IOT BASED SMART WATER MANAGEMENT SYSTEM

BATCH MEMBER

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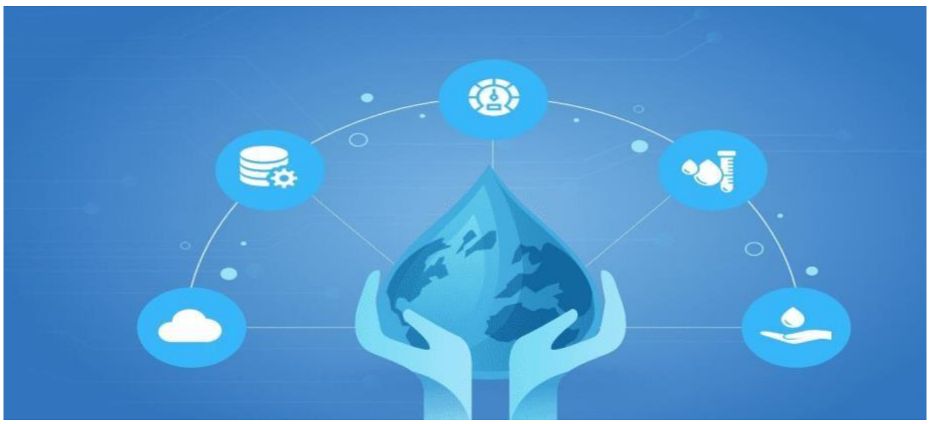
PROJECT TITLE Smart water management

PHASE 3: Development part 1

TOPIC : Smart water management system based on Internet of things



INTRODUCTION:

- Smart water management gives a greater understanding of the water system, including flaw detection, preservation, and water management.
- A comprehensive database of regions with water losses or unlawful connections can be built with the introduction of smart water system technology by public service corporations.
- Smart water grids can save costs by conserving water and energy while improving the quality of service to consumers. Wireless data transfer allows consumers to assess their water use to reduce water costs in other circumstances.
- The water management system can be broadly classified into two main categories namely water level monitoring systems and water quality monitoring systems.
- Water level monitoring systems are those systems that attempt to measure in real-time twater level of a water reservoir using sensors.
- The water quality monitoring system attempts to measure various water quality parameters like pH, conductivity, TDS, etc. value in the water by using different sensors.

PREPROCESSING THE DATASET :

1.Data Cleaning:

It is are low cost solutions that can be easily scaled. Low cost sensors allow easy measuring of water quality for presence for various contaminants. Availability of commonly used communication technologies allow deployment in existing system with little configuration. Use of IoT platforms provides easy access for remote monitoring and control .

2.Data Integration:

The IoT-enabled monitoring robust solution in the water sector provides adequate water as per the requirements and needs. It possesses the ability to solve encumbrances and acquire top-notch results with the aid of a smart water management solution. The gigantic IoT trends & techniques target to deliver effective results that rely on the resources and utilizes resources, Machine Learning techniques, Artificial Intelligence protocols, analytics & other sets of proceedings that can enhance productivity factor.

3.Data Transformation:

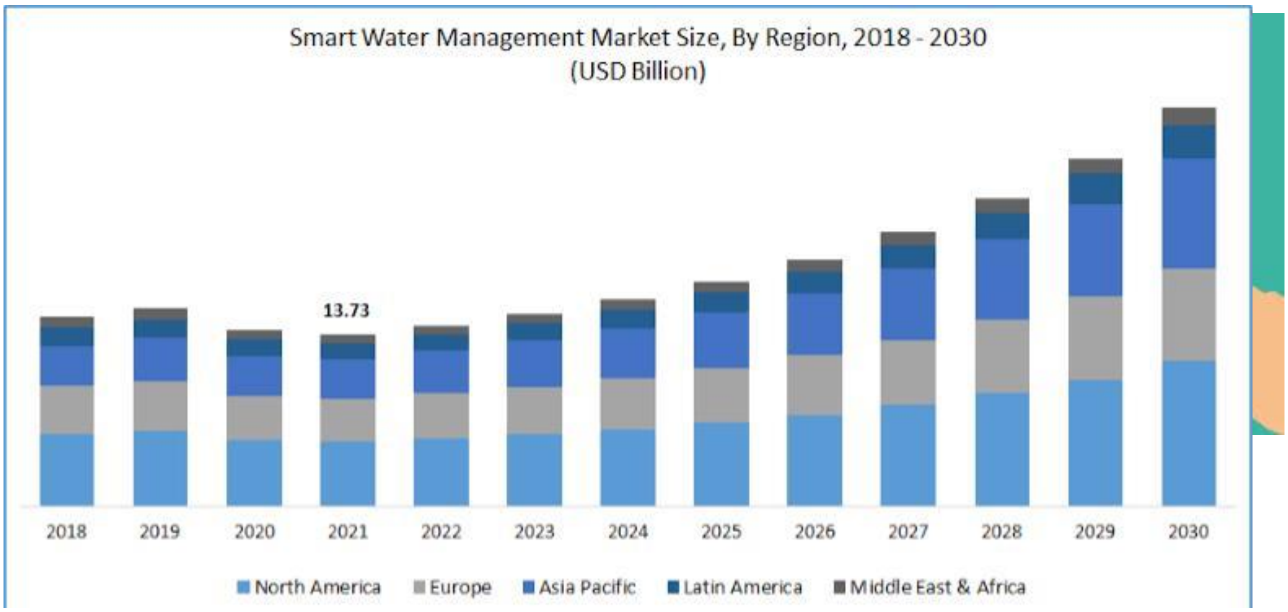
Smart water management using IoT provides the solution for the firms to regulate water flow by interconnecting smart sensors and smart meters. The main role of the sensors and meters is to collect water flow data and generate analytical water performance reports. With the aid of web dashboards, industries observe the utilization of water.

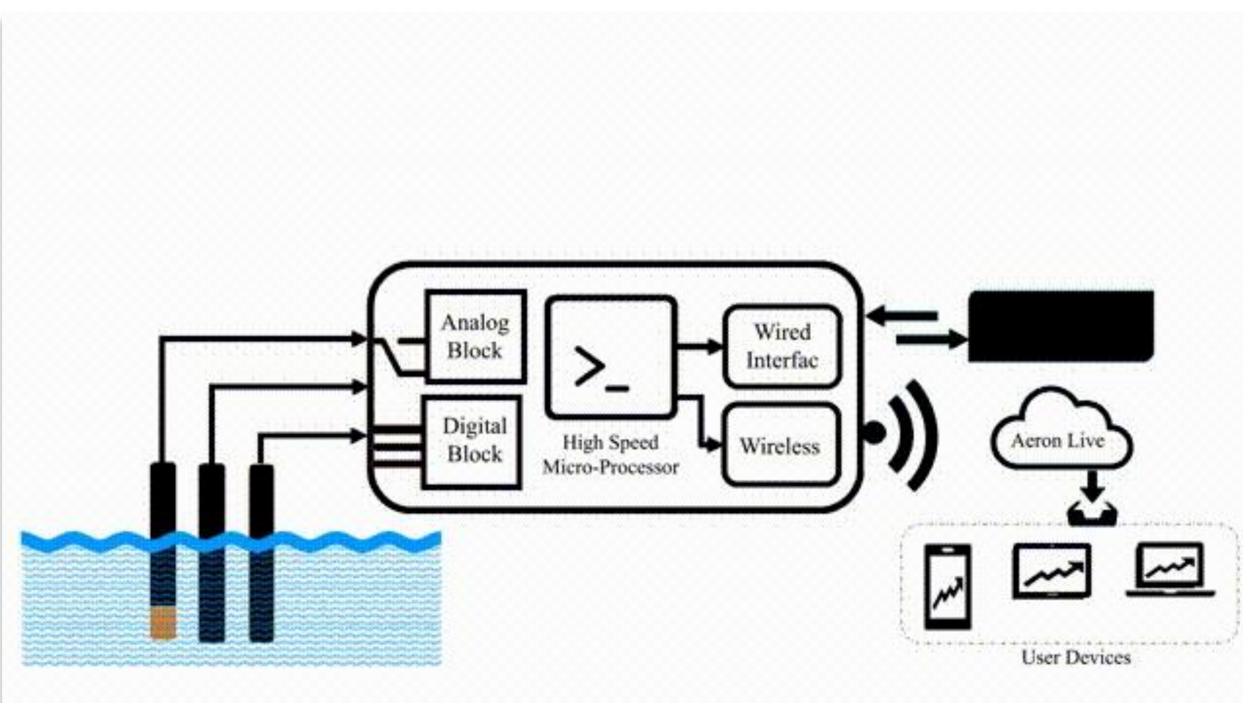
4.Feature Engineering:

The water quality in the distribution system is a serious factor that affects public health and smart water system provides a user-friendly interface to monitor the water quality in houses and take remedial measurements if necessary. One of the main challenges in smart water system is managing the cost, energy and efficiency required for water distribution system. The selection of water quality, quantity and topological parameters is another challenge in the smart water system. So there is in need of research about these challenges to provide a new cost and energy efficient solution to the smart water system.

The future work will focus on developing an IoT architecture in water distribution system with integration of new technologies such as cloud, energy harvesting etc.

5.Data visualization:





LOADING THE DATASET

1.Data splitting (Preprocess the dataset)

Programs(water level detection)

```
Class WaterManagementSystem:
   Def __init__(self, water_level):
      Self.water_level = water_level

   Def check_water_level(self):
      If self.water_level < 20:
         Return "Water level is low. Pumping more water into the tank."
      Elif self.water_level > 80:
         Return "Water level is high. Turning off the water supply."
      Else:
         Return "Water level is optimal. Maintaining the current supply."

   Def set_water_level(self, level):
      Self.water_level = level


If __name__ == '__main__':
   Water_system = WaterManagementSystem(50)
   Print(water_system.check_water_level())
   Water_system.set_water_level(15)
   Print(water_system.check_water_level())
```

Output:

Water level is optimal.
Maintaining the current supply.
Water level is low.
Pumping more water into the tank.

Program(pH detection)

```
 Import random
Import time

Class SmartWaterSystem:
   Def __init__(self):
      Self.ph_sensor_value = 0

   Def read_ph_sensor(self):
      # Simulating the pH sensor reading
      Self.ph_sensor_value = random.uniform(0, 14)

   Def display_ph_level(self):
      Print(f"pH Level: {self.ph_sensor_value}")

   Def run(self):
      While True:
         Self.read_ph_sensor()
         Self.display_ph_level()
         Time.sleep(2)
If __name__ == '__main__':
   Water_system = SmartWaterSyst
  Water_system.run()
```

Output:

```
pH Level: 3.09010263578516 5
pH Level: 12.787501692022735
pH Level: 4.112971151409534
pH Level: 0.673237437879673
pH Level: 13.365622416011266
pH Level: 10.815505861409433
pH Level: 4.166245466214362
pH Level: 11.629278547159265
pH Level: 8.2431716778975
pH Level: 1.9491348027251951
pH Level: 2.57776587680348
pH Level: 0.6190344445685818
pH Level: 11.912175967504625
pH Level: 10.643169834280624
pH Level: 3.529071700105318
pH Level: 12.036899810899886
pH Level: 4.219394702939317
pH Level: 3.3374965253937905
pH Level: 6.6236004521656575
pH Level: 9.236977169833324
pH Level: 13.745583266873071
pH Level: 13.13141663914056
pH Level: 4.124676890079415
pH Level: 3.2839287580645484
pH Level: 2.4241422991227592
pH Level: 8.63664571816229 2
```

Program(usage of water level)

# Initial and final water meter readings
Initial_reading = 1000
Final_reading = 1200

# Convert the readings to gallons (1 cubic meter = 264.172 gallons)
Gallons_per_cubic_meter = 264.172
Usage_in_cubic_meters = final_reading – initial_reading
Usage_in_gallons = usage_in_cubic_meters * gallons_per_cubic_meter

```
# Output the water usage in both cubic meters and gallons
Print(f"Water usage: {usage_in_cubic_meters} cubic meters")
Print(f"Water usage: {usage_in_gallons} gallons")
```

Output:

Water usage:200 cubic meter

Water usage:528340000000000 gallons

Program (Water level indication)

```
From twilio.rest import Client

# Replace these placeholders with your Twilio credentials
Account_sid = 'your_account_sid'
Auth_token = 'your_auth_token'
Client = Client(account_sid, auth_token)

# Simulated water level data (you would replace this with your IoT sensor data)
Water_level = 60

# Define a threshold value for water level to send alert
Threshold = 50

# Check the water level and send alert if it's below the threshold
If water_level < threshold:
  Message = client.messages.create(
    Body=f"Alert! Water level is at {water_level}%. Please refill the tank.",
    From_='your_twilio_number',
    To='your_mobile_phone_number'
  )
  Print(message.sid)
Else:
  Print("Water level is within the safe range.")

# The Twilio API will send an SMS with the water level data to your specified phone number
```

2.Data Collection(identify the dataset)

1. Water consumption data: This includes the volume of water used by households, businesses, and public institutions, which helps in understanding patterns and trends.

2. Water quality data: Monitoring parameters such as pH levels, contaminants, and impurities in water sources to ensure the safety and quality of the water supply.

3. Weather data: Gathering information on rainfall, temperature, humidity, and evaporation rates to assess the impact of weather conditions on water availability and usage.

4. Infrastructure data: Tracking the condition and performance of water infrastructure, such as pipelines, reservoirs, and pumps, to identify potential leaks, damages, or inefficiencies.

5. Sensor data: Using IoT sensors to monitor water flow, pressure, and usage in real time, enabling efficient management and timely interventions.

Conclusion:

The implementation of a smart water management system based on IoT technology offers substantial benefits, including improved efficiency, real-time monitoring, and effective resource utilization. By integrating sensors, data analytics, and automation, this system enables proactive decision-making, reduces water wastage, and enhances overall sustainability. With the potential to revolutionize water conservation practices, the IoT-driven smart water management system stands as a promising solution for addressing global water challenges and fostering a more environmentally conscious future.