SMART WATER FOUNTAIN

Our goal is to design a smart water fountain that can monitor the water quality and automatically replace water when polluted(not healthy) or running out. We will use sensors to measure the water quality. Common water quality measurement factors include temperature, Ph-value, conductance, turbidity and hardness . Considering the pollution at home can only affect limited factors, we choose temperature, Ph-value and conductance to be the three properties used for calculating water quality in our water fountain. These data will be collected, calculated, and reflected to the user in terms of “Good”, “Average” and “Bad”. The water fountain is also designed to self-filter the water every time when water is pumped through the submersible water pump.

SENSOR:

Unit This block contains the four sensors. The data acquired from the sensors will be transmitted to the control unit. Control unit will then have some logic designed to send corresponding signals to control other blocks of the water fountain. At the same time, the display screen on the water fountain will display the readings along with the determined water quality level and remaining water quantity. For the PH-value sensor, temperature sensor and conductivity sensor, values will be retrieved and calculated to determine the overall water quality level. When poor water quality is determined, the water replacement procedures will take place. The weight sensor readings will be used to determine the amount of fresh water left in the water tank.

TEMPERATURE SENSOR:

A water-proof temperature sensor is going to be used. Part number from sparkfun is: DS18B20 [6]. This temperature sensor is compatible with a relatively wide range of power supply from 3.0V to 5.5V. The measured temperature ranges from -55 to +125 celsius degrees. Between -10 to + 85 degrees, the accuracy is up to +-0.5 degrees. This sensor can fulfill all requirements needed for this project.

PH-sensor:

PH value is a valued indicator of water quality. This PH-sensor[7] works with 5V voltage, which is also compatible with the temperature sensor. It can 6measure the PH value from 0 to 14 with an accuracy of +- 0.1 at the temperature of 25 degrees.

Conductivity sensor:

Conductivity sensor is also part of the water quality assessment. The input voltage is from 3.0 to 5.0V. The error is small, +-5%F.S. The measurement value ranges from 0 to 20 ms/cm which is enough for water quality monitoring.

Liquid Level Sensor:

This sensor [9] is responsible for reflecting how much freshwater is left in the water tank. When the water level is low, fresh water will be pumped to the water tank to ensure the water fountain keeps running with freshwater. This sensor is 0.5 Watts. For water level from 0 to 9 inches, the corresponding sensor outputs readings from 0 to 1.6. From that, the quantity of freshwater left can be determined.

Fountain Pump:

The fountain pump [14] must maintain a continuous water supply through the fountain mechanism. The pump must work 24 hours a day, 7 days a week unless the user manually turns off the power supply.

Requirement 1: The fountain pump must lift a cylindrical water stream of diameter 6mm for a height of 400mm.

Requirement 2: The fountain pump must serve for a duration of 2 years without maintenance or replacement under heavy workload.

Requirement 3: The fountain pump should have an operational condition around 3V, 200mA

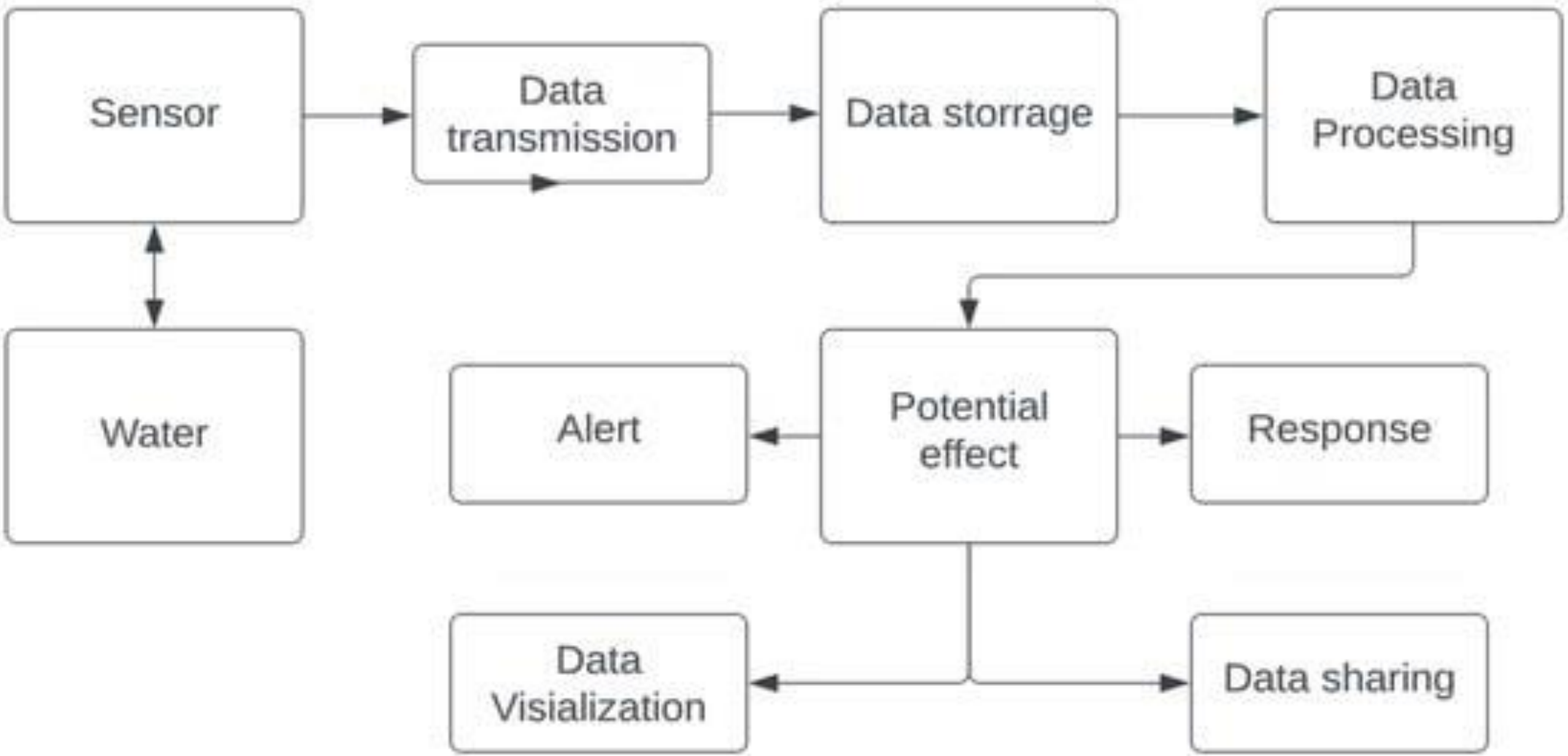
Supply Pump:

The supply pump must function when a low water level alert is raised. While no water supply is requested, the pump must prevent water flow between the main supply and the fountain. Requirement: The supply pump should have an operational condition around 3V, 200mA.

Filter:

The filter must maintain the water quality through controlling the pH value and conductivity of the water. Requirement 1: The filter must have a cost less than $5 each for frequent replacement. Each new filter must serve a duration no less than 3 month. Requirement 2: The filter must be designed for easy removal and installation, while the connection mechanism must have a low degenerate rate when submerged in water.

Block Diagram



purpose of a water fountain?

Fountain - A water fountain or drinking fountain is designed to provide drinking water and has a basin arrangement with either continuously running water or a tap. The drinker bends down to the stream of water and swallows water directly from the stream.

What are the benefits of a water feature?

Having a water feature in your yard or patio can help provide calming sights and sounds, promoting relaxation and stress reduction. They can help draw beneficial wildlife to your yard, like birds, butterflies, and bees

How do I control the water flow in my fountain?

Locate the flow control switch if the pump has one. Water fountains use submersible pumps designed for safe operation in water. The flow rate switch is usually a button that slides from side to side or a recessed dial located on one side of the pump's housing. An "S" indicates slow, and "F" is for fast.

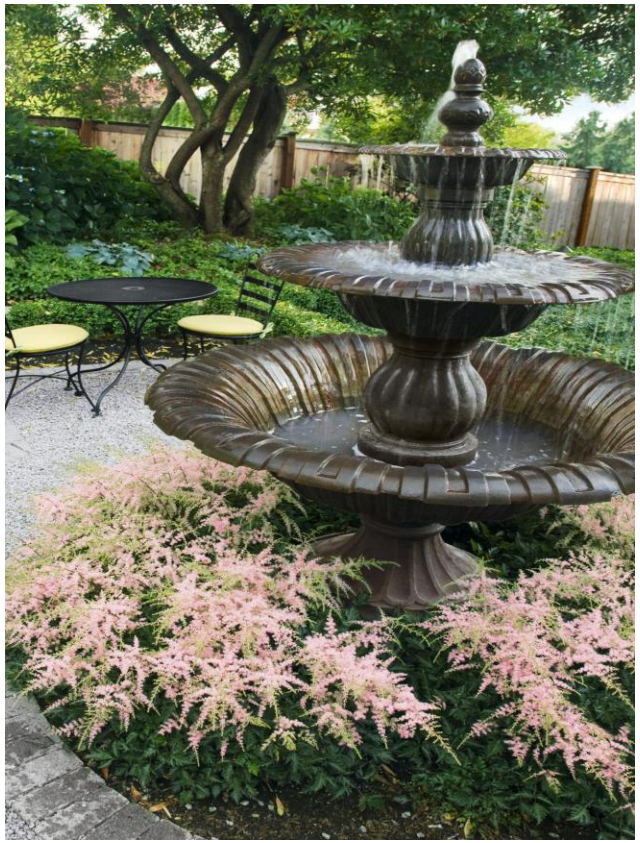
How can we control water flow?

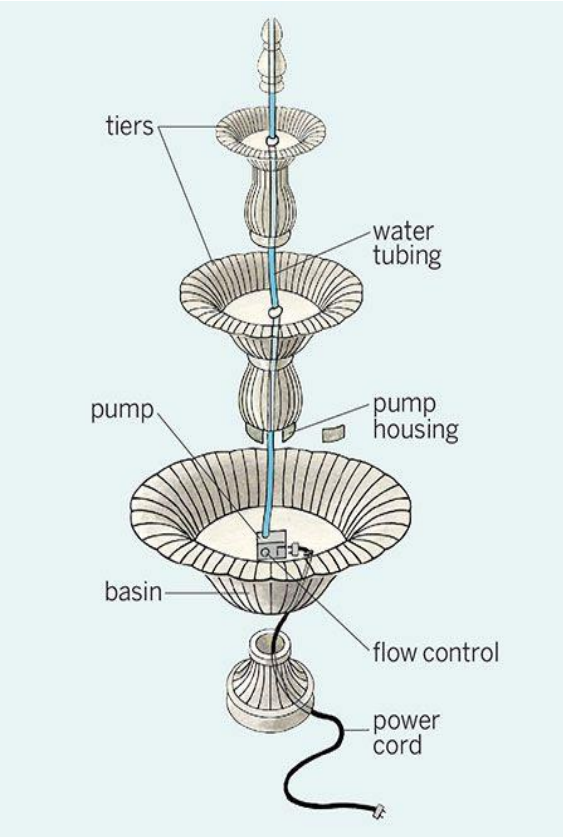
How to Control Water Flow Using Water Flow Regulators | Atlas ...A water flow regulator is a device that controls the flow of water from the source to the rest of the line—primarily reducing the pressure from the source. For example, pipes will have a water flow regulator connected before entering your home.

What is the best valve to control water flow?

CPV ManufacturingGlobe ValvesGlobe valves feature a unique construction designed to make the fluid passing through change direction twice. They are ideal for throttling and regulating flow with wire drawing and seat erosion. They are cheaper than gate valves but have greater resistance to flow.

SCHEMATIC DIAGRAM:

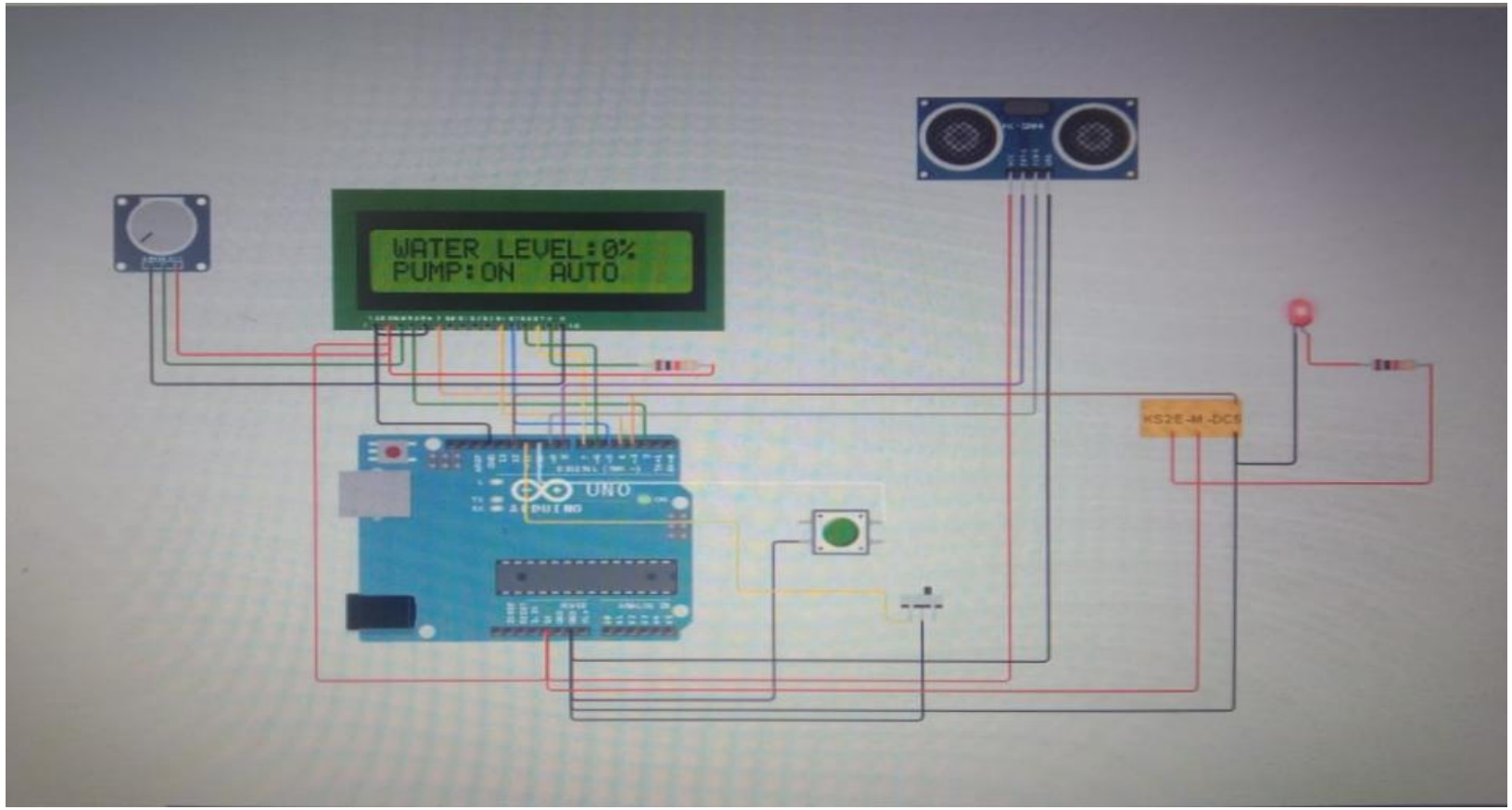




REQUIRED COMPONENTS:

1. Arduino UNO or Arduino Nano
   Float switch sensor 2no
   30A 5V SPDT relay module
2. 1k 0.25watt Resistors – 8 no (R1 – R8)
3. 10k 0.25watt Resistors – 4 no (R9 – R12)
4. BC547 NPN Transistor (Q1)
5. LED 5mm – 7no
   2-pin Terminal connectors (5 no)
   3-pin Terminal connectors (3 no)5V DCBuzzer
   Switches – 2noAC to DC converter 5V HLK-10M05 (Optional)

CIRCUIT DIAGRAM:



PROGRAM:

```
#include <EEPROM.h>
#include <LiquidCrystal.h>
LiquidCrystal lcd(2,3,4,5,6,7);
long duration, inches;
int set_val,percentage;
bool state,pump;
void setup() {
lcd.begin(16, 2);
 lcd.print("WATER LEVEL:");
 lcd.setCursor(0, 1);
 lcd.print("PUMP:OFF MANUAL");
 pinMode(8, OUTPUT);
pinMode(9, INPUT);
pinMode(10, INPUT_PULLUP);
pinMode(11, INPUT_PULLUP);
pinMode(12, OUTPUT);
```

```
set_val=EEPROM.read(0);
if(set_val>150)set_val=150;}
void loop() {
 digitalWrite(3, LOW);
delayMicroseconds(2);
digitalWrite(8, HIGH);
delayMicroseconds(10);
digitalWrite(8, LOW);
duration = pulseIn(9, HIGH);
inches = microsecondsToInches(duration);
percentage=(set_val-inches)*100/set_val;
 lcd.setCursor(12, 0);
if(percentage<0)percentage=0;
lcd.print(percentage);
lcd.print("%   ");
 if(percentage<30&digitalRead(11))pump=1;
if(percentage>99)pump=0;
digitalWrite(12,!pump);
```

```
lcd.setCursor(5, 1);
if(pump==1)lcd.print("ON ");
else if(pump==0) lcd.print("OFF");
 lcd.setCursor(9, 1);
if(!digitalRead(11))lcd.print("MANUAL");
else lcd.print("AUTO   ");
if(!digitalRead(10)&!state&digitalRead(11))
{
state=1;
 set_val=inches;
 EEPROM.write(0, set_val);
    }
 if(!digitalRead(10)&!state&!
digitalRead(11)){
state=1;
pump=!pump;
  }         if(digitalRead(10))state=0;
delay(500);
}
long microsecondsToInches(long microseconds) {
return microseconds / 74 / 2;
}
```

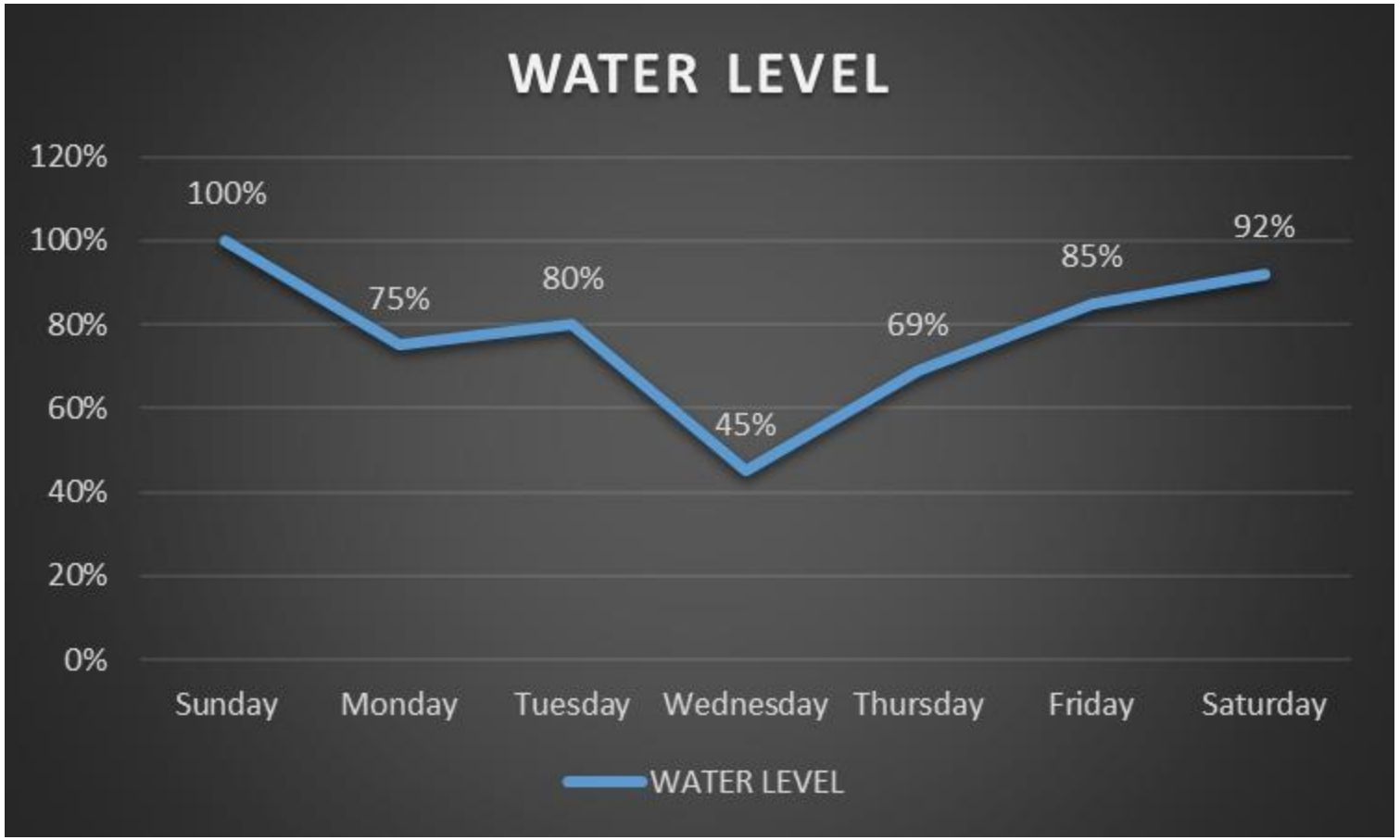
IOT SENSOR:

IoT sensors are used to measure various parameters of water quality, such as pH, temperature, dissolved oxygen, and the presence of chemicals and microorganisms. These sensors can be placed in rivers, lakes, and other bodies of water, and they can transmit data in real-time to a central monitoring system.

DESIGN FEATURES:

1. Fountains wirelessly communicate with base stations
2. Base stations collect and transmit usage, filter, and system health information to the cloud via Ethernet
3. Wireless communications use a low-power unlicensed band for improved security and power savings

OUTPUT:


WATER LEVEL
120%
100%
80%
60%
40%
20%
0%
100%
75%
80%
45%
69%
85%
92%
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
WATER LEVEL