Automated Aqua Resource Management

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Abstract

The project aims at conserving water at a greater level by reducing the usage in various ways. Since, water is getting depleted all over the world and many countries suffer from serious draught, especially the African countries. Water scarcity can be the main issue for the citizens of the world and it can be ended by optimizing the use of water. Our project aims at providing a way to conserve this precious resource by collating the user's information on their water usage and analyze the average amount of water needed in an individual habitat. Our project will be a major implementation in smart cities and can provide great benefits through this plan. By this technique we send limited amount of water to every individual habitat by a modified pipeline system. A pressure booster will be installed to main water supply to increase the pressure and the pressure boosted water will consequently reduce the amount of water used .A central system monitors on the water flow, usage and levels on the tank, all the information are collected and stored on cloud for analysis. The information from cloud gives out a better way to analyze and give the average amount of water needed for individual habitat. The calculation of average amount of water will be in best case scenario which will apply for condition taken into account and the algorithm for calculation will be created keeping all sorts for situations. The habitat will be installed with sensor for sensing and a microcontroller with WiFi module for passing information to the cloud. This project is cost effective and has profound impact in the quest for conservation of water.

Keywords—*component, formatting, style, styling*

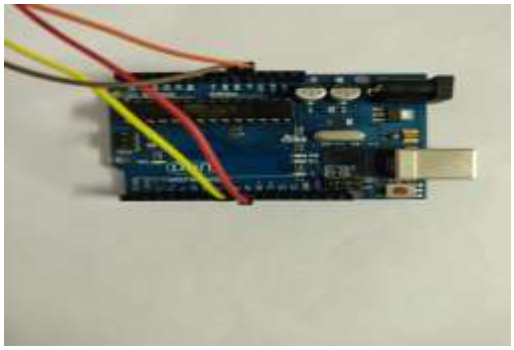
I. INTRODUCTION

Water is an essential resource for life and its management is a key issue nowadays. Information and communications technology systems for water control are currently facing interoperability problems due to lack of support of standardization in monitory and control equipments. This problem affects various processes in water management, such as water consumption, distribution, system identification and equipment maintenance .This model helps us to study the usage of water on a particular area with the data received we can come to a conclusion on how much water required can be calculated approximately for larger requirement for every individual house in a locality by this we could conserve water at a large scale.

OPC UA (Object linking and embedding for process control unified architecture). is a platform independent service-oriented architecture for the control of processes in the logistic and manufacturing sectors. based on this standard we propose a smart water management model combining internet of things technologies cloud and machine learning concepts. We provide an architecture for sub system interaction and detailed description of the physical scenario in which we will test our implementation, allowing specific vendor equipment to be manageable and interoperable in the specific context of water management processes.

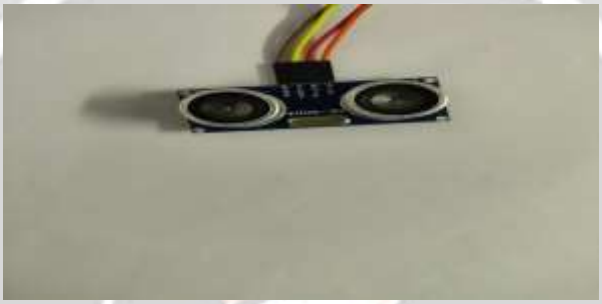
II. SYSTEM REQUIREMENTS

A. Arduino UNO



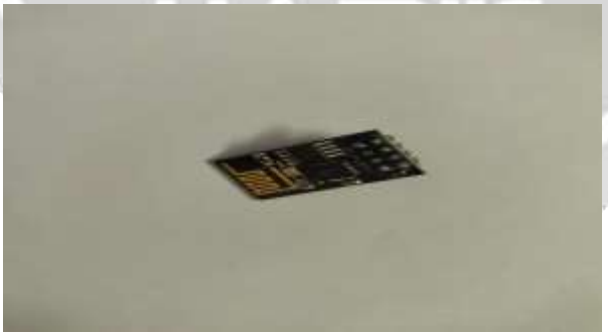
The Arduino UNO is an microcontroller board based on Microchip ATmega328P microcontroller and developed by Arduino.cc the chip is integrated with set of analog and digital input/output. The board has 14 digital pin and 6 analog pin and is programmable with Arduino IDE.

B. Ultrasonic sensor



The ultra sonic sensors emits short,high-frequency sound pulse at regular intervals if strikes an object,then they emit signals that are detected by nearby system and the timespan between the emitting signal and receiving echo are used to compute the distance.

C. WIFI module and GSM module

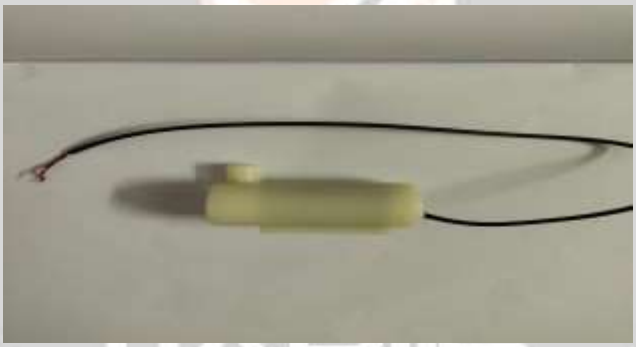


The ESP8266 is a low cost WIFI microchip with full TCP/IP stack and the ESP8285 is with 1MiB of build in flash, allowing for single chip devices capable of connecting to WIFI.
GSM module is used to establish communication between a computer and a GSM system. global system for mobile communication(GSM) is an architecture used for mobile communication in most of the countries. it receive send or delete SMS message.

D. ECHO module

The PoUs may or may not be in range of wifi.an arduino board with BLE can be used as echo module.This module can be treated as a hopes required depends on distance between PoUs and the place having Wi-Fi range.the receiving module,push module(ie.the hop in the Wi-Fi range)designed as arduino with bluetooth in software serial and Wi-Fi in hardware serial port.This arduino will push the data to a file in local server.

E.Water pump



A **pump** is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action. Pumps can be classified into three major groups according to the method they use to move the fluid: *direct lift*, *displacement*, and *gravity* pumps

Pumps operate by some mechanism (typically reciprocating or rotary), and consume energy to perform mechanical work moving the fluid. Pumps operate via many energy sources, including manual operation, electricity, engines, or wind power, come in many sizes, from microscopic for use in medical applications to large industrial pumps.

Mechanical pumps serve in a wide range of applications such as pumping water from wells, aquarium filtering, pond filtering and aeration, in the car industry for water-cooling and fuel injection, in the energy industry for pumping oil and natural gas or for operating cooling towers. In the medical industry, pumps are used for biochemical processes in developing and manufacturing medicine, and as artificial replacements for body parts, in particular the artificial heart and penile prosthesis.

III. AQUA RESOURCE MANAGEMENT SYSTEM

This device will help us to manage and plan the usage of water in our locality as water is an essential source(for human existence). This device focus on water level monitoring and all the related measures required for the model.

This device consist of sensor namely ultrasonic sensor which is connected to cloud through the WIFI module which is connected to the Amazon web services site (cloud platform) which stores, manage and detect the water level so when this is done at a large scale plans like smart cities this model can be very much efficient in water scarce area

A. Working And Implementation

the sensor detects the ECHO of the water and sends the signal to the aurdino UNO board and then wait to receive ECHO. Arduino reads the time between triggering and received ECHO. We know that speed of sound is around 340 m/s. so we can calculate distance by using given formula:

B. Units

- The model basically concentrates on the concept detecting the sound waves produced by water.
- The equation comprise of three factors speed distance and sound.
- The unit of speed is meter per second.
- The unit of sound is decibels(db).
- The unit of time is in seconds.
- The unit of outcome that is distance will be in meters.

C. Equations

Distance=(travel time/2)*speed of sound (1)

Where speed of sound is approximately 340m per second.

By using this methods we gets distance from sensor to water surface. After it we need to calculate water level.

Now we need to calculate the total length of water tank. As we know the length of water tank then we can calculate the water level by subtracting resulting distance coming from ultrasonic from total length of tank. And we will get the water level distance. Now we can convert this water level in to the percent of water, and can display it on LCD. The working of the complete water level indicator project is shown in below block diagram.

D. Point Of Use

point of use(PoU) are the places where water level sensors has to be deployed.there are two types of PoUs,sumps and over head tanks(OHT).4 sensors to be deployed in every PoUs at 20%,40%,60%,80%.The sensors will gives a TRUE if water is present at corresponding level and FALSE otherwise.One Arduino board with BLE has been used at every PoUs for data collection.

E. Data Processing And Integration

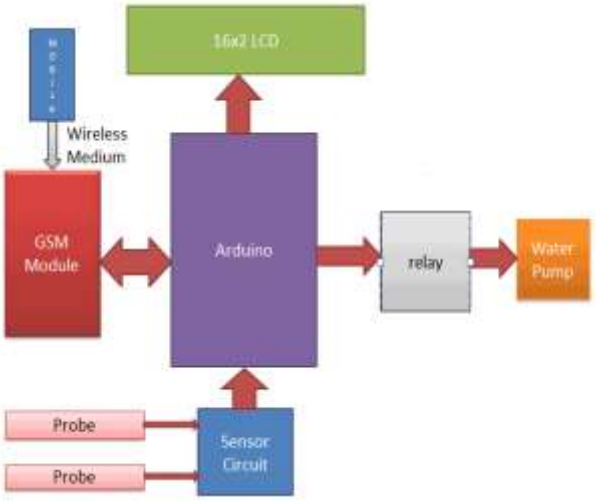
- A arduino is a low cost full functional computer with Wi-Fi connectivity can be used as the central system.data from the local server will be fletched by the central system and can start processing. arduino UNO has to be configured in such way that it has to perform the following functionalities .
- populate the data to corresponding tables for visualisation.
- populate the data to cloud.
- trigger Email/SMS alert when water level goes below threshold.
- trigger Email/SMS with different reports in daily/monthly/yearly basis.

F. Alert System

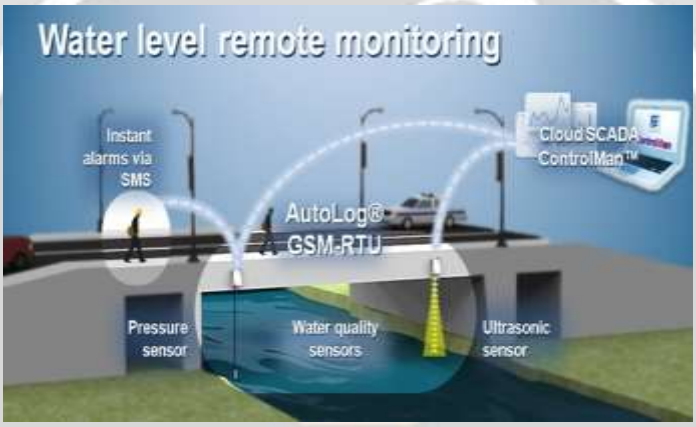
Mail alert:Excess water consumption details will be captured from the exus table and will send as mail to the concerned person/group.library in java is used for sending mail alert.
SMS alert:SMS alert system is implemented in such a way that will be triggered to corresponding lorry driver when the level of water in tank goes below a threshold.20 API are created for this project for sending SMS to concerned persons.

G. Figures and Tables

Inorder for the better understanding and implementation of the project we will require an architectural design of the model architectural design is as follows:



- Practical Design



H. Machine Learning concepts

- As we are adding many additional features to the device.one such is adding an precaution mechanism to the system if the tanks water level reduces more than half the capacity at once it will have a mechanism that the tank valve will block stopping the wastage of water. this will again be monitored using the arduino UNO board.
- As we are also thinking of adding machine learning to the model(prototype).by using this we can also determine quality assessment,reservoir management,artificial intelligence etc.

CONCLUSIONS

This IOT and machine learning integrated model developed is highly efficient in its aqua management concepts.And can be used in large scale projects like the one introduced by our former prime minister Narendra Modi “Smart cities mission” this model is highly useful in localities and cities which have scarce water supply by this water management can be done wisely.

References

1. Reference of architecture was taken from google images: https://www.google.com/search?biw=1366&bih=635&tbm=isch&sa=1&ei=n7yoXIiZHse7rQHhlpjwCA&q=water+management+iot+project+arduino+architecture&oq=water+management+iot+project+arduino+architecture&gs_l=img.3...1745.11352..12001...3.0..0.240.1911.23j0j1.....0....1..gws-wiz-img.SPfvTKB6k8c#imgrc=ZdU8oSbFyHy2zM
2. Practical design of the model was also taken from google images.
3. Definitions for modules were taken from Wikipedia.

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