Smart Water Monitoring and Purifying System

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Abstract

Proper maintenance of water outlets, their proper scheduling of repairing is must in order to reduce the water losses to leakages and breakages optimized the energy consumption requirements for pumping water. This can be achieved by ensuring a right combination of pumping configuration predictive analysis techniques can be used for getting the right amount of water at the right destination for the right duration.

Keywords - *Smart water, IOT with Arduino Uno, Water Management, Water Monitoring and Purification system.*

I. INTRODUCTION

Water has been considered exploitable and the renewable resource from the beginning of the civilization. There is a need to manage the sustainability of water resources is called water management. Misuse of this resource on large scale contributes to water scarcity and unequal access to millions of people across the world. To overcome the wastage of water the techniques are used to reduce such exploitation, which helps in saving water in the long run. Scientists and engineers developed brilliant technologies to notify the user whenever the tank overflows or underflows so that he or she can manually turn the machine off or on respectively. A microcontroller is a small computer on a single integrated circuit which is used to detect water level and control the pumps by functioning throughout the task. This microcontroller can be effectively implemented by the regular monitoring and maintenance so as to prevent the water wastage.

A. Basic Iot Implementation

Ever since mankind came into existence, we have been hearing that we need to make a proper management of our resources and energies as a caution from everyone. And water is one such vital resource, which should be properly managed and used. Proper management of water can be done with the help of IOT. Here level sensors are equipped across overhead tanks and reservoirs, these sensors indicate passed to the management and they determine the amount of water usage on daily basis. We can also monitor the temperature of water present in the tank using L-35 sensor.

B. IOT Application

- When we want to buy something from the grocery store we need to make an handwritten list and we need to go store and purchase it, but in today's busy schedule, IOT made it easy with the help of smart refrigerator this is able to examine customers buying habits and build a list of items on its own. And here RFID (Radio Frequency Identification Tags) are embedded in the refrigerator, these tags notify the customer when an item is no longer fresh or nearing to its expiration date. So,there will be no loss of food items and always keeps them in fresh condition.
- In today's major cities moving from one place to another place is a nightmare. But IOT makes it easier by using your navigation system communicates with sensors that are embedded in the environment with the help of this, people can reach their destination in correct time. Example: GPS with Radar
- They are many smart devices in farming which are used for monitoring the climate condition, soil quality, cattle health and crops growth progress. And is allows us to automate multiple process across your production cycle. By using these smart devices we will be able to mitigate the risks of losing our yield.

II. DISADVANTAGES OF IOT

A. Security

Every device that person uses now a days is connected to the internet, so the data that is collected by sensor/device is placed on to the internet and it be available online for lifetime. As the data is open it can be easily hacked and it leads to know about individuals' life, these data acts as an input for the companies.

B. Over -Reliance On Technology

Our next generation will be growing in the availability of internet and technology. So they will be completely depend on the technology and try to make decision based on the information given by IOT/Internet, which would led them to devastation. And they work in-front of the system for 24/7 and no system in this is fault free. So, we shouldn't solely rely on them.

C. Impact On Employability

In the coming days the work which should be done by humans will be completely replaced by machines in an efficient manner. So, IOT has an impact on employability.

III.OBJECTIVE

Our main objective is to regulate and optimize the usage of water so as to avoid water wastage. This regulation of water supply can be done by controlling the water usage by controlling the pump which is used to fill the water tank and alerting the user about any malfunctioning of the pump and the table.

The coil in the electromagnetic switch (relay) gets activated when current flows through it and water pump is used to regulate the water in to the tank. An Arduino Uno Microcontroller reads the input from the probes present in the tank and displays the output on to the LCD indicating the usage of the water. Global System for Mobile communication (GSM) is used as an interface between the microcontroller and humans. This as a whole process is the combination of regulating, optimizing the usage of water with the help of relay, microcontroller (Arduino-Uno).If any miss-functionality in the process will be notified by the GSM.

Types Of Microcontroller Boards Used

Arduino UNO

It is the most popular open source electronics prototyping platform to create interactive electronic applications. The clip on the board plugs straight into your USB port and supports on your computer as a virtual serial port. It uses 16MHz clock which is fast enough for more applications. Here in our project it uses Atmega328P as a micro-controller. Has an operating voltage of 5V.

Types of Sensors Used

Sensors are the trailblazing devices that are often used to detect and respond to the electrical or optical signals. A sensor converts the physical parameter into a signal which can be measured electrically.

Temperature Sensor

A device used to measure the amount of heat energy and that allows detecting a physical change in temperature from a particular source and converts the data for a device or user is known as temperature sensor. In manufacturing, the sensor continually measures the temperature of a machine to ensure that it stays within a secure threshold. In farms, they are used to track temperature of soil, water and plants.

Level Sensor

A sensor which is used to determine the level or amount of liquids or other substances that flow in an open or closed system is called level sensor. It is used in smart water management and recycling purposes. It is also used to measure tank levels, diesel fuel gauging, liquid assets inventory etc.

IV.METHODOLOGY

1. First step is the selection of locales that will provide useful data. The location was narrowed down to gated communities apartments and group houses where human interface has a considerable impact.
2. The second step is to transmit data on to the Arduino kit for further processing.
3. Here we make use of probes to indicate 5 different levels in the tank and the data is displayed on to the LCD screen.
4. Each probe in the tank is connected to the analog pins of the Arduino Board(A0, A1, A2,A3 ,A4,A5).
5. Now water pump and LCD screen are interfaced with Arduino board using jumper wires.
6. The probes which are installed in the tank gets activated when the water pokes the probe
7. When the probe gets activated, analog signal is transmitted to the Arduino board through analog pins, which then converted into digital signal.
8. Arduino programming code is written in Arduino IDE 1.8.5 which is suitable for Arduino Nano (which is used in our project).
9. Once the programming part is completed, Arduino board is connected to the personal computer in which the code is written.
10. This code is transferred into the Arduino board.
11. The result will be monitored in the LCD Screen; once the power is supplied to the model. This indicates the level of water present in the tank.
12. Now interface the GSM model to the Arduino Board which is used to send messages to the user to notify the level of water in the tank.

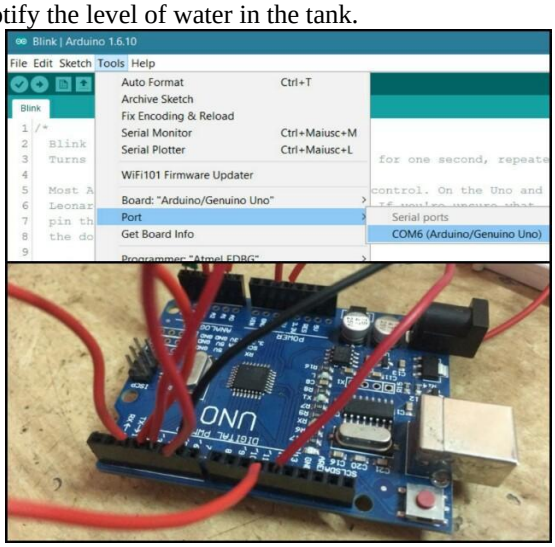

Fig-1: Setup of the Arduino Uno and the Probes

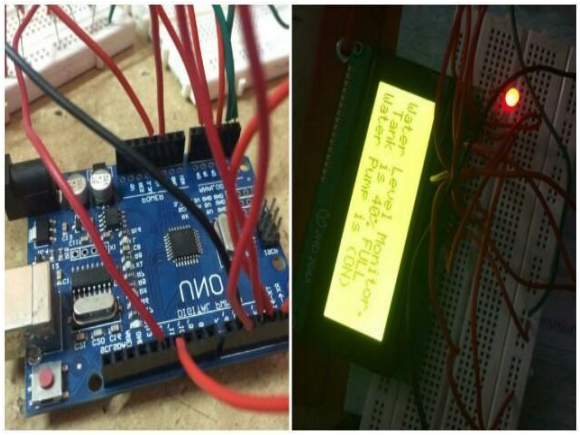

Fig-2: Interfacing the GSM with the Arduino Uno

V. DEPLOYING SMART WATER PROJECT

Water is a vital resource which should be monitored efficiently and measures to be taken for proper distribution. This work aims at proposing a Smart water level monitoring system using the techniques of sensors and analytics. We are trying to provide an IOT based solution for this. The solution includes sensing the water present at each level in the tank using probes, transmitting it to a centralized server (Arduino Board) and provides an SMS alert to the user. The implementation of the Smart Water level monitoring system is done in three stages.

- ***Source of Input:*** Here water level data near the command centre is read by probes and the decisions are taken almost instantaneously when it is transmitted to the Arduino Board.
- ***Validation rules:*** Used to verify that the data a user enters in a record and meets the standards we specify before the user can save the record.

A. Control Statements

Here a sequence of If-Else statements help us to make a decision and shifts the control.

SAMPLE CODE

```
lcd.setCursor(0,1);
lcd.print("Water Level Monitor.");
```

The above code is responsible for displaying the title Water Level Monitor on the top first row of the LCD Screen

```
if(d>z && c>z && b>z && a>z )
{
  {
    digitalWrite(motor,LOW);
  }
lcd.setCursor(1,2);
lcd.print("Tank is 80% FULL");
```

This code stops the motor, and when all the attributes are in true condition i.e water is present at each level of the tank so it shows that the “tank is 80% full”.

```
if(d<z && c>z && b>z && a>z )
{
lcd.setCursor(1,2);
lcd.print("Tank is 60% FULL");
}
```

if the last attribute is in false condition(i.e < Z)the water is not present at the 80% so it displays as tank is 60% full . Respectively the remaining conditions are also displayed on the LCD Screen.

B. Alert Statements

When the tank is 100% full an SMS Alert is sent to the respective phone number we mentioned in the code, we can send it to multiple phone numbers at a time.

```
if (digitalRead(pin) == HIGH &&
state == 0) {
   Serial.print("\r");
   delay(1000);
   Serial.print("AT+CMGF=1\r");
   delay(1000);

Serial.print("AT+CMGS=\"+XXXX
XXXXXX\"\r");
   delay(100);

Serial.print("AT+CMGS=\"+XXXX
XXXXXX\"\r");
   delay(1000);
   //The text of the message to be sent.
   Serial.print("TANK IS 100%
FULL");
   delay(1000);
   Serial.write(0x1A);
   delay(1000);
   state = 1;
 }
```

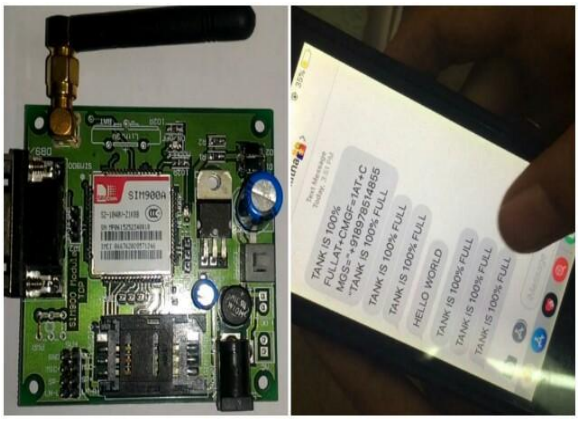

Fig-3: Arduino Uno code

C. Arduino Board Functionality

The board reads the input from the probes and takes the decision based on the input and transmits the output on to the LCD Screen.

VI. CONCLUSIONS

Now a days monitoring of smart applications is vital for the eco-friendly usage of the systems. Our intension of this research was to provide a flexible, economical, easily configurable and most importantly, a portable system which can solve water wastage problem. Our proposed system water level monitoring comes under the field of Internet Of Things which automatically processes updates by automatic water level controller to the user via GSM technique i.e. SMS notification.

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