Iot water consumption monitoring

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Abstract: *O*ne of the biggest problems faced today is the challenge of water scarcity caused by increasing water consumption. This consumption can be intimated by measuring the flow of water to every connection in a water supplying network. In this paper, we are focusing on continuous and real time monitoring of water supply in IOT platform. Water supply with continuous monitoring makes a proper distribution so that, we can have a record of available amount of water in tanks, flow rate, abnormality in distribution line. Internet of things is nothing but the network of physical objects embedded with electronics, sensors ,software and network connectivity where monitoring can be done from anywhere .

***Keywords* – IOT Platform, NodeMcu, Water flow sensor, Serial monitor**

I. INTRODUCTION

Water is the most precious and valuable resource because it is a basic need for all the human beings but, now a days water supply department is facing many problems in real time operation this is because less amount of water in resources due to less rain fall. With increase in Population, urban residential areas have increased because of this reasons water has become a crucial problem which affects the problem of water distribution, interrupted water supply, water conservation, water consumption and also the water quality so, to overcome water supply related problems and make system efficient there is need of proper monitoring and controlling system. In this paper, we are focusing on overcoming the water scarcity caused by increasing water consumption. This can be done by intimating the water consumption by measuring the flow of water in every connection in a water supplying network. On the basis of the measured value, the usage of water by each unit can be calculated.

2. OVER VIEW OF IOT WATER MONITORING SYSTEM:

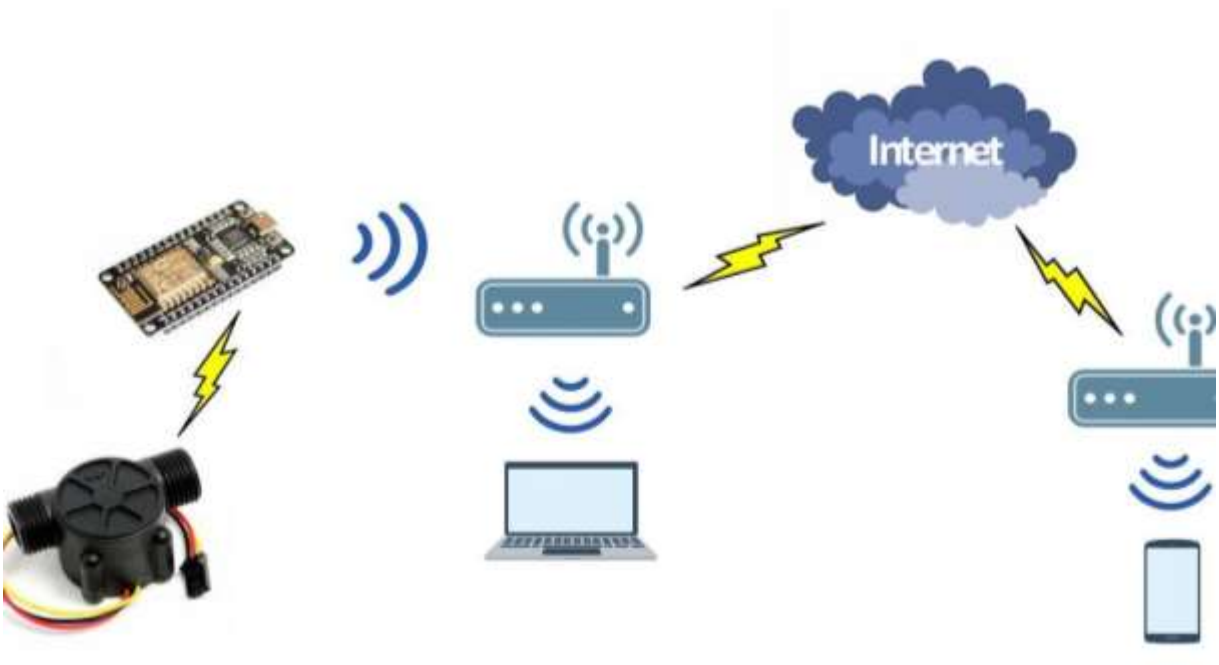

Fig:1 Iot water monitoring system

3. HARDWARE REQUIREMENTS:

1.NODEMCU
2.WATER FLOW SENSOR
3.BREADBOARD
4.WIFI CONNECTIVITY
5. JUMPER WIRES

3.1 NODEMCU

NodeMCU is an open source IOT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module.

Fig -2 NodeMcu

3.2 WATER FLOW SENSOR

Water flow sensor consists of a plastic valve body, a water rotor, and a hall-effect sensor. When water flows through the rotor, rotor rolls. Its speed changes with different rate of flow. The hall-effect sensor outputs the corresponding pulse signal. This one is suitable to detect flow in water dispenser or coffee machine**.**

Fig –3 water flow sensor

4. Hard Ware Specifications:

Table -1: specification parameters

S. No	Component	Ratings
1.	NODEMCU	-------
2.	WETER FLOW SENSOR	5 to 18V DC
3.	LED	------

5.CONNECTION:

The hardware connection is done by attaching 3 cables (jumper cables) between the flowmeter and the nodemcu, in order to get the on/off pulse generated by the flow of water and thus count for the litres .

- Connect the red cable output from the flowmeter to the 3.3v pin on the nodemcu.
- The black cable output from the flowmeter to "ground" on the nodemcu.
- Connect the yellow cable output from the flowmeter to the control pin on the nodemcu.
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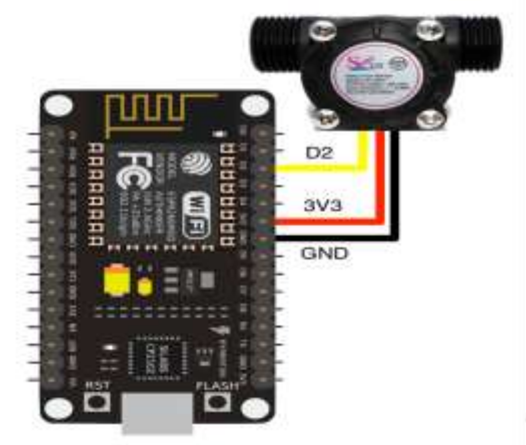

Fig:4 Connection Diagram

6.CODE FOR NODEMCU

```
#include <Arduino.h>
#include <EEPROM.h>
#define USE_SERIAL Serial
#include <ESP8266WiFi.h>
#include <ESP8266HTTPClient.h>
// Variable init
const int buttonPin = D2; // variable for D2 pin
const int ledPin = D7;
char push_data[200]; //string used to send info to the server ThingSpeak
int addr = 0; //endereço eeprom
byte sensorInterrupt = 0; // 0 = digital pin 2
// The hall-effect flow sensor outputs approximately 4.5 pulses per second per
// litre/minute of flow.
float calibrationFactor = 4.5;
volatile byte pulseCount;
float flowRate;
unsigned int flowMilliLitres;
unsigned long totalMilliLitres;
unsigned long oldTime;
//SSID and PASSWORD for the AP (swap the XXXXX for real ssid and password )
const char * ssid = "<NETWORK_NAME>";
const char * password = "<NETWORK_PASSWORD>";
//HTTP client init
HTTPClient http;
void setup() {
Serial.begin(115200); // Start the Serial communication to send messages to the
computer
delay(10);
Serial.println('\n');
startWIFI();
 // Initialization of the variable “buttonPin” as INPUT (D2 pin)
    pinMode(buttonPin, INPUT);
// Two types of blinking
    // 1: Connecting to Wifi
    // 2: Push data to the cloud
 pinMode(ledPin, OUTPUT);
 pulseCount = 0;
 flowRate = 0.0;
 flowMilliLitres = 0;
 totalMilliLitres = 0;
  oldTime = 0;
 digitalWrite(buttonPin, HIGH);
 attachInterrupt(digitalPinToInterrupt(buttonPin), pulseCounter, RISING);
}
void loop() {
if  (WiFi.status()  ==  WL_CONNECTED  &&  (millis()  -  oldTime)  >  1000)  //  Only  process
counters once per second
 {
 // Disable the interrupt while calculating flow rate and sending the value to
 // the host
   detachInterrupt(sensorInterrupt);
 // Because this loop may not complete in exactly 1 second intervals we calculate
  flowRate = ((1000.0 / (millis() - oldTime)) * pulseCount) / calibrationFactor;
  oldTime = millis();
  // convert to millilitres.
  flowMilliLitres = (flowRate / 60) * 1000;
  // Add the millilitres passed in this second to the cumulative total
   totalMilliLitres += flowMilliLitres;
   unsigned int frac;
   // Print the flow rate for this second in litres / minute
   Serial.print("Flow rate: ");
   Serial.print(int(flowRate)); // Print the integer part of the variable
   Serial.print("."); // Print the decimal point
   // Determine the fractional part. The 10 multiplier gives us 1 decimal place.
   frac = (flowRate - int(flowRate)) * 10;
   Serial.print(frac, DEC); // Print the fractional part of the variable
   Serial.print("L/min");
   // Print the number of litres flowed in this second
   Serial.print("  Current Liquid Flowing: "); // Output separator
   Serial.print(flowMilliLitres);
   Serial.print("mL/Sec");
   // Print the cumulative total of litres flowed since starting
    Serial.print("  Output Liquid Quantity: "); // Output separator
    Serial.print(totalMilliLitres);
    Serial.println("mL");
    if (flowRate > 0) {
    digitalWrite(ledPin, HIGH);   // turn the LED on (HIGH is the voltage level)
    delay(100);
   // Replace <YOUR_API_KEY> with your EmonCMS API Key
   sprintf(push_data,
//"http://emoncms.org/input/post?json={frac:%d.%d,flowml:%d,totalml:%d}&node=Penampung
2&apikey=<YOUR_API_KEY>",       int(flowRate),       int(frac),       flowMilliLitres,
totalMilliLitres);
   Serial.printf("%s\n", push_data);
    http.begin(push_data);
    digitalWrite(ledPin, LOW);    // turn the LED off by making the voltage LOW
    delay(100);
    int httpCode = http.GET();
    // httpCode_code will be a negative number if there is an error
     Serial.print(httpCode);
     if (httpCode > 0) {
    digitalWrite(ledPin, HIGH);   // turn the LED on (HIGH is the voltage level)
     delay(100);
    // file found at server
     if (httpCode == HTTP_CODE_OK) {
     String payload = http.getString();
     Serial.print(" ");
    Serial.print(payload);
```

```
                }
  digitalWrite(ledPin, LOW);    // turn the LED off by making the voltage LOW
   delay(100);
           } else {
  Serial.printf("[HTTP] GET... failed, error: %s\n",
   http.errorToString(httpCode).c_str());
    }
    http.end();
      }
  // Reset the pulse counter so we can start incrementing again
      pulseCount = 0;

  // Enable the interrupt again now that we've finished sending output
      attachInterrupt(sensorInterrupt, pulseCounter, FALLING);
    } else if (WiFi.status() != WL_CONNECTED) {
      startWIFI();
     }}
 /*
  Insterrupt Service Routine
  */
 void pulseCounter() {
  // Increment the pulse counter
  pulseCount++;
 }

 void startWIFI(void) {
  digitalWrite(ledPin, HIGH);   // turn the LED on (HIGH is the voltage level)
  delay(100);

  WiFi.begin(ssid, password); // Connect to the network
  Serial.print("Connecting to ");
  Serial.print(ssid);
  Serial.println(" ...");
  oldTime = 0;
  int i = 0;
  digitalWrite(ledPin, LOW);    // turn the LED off by making the voltage LOW
  delay(100);

  while (WiFi.status() != WL_CONNECTED) { // Wait for the Wi-Fi to connect
      digitalWrite(ledPin, HIGH);   // turn the LED on (HIGH is the voltage level)
      delay(2000);
      Serial.print(++i);
      Serial.print('.');
      digitalWrite(ledPin, LOW);    // turn the LED off by making the voltage LOW
      delay(100);
  }
  delay(2000);
  Serial.print('\n');
  Serial.print("Connection established!");
  Serial.print("IP address:\t");
  Serial.print(WiFi.localIP()); //Send the IP address of the ESP8266 to the
  Computer
  }
```

7.WORKING

In general water flow measurement is necessary for various purposes in industrial,domestic……using various methodologies.In this project we are going to measure the water flow using water flow sensor and nodemcu .

When the water flows through the water flow sensor placed in the middle of the flow,the sensor detects the flow and is represented as emf at the output terminal of the flow sensor.The obtained EMF at the output of the sensor will be proportional to the flow rate at which the water is being consumed.The output of the sensor is connected to the nodemcu ,where the proportional emf will be converted into the flow rate in litres per hour or milli litres per second based on the coding provided to the nodemcu board. Now open the Arduino software and run the code in pc and then open the serial monitor and set the baud rate same as that was mentioned in the code .Now the flow rate will be displayed in that monitor.In this way we can contionously monitor the flow rate by using iot .

EMF Induced in the sensor α Rate of flow

8.Practical hardware model of iot water consumption monitoring

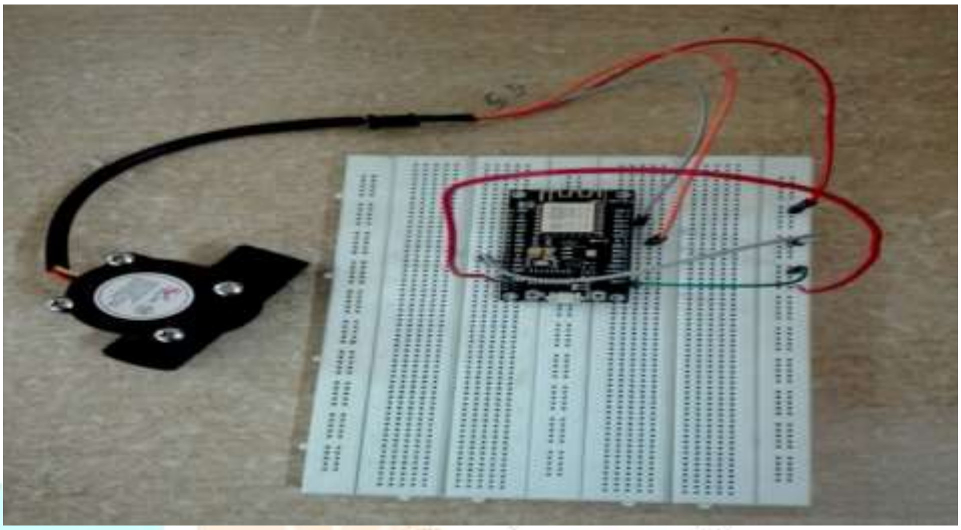

Fig:4 Hardware of water consumption monitoring

9. FUTURE SCOPE

In future, the proposed system can be used to monitor and analyze water usage of the specific water source thus require developing such logic for the application. The system can also be used to collect and study the environmental data of water source,water consumption at domestic level ,industrial level…and its surrounding area by integrating other sensor to the system. The study may include location data, water quality, temperature, humidity and various other factors.

10. CONCLUSIONS

This IoT based proposed system is used to acquire water flow details of a water source in real time from any location, any device connected to Internet. This water flow data can be used for various purposes for better management of water source.

Monitoring water flow and its consumption from remote location may be very useful when it is not possible to visit location physically every time. The system can be implemented for different sources of water by replacing sensor device suitable for the condition.

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