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PROJECT NAME:SMART WATER MANAGEMENT
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Smart water management using IOT

1. Introduction

Internet of Things has been associated with cities, smart homes and also to manage traffic system.A unknown fact that about internet of things technology is also application across many other fields in our everyday life. Another such area where the internet of things technology can play a major role in water management.IOT is evolving fast and latest innovation occurring in wireless technology and embedded technology. This work focuses on a solution for water management in colleges, building and commercial area with the help of IOT. Water is precious and supply the needs to be regulated.

To maintain the water in a proper way, should prevent the overflow of water in tanks and usage of the water in proper manner. In traditional days there is no proper maintenance of water. In conventional tanks there is need of human being toON/OFF the motor. In this paper the automated system is introduced which is used to save the human work and cost. In this system the motor is automatically ON/OFF by using level sensor. The usage of water is observed by the water flow sensor.

2. Related work

Many researches are working in the field of IOT and its application. One such application is Smart Water Management. The researchers are creating a system which can indicate level of water in tanks, usage of water in water,quality monitoring suchas turbidity sensor, PH sensor, salt sensor in the water tanks to know contamination, alkaline nature and salts in the water which causes diseases to living beings. Another work presented an IOT system which is capable of detecting and displaying level of water in the storage tanks and used for managing and planning use of water.

Divyapriya et.al in continuously keeps track of the level of the water in water system like overhead water tanks. Proposed the client can send the message to the framework realize the water level subtleties of the tank. This is intended to control the dimensions of water with help of ultrasonic sensor and GSM innovation. Kumar et.al in IOT based water management system for a campus proposed real time monitoring system for campus recommended that work utilized an off /on the track ultrasonic sensor HC-SR04 which is mounted at the highest point of the tank.It sends the ultrasound beats at 40khz towards the water surface and measures the reflected waves backs to the sensor.

3. Existing system

This is used for water level detection and automatic ON/OFF the motor for water tanks. By using IOT the data is upload on Ada fruit platform. Laser sensor is placed above the tank toknowthe level of the water in the tank. When water falls below the threshold value the motor is automatically ON.

Fig.1: Block diagram of existing model

4. Proposed System

In the proposed system the following parameters can be known

➢ The level of water in the tank by using the ultrasonicsensor and can reduce overflow of the water.

➢ The usage of the water in the tank can be used to controlthe wastage of the water.

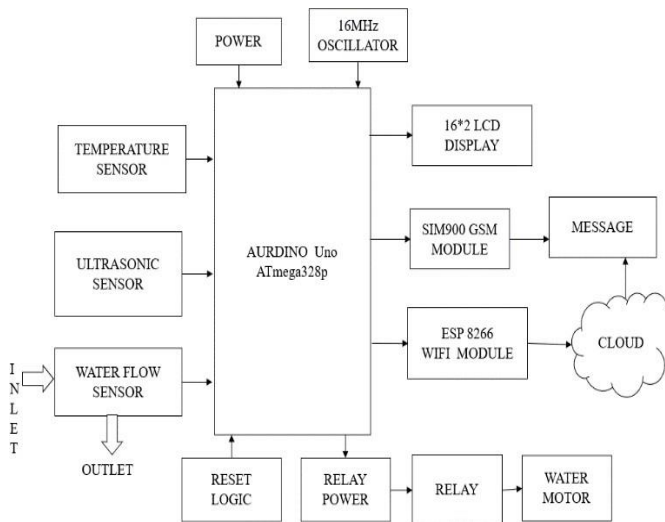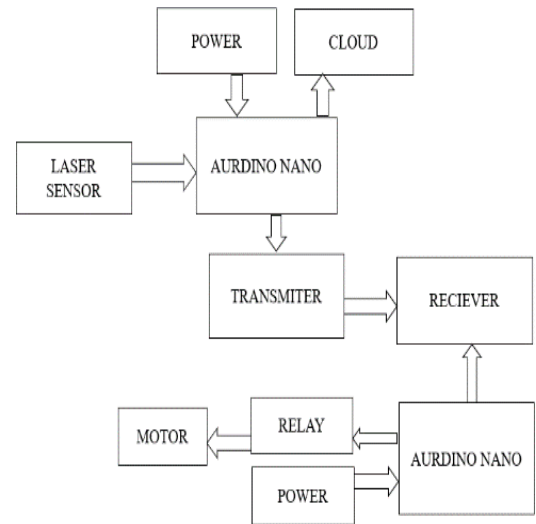➢ To know the temperature in the water tank in real time

Fig. 2: Block Diagram of Proposed System

The Arduino UNO has super convenient power management and built-in voltage regulation.The Arduino can be directly powered through USBor external power supply.

The external power supply can be given by

- Connecting power source(7-12v DC) to DC power jack
- Connecting a battery lead to Vin and Gnd.

5V and 3.3Vare used to provide power to sensors and modules when connecting it to. The temperature sensor LM35IC has been used for sensing the temperature. It is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature. The temperature can be measured more accurately with it than using a thermistor. The sensor circuit ryis sealed and not subject to oxidation, etc. It is a three terminal sensor used to measure the surrounding temperature ranging from -55 degree centigrade to 150 degree centigrade.
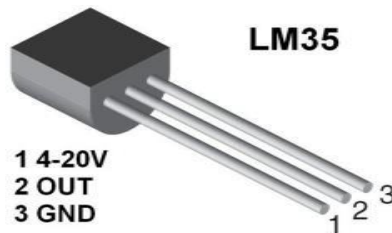

Fig. 3: temperature sensor

Water flow sensor are installed at the water sources or pipes to measure the rate of flow of water and calculate the amount of water flowed through the pipe. Rate of flow of water is measured as liter per hour or cubic meters. Water flow sensor consists of plastic valve from which water can pass. A water rotor along witha hall effect sensor is present and measure the water flow. The main working principle behind the working of this sensor is the hall effect. According to this principle , in this sensor , a voltage difference is induced in the conductor due to rotation of the rotor. This induced voltage difference is transverse to the electric current.

Fig. 4: water flow sensor

The HC-SR04 ultrasonic module is a module that can provide noncontact measurement within the range of 2cm to 400cm with an ranging accuracy that can reach 3mm. It works on the principle of echolocation. The ultrasonic sensor as a trigger and an echo pins. The Arduino provides a high signal of 10microseconds tothis pin. The sensor is trigged, it send out a 840khz to the surface of the water. On getting to the surface of the water, the wave is echoed back to the sensor and the Arduino reads the echo pin to determine the time spent between the triggering and receiving of the echo.

Fig. 5: Ultrasonic sensor

The Arduino Uno is used as microcontroller in this structure , it has 14 propelled data/yield pins of which the user are using 6 pins for interfacing sensors-waterflow , Ultrasonic and temperature. Interfacing the wi-fi module ESP8266 with Arduino for giving an electronic system. Arduino is a microcontroller board subject to the Atmega328p. A 16 MHz quartz valuable stone, a USB affiliation, a power jack, a reset.

Fig. 6: Arduino uno

The ESP8266 can do either offloading wi-fi frameworks organization limits from another application processor or encouraging an application. The ESP8266 wi-fi module is a free SOC with facilitated TCP/IP show stack that can giveany microcontroller to access to the wi-fi range. This module has an earth shattering enough prepared getting ready and limit capacity that empowers it to be composed with the sensors.

Fig. 7:ESP 8266 WI-FI module

The SIM900 is a quad-band GSM/GPRS solution is a SMT module which can be embedded in the customer applications.Featuring an industry standard , interface the SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for the voice, sms , data with small power consumption.

A 16*2 LCD has two registers namely, command and the data. The register select is used to switch from one register to other. RS=0 for command register and RS=1 for data register.

5. Results

This paper gives efficient usage and level detection of water in the water tank in effective manner by using the IOT.
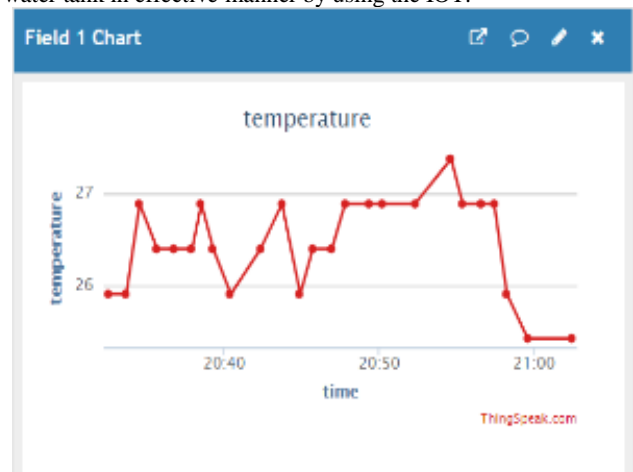

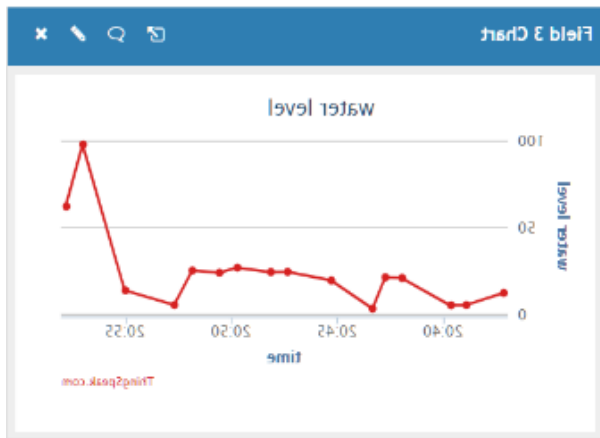**Fig. 8:** temperature in water tank
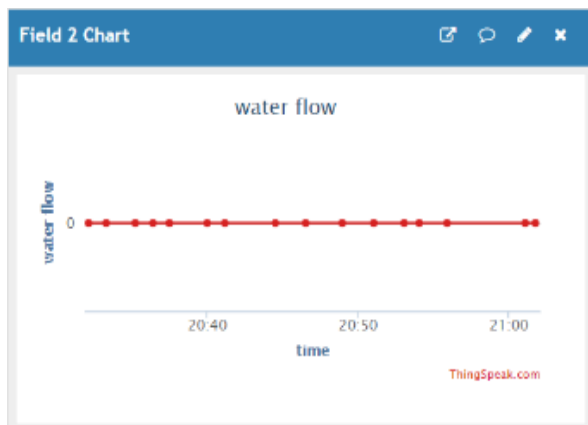
Fig. 9: Water level sensor

Fig.10: Water is not in usage

6. Conclusions

According to this system, proposed architecture becomes more autonomous with quick transmission of data by using IOT. The main advantage in IOT is, even when clients are not in the node network, data will be sent, whenever a client is connected with that node, they can able to see the data which has been sentalready.

Smart water management can reduce the overflow of water in tanks and provide the usage of water in liter per hour in real time. This system is cost effective. This enables the efficient use of water.Thus it reduces the wastage of water. This project can be further enhanced by using the results of this present project. The turbidity sensor is placed in the water tank to know quality of water which is helpful to know that chemicals in the water. The PH sensor is also placed in water tank to know the nature of water in tanks in which is suitable for drinking or not for living beings inreal time by using IOT.

Smart water management project code:

```
#define
_DISABLE_TLS_


                        #include <ThingerESP8266.h>
                        #include <ESP8266WiFi.h>
                        #include <SPI.h>
                        #include <Wire.h>
                        #include <Adafruit_GFX.h>
                        #include <Adafruit_SSD1306.h>
                        #define OLED_RESET LED_BUILTIN
```

```
#define USERNAME "test123"
#define DEVICE_ID "SWM"
#define DEVICE_CREDENTIAL "ABCDEFGHIJ"


#define SSID "test123"
#define SSID_PASSWORD "test123"
Adafruit_SSD1306 display(OLED_RESET);


byte indikator = 13;


byte sensorInt = 0;
byte flowsensor = D3;


float konstanta = 4.5; //konstanta flow meter


volatile byte pulseCount;


float debit;
float harga;
unsigned int flowmlt;
unsigned long totalmlt;


unsigned long oldTime;


ThingerESP8266 thing(USERNAME, DEVICE_ID, DEVICE_CREDENTIAL);


void setup()
{
display.begin(SSD1306_SWITCHCAPVCC, 0x3C);
display.clearDisplay();
display.display();
display.setTextSize(1);
display.setTextColor(WHITE);
display.setCursor(0, 0);


// Inisialisasi port serial
Serial.begin(9600);
```

```
pinMode(flowsensor, INPUT);


pulseCount = 0;
debit = 0.0;
flowmlt = 0;
totalmlt = 0;
oldTime = 0;
harga = 0.0;


// digital pin control example (i.e. turning on/off a light, a
relay, configuring aparameter, etc)
thing["sensor"] >> [](pson& out){


digitalWrite(flowsensor, HIGH);


attachInterrupt(digitalPinToInterrupt(D3), pulseCounter, FALLING);


out["debit"] = debit;
out["volume"] = totalmlt;
out["harga"] = harga;


};
}


void loop()
{
thing.handle();
display.clearDisplay();
if((millis() - oldTime) > 1000)
{
detachInterrupt(sensorInt);
debit = ((1000.0 / (millis() - oldTime)) * pulseCount) / konstanta;
oldTime = millis();
flowmlt = (debit / 60) * 1000;
totalmlt += flowmlt;
harga = totalmlt*0.002;


unsigned int frac;
```

```
    Serial.print("Debit air: ");
    Serial.print(int(debit));
    Serial.print("L/min");
    Serial.print("\t");
    display.setCursor(0, 0);
    display.print("Debit air: ");
    display.setCursor(60, 0);
    display.print(int(debit));
    display.setCursor(85, 0);
    display.print("L/min");




    Serial.print("Volume: ");
    Serial.print(totalmlt);
    Serial.print("mL");
    Serial.print("\t");
    display.setCursor(0, 12);
    display.print("Volume: ");
    display.setCursor(50, 12);
    display.print(totalmlt);
    display.setCursor(100, 12);
    display.print("mL");
    display.print("\t");




    Serial.print("Harga: ");
    Serial.print("Rp ");
    Serial.println(harga);
    display.setCursor(0, 24);
    display.print("Harga: ");
    display.setCursor(45, 24);
    display.print("Rp ");
    display.setCursor(70, 24);
    display.println(harga);
    display.display();




    pulseCount = 0;


    attachInterrupt(digitalPinToInterrupt(D3), pulseCounter, FALLING);
  }
}
```

```
void pulseCounter()
{
// Increment the pulse counter
pulseCount++;
}
```

Reference github link: https://github.com/thefloatman/smart-water-meter-project/commit/c5824c51870d1ae0b8efb3e400e1a27814352b00#diff-e2eb93a61ffd7877ea5c751abcb3a618e8e2e9a2073a27f66d4114fe10819f86