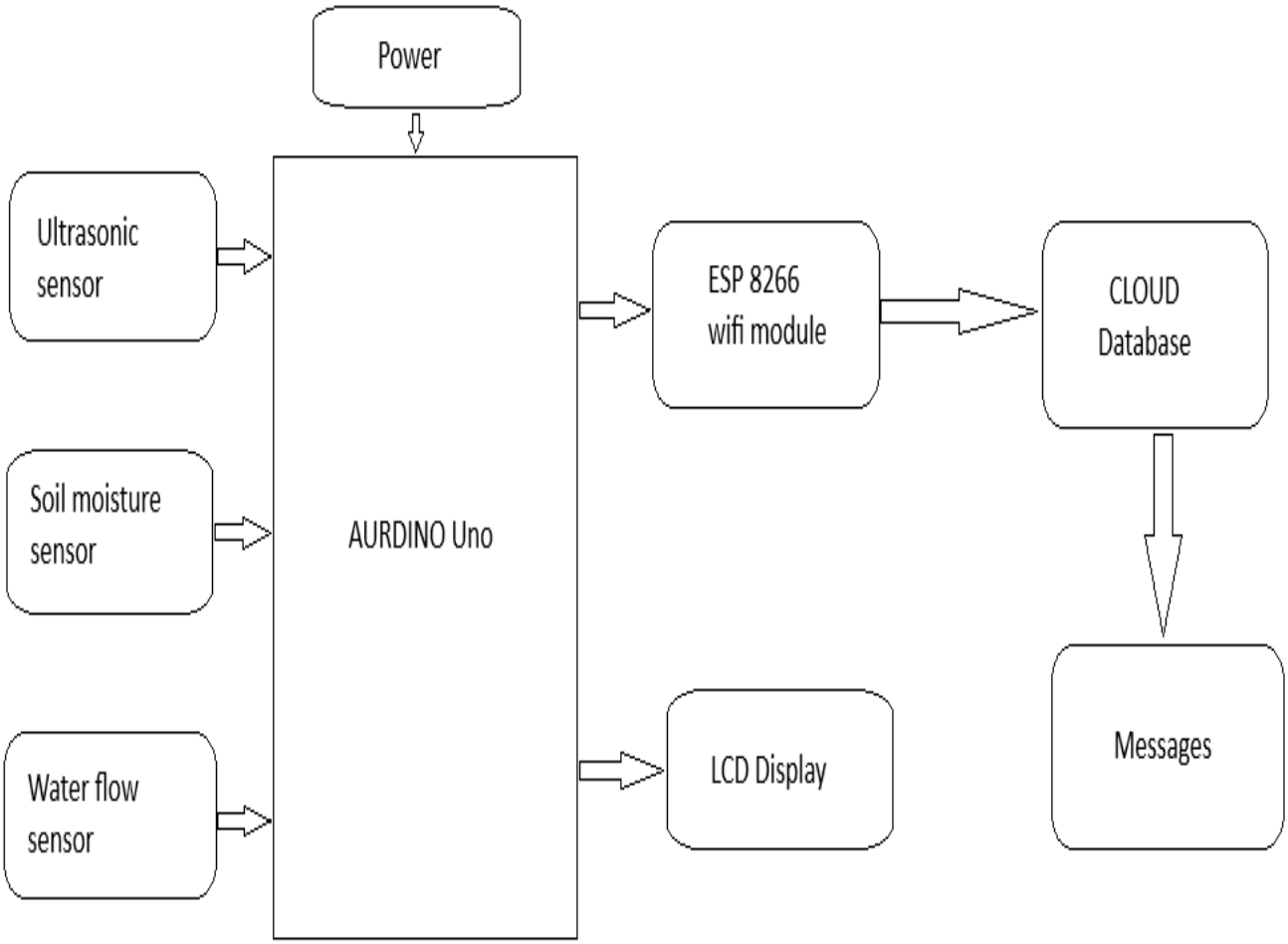
SMART WATER MANAGEMENT (Phase-2)

Project Objectives:

- Develop a system to conserve water in public places like gardens or parks using required IOT sensors
- Machine learning algorithm to analyse water consumption in public places and to provide suggestions for water conservation.

Block Diagram:



Hardware specification:

1.Ultrasonic sensors:

- It is frequently used to monitor water levels in reservoirs, tanks, and other water storage facilities. They provide real-time data on water levels, allowing water managers to track and manage the availability of water resources more effectively. This information is crucial for irrigation and ensuring a stable water supply.

Fig: Ultrasonic sensor

2.Water flow sensor:

- Water flow sensor is installed at the water sources or pipes to measure the rate of flow of water and calculate the amount of water flowed through the pipe. Rate of flow of water is measured as litre per hour or cubic meters. Water flow sensor consists of plastic valve from which water can pass.
- The normal consumption of water data is given to the sensor, so when there is a high consumption of water (weather the water is being wasted or there may be a leak in pipes) it gives alert.

Fig: Water flow sensor

3. Arduino Uno:

- The Arduino Uno is used as microcontroller in this structure , it has 14 propelled data/yield pins of which the user is using 6 pins for interfacing sensors-waterflow, Ultrasonic and temperature. Interfacing the wi-fi module ESP8266 with Arduino for giving an electronic system. Arduino is a microcontroller board subject to the Atmega328p. A 16 MHz quartz valuable stone, a USB affiliation, a power jack, a reset.

Fig: Arduino uno

4.ESP 8266 WI-FI module:

- The ESP8266 can do either offloading wi-fi frameworks organization limits from another application processor or encouraging an application. The ESP8266 wi-fi module is a free SOC with facilitated TCP/IP show stack that can give any microcontroller to access to the wi-fi range. This module has an earth shattering enough prepared getting ready and limit capacity that empowers it to be composed with the sensors.

Fig: ESP 8266 WI-FI module

5.Soil moisture sensor:

- IoT soil moisture sensors are crucial for efficient irrigation in agriculture. They measure the moisture content in the soil and provide data for precise irrigation scheduling, reducing water wastage.
- Use a combination of soil moisture, weather data, and other sensor inputs to determine when and how much to water plants or lawns, reducing overwatering and conserving water

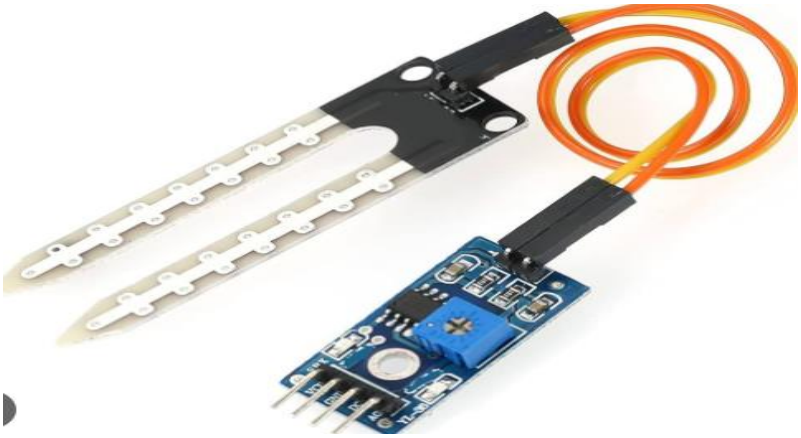


Fig: Soil moisture sensor

SOFTWARE SPECIFICATIONS:

- Linux
- MC programming languages: C/C++, Python.

Components Implementation Steps:

1.Ultrasonic Sensors:

Step 1: Physical Installation:

- Mount the ultrasonic sensors at the top of each tank securely using appropriate brackets or holders. Align the sensors to face downwards into the tanks to accurately measure water levels.

Step 2: Wiring and Connection:

- Connect the trigger (TRIG) and echo (ECHO) pins of each ultrasonic sensor to the respective pins on the Arduino board .

2.Arduino Microcontroller:

Step 1: Arduino Setup:

- Set up the Arduino board on a stable surface in proximity to the tanks and pump system.

Step 2: Wiring:

- Connect the power and ground pins of the ultrasonic sensors and pumps to the appropriate pins on the Arduino board.

Step 3: Code Upload:

- Write the Arduino code to control the ultrasonic sensors and pumps as per the system design.
- Upload the code to the Arduino board using the Arduino IDE.

3.Power Supply:

Step 1: Power Source Selection:

- Choose an appropriate power supply source for the Arduino board and sensors.

Step 2: Wiring and Connection:

- Connect the power supply to the Arduino board, ensuring proper voltage and current requirements.

4.Integration and Testing:

Integrate all the components (sensors, Arduino, power supply) into a cohesive system and test the system to ensure the ultrasonic sensors accurately measure water levels and trigger the water levels appropriately.

Machine learning algorithm for analysis of water consumption:

1.Water flow Sensors for Water Consumption:

- Install water flow sensors at various key points in the park or garden.
- These sensors measure the volume of water passing through pipes or irrigation systems in real time.

2. Data Collection:

- IoT sensors continuously collect data on water flow rates and usage.
- The data is transmitted to the central control hub where it is processed and stored.

3. Machine Learning Data Analysis:

- Machine learning algorithms analyse the real-time water consumption data.
- The algorithms can calculate and monitor the total water consumption at any given moment.

4.Real-Time Display:

- Display the real-time water consumption data on the mobile app and any public awareness displays.
- Park and garden managers can see current water usage patterns on their mobile devices.

Steps taken for water conservation:

1. Real-Time Data Collection:

- IoT sensors continuously monitor soil moisture, weather conditions, and other relevant data.
- This real-time data is sent to the central control hub, where it is processed by the machine learning model.

2. Data Analysis:

- Machine learning algorithms analyze the incoming data to understand the current state of the park or garden.
- They consider factors like soil moisture levels, recent rainfall, weather forecasts, and historical water consumption.

3. Predictive Models:

- The machine learning model uses predictive analytics to forecast future water requirements.
- It predicts how much water the park or garden will need in the coming hours or days based on current conditions and trends.

4. Recommendation Generation:

- Using the predictions and real-time data, the machine learning model generates real-time conservation suggestions.
- For example, it might suggest adjusting the irrigation schedule, reducing water flow to certain areas, or postponing irrigation due to imminent rain.

5. Alerts and Notifications:

- The system sends immediate alerts and notifications to park and garden managers via the mobile app.
- Managers receive real-time recommendations and can approve or adjust settings based on the suggestions.

6. Historical Data Comparison:

- The system can also compare real-time data with historical water consumption patterns.
- Deviations from normal patterns can trigger alerts and immediate responses.

Conclusion:

By monitoring water consumption in real time, the system can quickly respond to changing conditions, identify problems, and optimize water usage for the park or garden. The use of machine learning helps in providing insights into consumption patterns and early detection of anomalies for efficient water management.