Ahsanullah University of Science & Technology
Department of Computer Science & Engineering
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CSE 3216 Microcontroller Based System Design Lab

Project Proposal

Project Name: Water Level and Water Quality Monitoring System

Submitted To

Ashna Nawar Ahmed
Lecturer
Department of CSE, AUST

Mr. Farzad Ahmed
Lecturer
Department of CSE, AUST

Submitted By

Tanjila Sultana Joti	180104007
Nusrat Jahan	180104020
Fatema Marjan	180104021

Objective:

Overflowing water tanks is a typical problem that wastes both water and power supply. The percentages of drinkable water sources is rapidly dwindling. Deteriorating quality of water, for whichever reason, can pose a major hazard to human health, aquatic live and entire eco-systems. So, the objectives of a water quality monitoring system can be manifold. Our project "Water Level and Water Quality Monitoring System" can inform people about the current condition of the water while preventing wastage of water and power supply.

Social Values:

Nowadays everybody has overhead tanks at their homes. But everyone who has a water tank above knows the kind of problems that they face. Firstly there is no system to track the water in the tank. Then there is a secondary problem, that is, when the water pump is turned on, they do not know when it is full. Sometimes the water pump keeps pumping water into the water tank and the water starts to overflow from the water tank. There is wastage of energy as well as wastage of water. This project is to notify the user the amount of water that is present in the overhead water tank and can be further enhanced to control the water level in the tank by turning motor on, when the water level is low, and turning motor off when the water level is high. Thus, the Arduino water level indicator helps in preventing wastage of water in overhead tank.

Declining water Quality has become a global issue of concern as human populations grow, industrial and agricultural activities expand, and climate change threatens to cause major alterations to the Hydrological cycle. Every year, more people die from unsafe water than from all forms of violence, including war.

The pH value in drinking water is important because low-pH drinking water can degrade pipes and cause toxic metals such as lead, manganese, copper, and iron, and lead to enter the water supply system. The high pH in drinking water can also cause unpleasant tastes.

TDS (Total Dissolved Solids) indicates how many milligrams of soluble solids are dissolved in one liter of water. In general, the higher the TDS value, the more soluble solids are dissolved in water, and the less clean the water is. Therefore, the TDS value can be used as one reference point for reflecting the cleanliness of the water. This can be applied to domestic water, hydroponic and other fields of water quality testing and monitoring.

TDS and pH Sensor are a good solvent that picks up impurities easily. So using a pH sensor and a TDS sensor can make a perfect water quality monitoring system

Required Components:

These following parts and tools are required for building this project:

1. ARDUINO MEGA2560 R3
2. Ultrasonic sensor Module
3. 16×4 LCD
4. Relay 6 Volt
5. ULN2003
6. 7806
7. POT-HG
8. Buzzer
9. Motor
10. Alternator
11. 9 volt battery or 12 volt adaptor
12. LED (RED, GREEN, BLUE)
13. pH sensor
14. TDS Sensor

Working Procedure:

1. As shown in the water level controller circuit given above, The Ultrasonic sensor module's "trigger" and "echo" pins are directly connected to pin 10 and 11 of Arduino. A 16×4 LCD is connected with Arduino in 4-bit mode.
2. Control pin RS, RW and En are directly connected to Arduino pin 2, GND and 3. And data pin D4-D7 is connected to 4, 5, 6 and 7 of Arduino, and buzzer is connected at pin 12.
3. 6 Volt relay is also connected at pin 8 of Arduino through ULN2003 for turning on or turning off the water motor pump. A voltage regulator 7805 is also used for providing 6 volt to relay and to remaining circuit.
4. In this circuit we are going to measure the water level by using ultrasonic sensors. Ultrasonic sensor module is placed at the top of water tank for demonstration. This sensor module will read the distance between sensor module and water surface and it will show the distance on LCD screen with message "Water Space in Tank is:"
5. The Ultrasonic sensor module will transmit signal by Arduino, then wait for receiving ECHO.
6. The Arduino will read the time between activation and receiving from ECHO. It will help to measure the distance from the sensor to the water surface to calculate the water level.
7. This sensor module will read the distance between the sensor module and the water surface. It means we are here showing empty place of distance or volume for water instead of water level. Because of this functionality we can use this system in any water tank.
8. When empty water level reaches at distance about 30 cm then Arduino turns ON the water pump by driving relay. And now LCD will show "LOW Water Level" "Motor turned ON", and Relay status LED will start glowing.
9. Now if the empty space reaches at distance about 12 cm Arduino turns OFF the relay and LCD will show "Tank is full" "Motor Turned OFF". Buzzer also beeps for some time and relay status LED will turn OFF.

10. We use custom pot as PH sensor and TDS sensor which build by to pot-hg. By varying pot, the pot sensor will take the PH and TDS value and then display this value on the LCD.

Estimated budget:

Equipment	Quantity	Budget(Tk)
ARDUINO MEGA2560 R3	1	920
Ultrasonic sensor Module	1	95
Relay 6 Volt	1	85
16 x 4 LCD	1	318
TDS Sensor	1	1,100
ULN2003	1	60
Copper wire	As required	100
Buzzer	1	300
PH sensor	1	3,400
POT-HG	1	50
7806- Voltage Regulator	1	15
9 Volt Battery/12 Volt Adaptor	1	40
Total		**6,483**

Code:

```
#include <LiquidCrystal.h>
#define trigger 10
#define echo 11
#define motor 8
#define buzzer 12
#define ledpinred  14
#define ledpingreen  15
#define pH_Sensor_Pin  A1
#define TDS_Sensor_Pin  A0

LiquidCrystal lcd(2, 3, 4, 5, 6, 7);

float time = 0;
float distance = 0;
int temp = 0;
int sensorValue = 0;
float tdsValue = 0;
float Voltage = 0;

 void setup(){
 lcd.begin(16, 4);
 lcd.setCursor(0, 0);
 pinMode(pH_Sensor_Pin, INPUT);
 pinMode(TDS_Sensor_Pin, INPUT);
 pinMode(ledpinred, OUTPUT);
 pinMode(ledpingreen, OUTPUT);
```

```
  pinMode(A2, INPUT);
  pinMode(trigger, OUTPUT);
  pinMode(echo, INPUT);
  pinMode(motor, OUTPUT);
  pinMode(buzzer, OUTPUT);
  lcd.print("Water Level and");
  lcd.setCursor(0, 1);
  lcd.print("Water Quality");
   lcd.setCursor(0, 2);
  lcd.print(" Monitoring ");

   lcd.setCursor(0, 3);
  lcd.print(" System ");
  delay(1000);
}
void loop(){
  lcd.clear();
  digitalWrite(trigger, LOW);
  delayMicroseconds(2);
  digitalWrite(trigger, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigger, LOW);
  delayMicroseconds(2);
  time = pulseIn(echo, HIGH);
  distance = time * 340 / 200023;
  lcd.clear();
  lcd.print("Water Space In  ");
```

```
lcd.setCursor(0, 1);
lcd.print("Tank is:");
lcd.print(distance);
lcd.print("Cm");
delay(1000);
if (distance < 12 && temp == 0)
{
  digitalWrite(motor, LOW);
  digitalWrite(buzzer, HIGH);
  lcd.clear();
  lcd.print("Water Tank Full ");
  lcd.setCursor(0, 1);
  lcd.print("Motor Turned OFF");
  delay(1000);
  digitalWrite(buzzer, LOW);
  delay(1000);
  temp = 1;
}
else if (distance < 12 && temp == 1){
  digitalWrite(motor, LOW);
  lcd.clear();
  lcd.print("Water Tank Full ");
  lcd.setCursor(0, 1);
  lcd.print("Motor Turned OFF");
  delay(1000);
}
```

```
  else if (distance > 30) {
  digitalWrite(motor, HIGH);
  lcd.clear();
  lcd.print("LOW Water Level");
  lcd.setCursor(0, 1);
  lcd.print("Motor Turned ON");
  delay(1000);
  temp = 0;
 }
 float val = analogRead(pH_Sensor_Pin);
 val = val / 1023;
 val = val * 14;
 lcd.setCursor(0, 2);
 lcd.print("pH = ");
 lcd.print(val);

 sensorValue = analogRead(TDS_Sensor_Pin);
 Voltage = sensorValue * 5 / 1024.0;
 tdsValue = (133.42 * Voltage * Voltage * Voltage - 255.86 * Voltage *
Voltage + 857.39 * Voltage) * 0.5;
 lcd.setCursor(0, 3);
 lcd.print("TDS Value = ");
 lcd.print(tdsValue);
 lcd.println(" ppm");
 delay(1000);
```

```
  if (val >= 6.5 && val <= 7.5 &&  tdsValue>=0 && tdsValue<= 600 ){
   digitalWrite(ledpingreen, HIGH);
   digitalWrite(ledpinred, LOW);
   delay(1000);
 }
else {
  digitalWrite(ledpingreen, LOW);
  digitalWrite(ledpinred, HIGH);
  }
}
```

Member Contribution:

All members are equally participate in this project.

Difficulties:

Due to the software implementation, we need different sensor libraries, but the sensor libraries are not available, so we use a custom potentiometer in our implementation.

If group members are not using the same proteus version, it may cause that one's proteus file does not support in another proteus.

Future implementation:

1. We will like to use a turbidity sensor, which output a voltage level proportional to the amount of suspended solid particles in the water.
2. We will like to implement Reverse Osmosis System
3. Will measure the temperature of the water and then set temperature of the water at suitable/required temperature.

Conclusion

The automation of various components around us has been greatly increased to reduce human intervention and save time. The tank overflows because the height of the water in the tank cannot be randomly guessed. This leads to additional energy consumption, which is a big problem today. People should also wait until the water tank is full. So here is an idea. It can detect and indicate the water level so that the pump can be turned off at an appropriate time to save water and electricity, and it can be turned on when the water level is low. With regard to water quality issues, such as the unbalanced pH in the water, people will suffer from many diseases. The pH indicator will show the pH value in the water, which will help people stay away from health or skin diseases. Using TDS sensor to find the drinking water is clean or not.