Smart water management using iot

Objectives:

The objective of smart water management using IoT (Internet of Things) is to utilize technology to monitor, control, and optimize water usage and distribution in a more efficient and sustainable manner.

iot set-up device:

1)This is the device that processes the data collected by the sensors and communicates it to the cloud or a central server.
2)Popular choices include Raspberry Pi, Arduino, or specialized IoT gateways.

Hardware specifications:

1)Microcontroller or Microprocessor:

2)Common choices include Raspberry Pi, Arduino, ESP8266, or ESP32.
3)handle the tasks required for data processing and communication.
Connectivity:

4)WiFi, LoRa, or GSM/3G/4G for communication with the cloud or other devices.

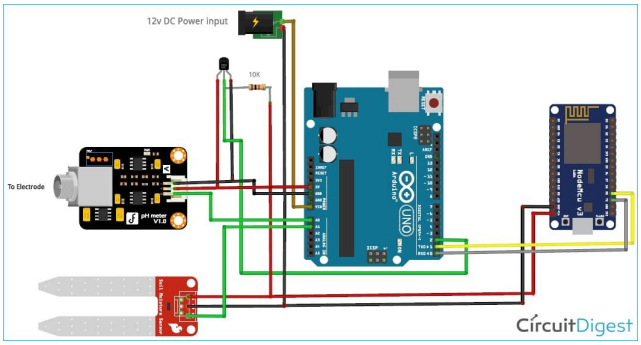
Software specifications:

1) This is the software that runs on the microcontrollers or IoT devices.

2) It manages sensor readings, communication protocols, and data transmission to the central server.

3) Software to handle data received from sensors, including filtering, calibration, and preprocessing for accurate readings

Circuit diagram:



Working principle of smart water management:

The working principle of smart water management using IoT (Internet of Things) involves the integration of various sensors, communication devices, and data processing systems to monitor, analyze, and control water-related parameters in real-time. Here's a step-by-step explanation of the process:

Sensor Deployment:

IoT sensors (e.g., water quality sensors, flow sensors, pressure sensors, etc.) are strategically placed at different points in the water distribution network, such as reservoirs, pipes, treatment plants, and consumer endpoints.
Data Collection:

Sensors continuously collect data on parameters like water quality, flow rates, pressure, temperature, and water levels. This data is converted into electronic signals.
Sensor Communication:

Microcontrollers or IoT devices receive the electronic signals from the sensors. These devices are equipped with communication modules (e.g., Wi-Fi, LoRa, cellular) to transmit the collected data to a central server or cloud platform.
Data Transmission:

The IoT devices use established communication protocols (e.g., MQTT, HTTP, CoAP) to send the data over the chosen network to the central server or cloud platform.
Data Processing and Storage:

The central server or cloud platform receives the transmitted data. The data is then processed to remove noise, calibrate readings, and perform any necessary computations. Processed data is stored in a database for further analysis.
Data Analysis and Insights:

Data analytics software is used to analyze the collected data. This can involve tasks like anomaly detection, trend analysis, predictive modeling, and other algorithms to extract valuable insights.
Visualization and Reporting:

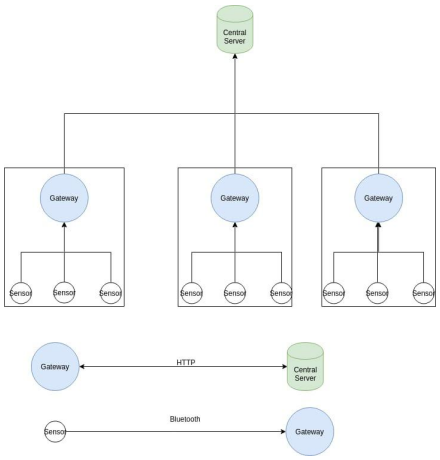
The analyzed data is presented in user-friendly dashboards or applications. This allows stakeholders to monitor water parameters, consumption patterns, and any potential issues in real-time. Reports may be generated for compliance, decision-making, or auditing purposes.
Alerts and Notifications:

The system can be configured to send alerts or notifications in case of critical events or abnormal conditions. For example, alerts may be triggered for leak detection, water quality deviations, or low water levels.
Automated Control (Optional):

Depending on the system's capabilities, automated control mechanisms may be implemented. For instance, valves or pumps can be adjusted based on real-time data to optimize water distribution.
Remote Management:

Remote access and management of the IoT devices may be facilitated for tasks such as firmware updates, sensor calibration, or configuration adjustments.
Feedback Loop and Optimization:

Insights gained from the data analysis can inform decisions regarding infrastructure upgrades, maintenance schedules, and policy adjustments, leading to continuous improvement in water management practices.
By employing IoT technology, smart water management systems aim to enhance efficiency, reduce wastage, improve water quality, and ensure sustainable utilization of this vital resource. This integrated approach allows for more informed decision-making and proactive response to water-related challenges.



Source code:

****HTML(index .html)**

```
<!DOCTYPE html>
<html>
<head>
    <title>Smart Water Management</title>
    <script src="https://code.jquery.com/jquery-3.6.0.min.js"></script> <!-- Include jQuery for AJAX requests -->
</head>
<body>
    <h1>Smart Water Management System</h1>

    <div id="status"></div> <!-- Display system status here -->
```

```
    <button onclick="turnOn()">Turn On</button>
    <button onclick="turnOff()">Turn Off</button>

    <script>
        function turnOn() {
            $.ajax({
                url: '/api/control', // Endpoint to control IoT device
                method: 'POST',
                data: { action: 'on' }, // Send command to turn on
                success: function(response) {
                    $('#status').text('System turned on');
                },
                error: function(error) {
                    $('#status').text('Error turning on system');
                }
            });
        }

        function turnOff() {
            $.ajax({
                url: '/api/control',
                method: 'POST',
                data: { action: 'off' }, // Send command to turn off
                success: function(response) {
                    $('#status').text('System turned off');
                },
                error: function(error) {
                    $('#status').text('Error turning off system');
                }
            });
        }
    </script>
</body>
</html>
```

2) Css(style.css):

```
/* Apply some basic styling to the page */

body {
    font-family: Arial, sans-serif;
    margin: 20px;
    text-align: center;
}
```

```
h1 {
    color: #333;
}

button {
    font-size: 16px;
    padding: 10px 20px;
    margin: 10px;
    background-color: #007BFF;
    color: #fff;
    border: none;
    border-radius: 5px;
    cursor: pointer;
}

button:hover {
    background-color: #0056b3;
}

#status {
    font-size: 18px;
    margin-top: 20px;
}

/* You can add more CSS rules for additional styling as needed */
```

3) JavaScript :

```
    javascript
// Simulated water level sensor data (in centimeters)
Const waterLevelSensor = {
 currentLevel: 20,
 idealLevel: 50
};
// Function to check water level and control water usage
Function checkWaterLevel() {
 If (waterLevelSensor.currentLevel < waterLevelSensor.idealLevel) {
 Console.log(“Water level is low. Initiating water supply…”);
 // Code to activate water supply system goes here
 } else {
 Console.log(“Water level is sufficient. No action needed.”);
 // Code to stop water supply system goes here
 }
}
// Simulate changing water levels (for demonstration purposes)
Function simulateWaterLevelChange() {
```

```
 setInterval(() => {
 // Randomly change water level between 0 and 100 cm
```

Conclusion:

Smart water management using IoT (Internet of Things) has proven to be a significant advancement in optimizing water resources. By integrating sensors, data analytics, and communication technology, it allows for real-time monitoring and control of water systems.