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SEWAGE MAINTENANCE AND MONITORING SYSTEM

CSE 3009: Internet of Things (IoT) Project Report

B.Tech CSE

School of Computing Science & Engineering

Submitted by

Prithish Samanta-19BCE2261

Anchit Agarwal-19BCE2279

Ritvik Kohli-19BCE2223

Pranav K Kadambi-19BCE0964

Under the guidance of

Dr. Vishnu Srinivasa Murthy Y

CERTIFICATE

This is to certify that Ritvik Kohli (19BCE2223), Anchit Agarwal (19BCE2279), Prithish Samanta (19BCE2261) and Pranav K Kadambi (19BCE0964) 3rd year B.Tech, (Computer Science & Engineering) from Vellore Institute of Technology (VIT) have successfully completed their project work in the field of Internet of Things (IoT) on the topic SEWAGE MAINTENANCE AND MONITORING SYSTEM. This is a record of their own work carried out during the Fall Semester of the Academic Year 2020-21 under the guidance of Dr. Vishnu Srinivasa Murthy Yarlagadda. He has presented his project in the presence of faculty.

Dr. Vishnu Srinivasa Murthy Y
Assistant Professor / Guide.

ABSTRACT

Across the country, sewage overflow is the most common issue. Many cities are on the path to becoming smart cities, but sewage maintenance remains a challenge. Most people's everyday routines are affected by overflow. The current sewage maintenance system isn't up to the task of preventing flooding. A method is being developed to reduce sewage floods by sensing rising sewage levels. The system consists of sensors that detect level, a microcontroller that executes commands, and a network that logs problems. To record data, a base station must be constructed. The system monitors the sewage level and, in the event of an overflow, sends a signal and a message to the appropriate agencies.

Sewage management is a critical component of urban infrastructure, and it has a direct impact on our daily hygiene. Poor sewage/drainage management can result in urban flooding, which is especially common in densely populated areas. Smart Sewage Management Devices based on IoT and Sensor Technology can help solve this problem.

In this project, we have developed a smart device that can detect when the drainage system becomes clogged, and if the water overflows as a result of the clogging, we'll notify the local government to take appropriate action. Furthermore, the drainage system's status may be checked in real time using the Android application. This project is similar to a previous water level indicator project, but instead of water, we will be sensing sewage overflow and monitoring it online via IoT.

ACKNOWLEDGEMENT

The success and final end of this project necessitated a great deal of direction and assistance from many people, and we consider ourselves quite fortunate to have received it during the duration of our project. It is only because of such oversight that we have accomplished everything we have. We would like to express our gratitude for their help and assistance, and we would not forget to thank them.

First and foremost, we owe a debt of gratitude to Dr. Vishnu Srinivasa Murthy Y, our IoT professor, who was very interested in our idea and helped us all along the way, till we finished our project job by supplying all of the necessary resources and information on putting together a solid system. We won't forget to mention our group participants, as well as friends, for the useful information they supplied us.During our course of this project, this ultimately resulted in the project's improvement.

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1. MOTIVATION

As we all know, a well designed efficient sewage system is absolutely necessary for each and every city in the world. Improper maintenance of sewage systems can lead to various problems for the environment and the citizens. This occurs when the sewage pipes/drains leak due to blockage or overflow and all the sewage and waste leaks out of the system. This leads to a lot of germs,bacteria,and foul smell spreading into the environment as well as the communities living around. These factors can cause disease as well as environmental degradation.

In order to prioritise alerting the authorities on sewage leaks before such hazards can take place, we have decided to make a sewage monitoring and maintenance system that alerts the authorities everytime a leak or blockage occurs.

Therefore, keeping in mind the safety of the environment and the communities living in mind,we decided to make this alerting device that uses sensors for detection and the cloud for alerting the designated authorities everytime there's a block or an overflow in the sewage system. By doing so we are preventing the spread of disease, keeping air contamination to a minimum as well as building safe and efficient communities to live in by warning the authorities that can fix the damaged sewage pipes/manholes before even people get a whiff of the bad smell.

2. PROBLEM STATEMENT AND APPLICATION

Our goal is to build a project that monitors water level and detects blockages in sewage systems. If there is an overflow of sewage water or a blockage in the system ,the designated authorities get notified of it through an app.

To do so,our project aims to use 2 types of sensors, an ultrasonic sensor that tries to detect blockage and a water level sensor that detects the water level.

When either of the 2 sensors detect something, it sends info to ESP8266 NodeMCU.

The information is then forwarded to the Blynk Cloud after the ESP8266 does the necessary calculations and a notification will be sent about the problem that has occurred.

Our projects aim at optimizing the time taken to detect water leaks and blockages. Usual sewage leaks are detected by the foul smell or with sewage water overflowing from the drains. Our aim is to detect the blockage before this happens, as it can lead to problems for the environment as well as the people living around the area and this is the novelty in our work.

This application can be used in places where there is poor sewage and drainage management, which can cause urban floods. It can be used to monitor the status of a drainage system, using an Android application. If the water overflows because of this blockage, we will send a notification to the respective authority for the necessary action. It can also be extended to detect water tank overflows in households.

3. PROPOSED APPROACH AND CONNECTION SPECIFICATIONS

a. Proposed Approach

In order to bring this idea to live we have decided to use a float sensor and ultrasonic sensor. The float sensor will help us know when the water level in the sewage rises. An increase in water level might mean that there is a blockage some where in the sewage and needs to be fixed soon. When the water level in the sewage rises, a notification or an alert will be sent to the concerned authorities through the blynk cloud.

The ultrasonic sensor helps in identifying huge objects that have entered the sewage and may lead to a blockage in the sewage. The ultrasonic sensor measure the distance between the water flowing and the sensor. When a huge object comes in between the height that is measured decreases, if the height measured is below a certain level it may lead to a blockage, therefore the concerned authorities are informed again.

b. Connection Specifications

For this project we have used two sensors - ultrasonic sensor and float sensor, a nodemcu esp8266 board, blynk cloud, arduino ide, a bread board, a 5V power supplier, a micro usb to usb cable and few connecting wires.

The ultrasonic sensor’s Vcc pin is connected to the Vin of the Nodemcu, the Echo pin is connected to D2, the Trig pin is connected to D3, and the Grnd pin is connected to the Grnd of the Nodemcu,

The two pins of the float sensor are connected to the Grnd and A0 of the Nodemcu respectively.

The 5V power supply is connected to the Vin and Gnd of the Nodemcu.

One end of the USB to micro USB cable connects the laptop to the nodemcu. It helps inuploading the code to ESP8266.

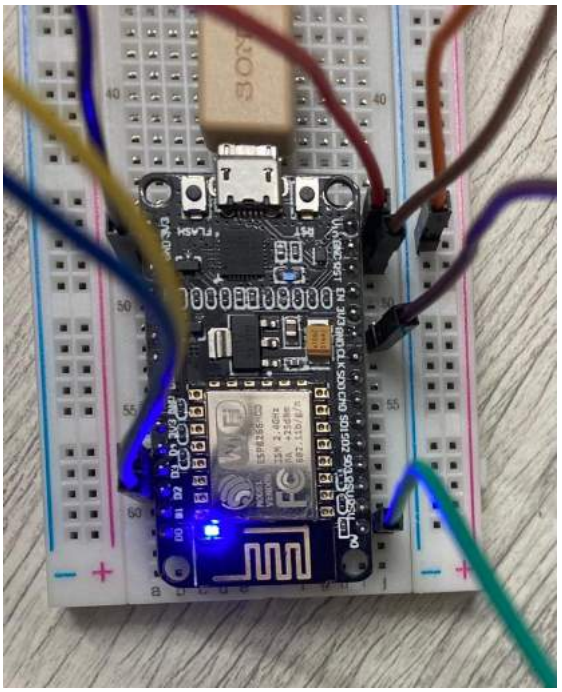

Figure 1: Connections Made

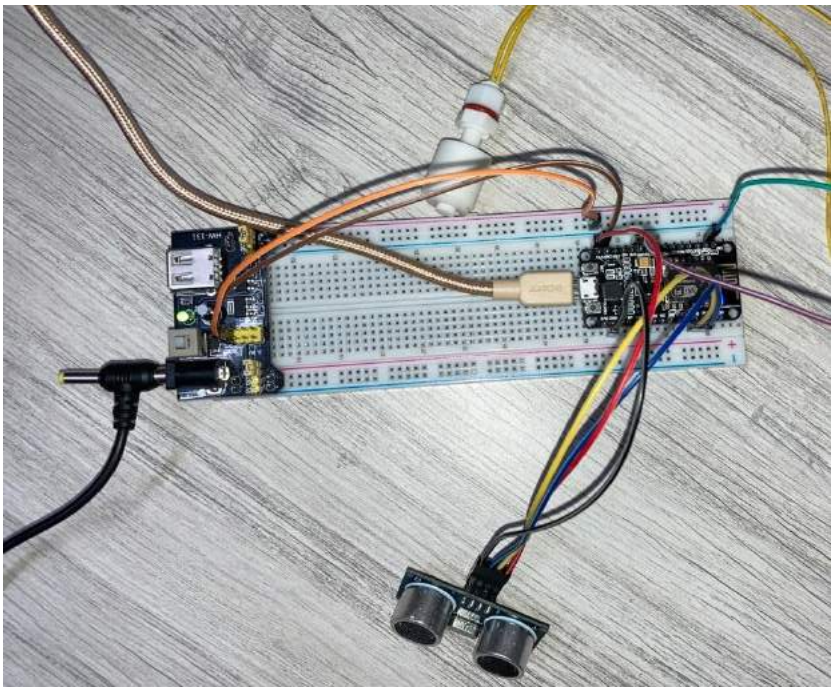

Figure 2: Connections

Figure 3: ESP8266 Nodemcu

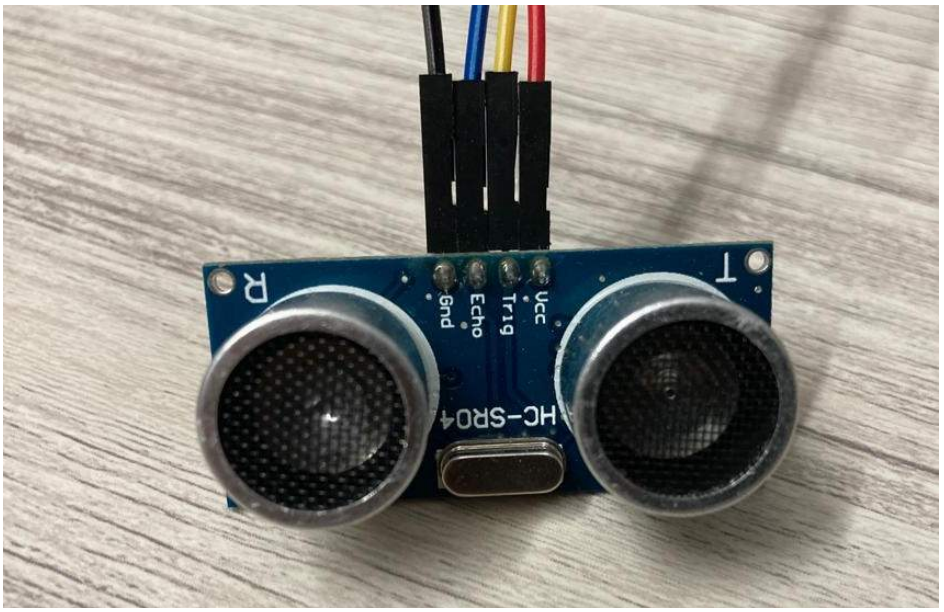

Figure 4: Ultrasonic Sensor

Figure 5: Float Sensor

Once we finished connecting everything, writing the code and connecting the nodemcu to the cloud, we uploaded the code onto the ESP8266 WiFi Module. After that we made the user interface of the frontend which can be seen by the authorities.

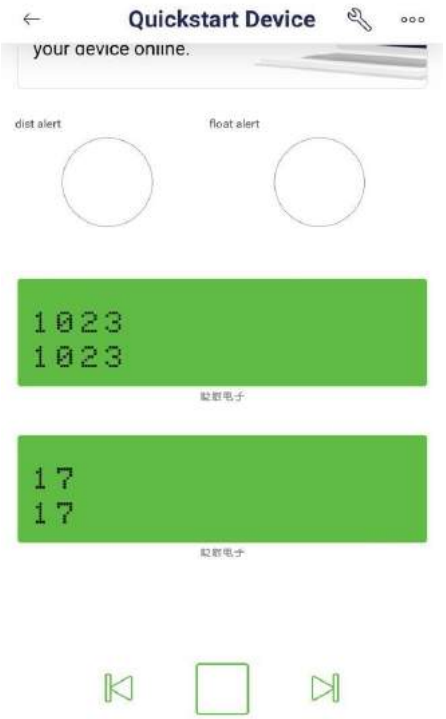

Figure 6: Blynk App User Interface

We added few functionalities to the blynk interface. We have added 2 LCD widgets which displays the numeric values that are share by the 2 sensors. We have also added 2 LED widgets. When the value detected by the sensors crosses a limit the LEDs start 2 blink. When the Ultrasonic sensor dtects a value less than 5, the left LED blinks, and when the float sensor measure a value below 7, the right LED blinks.

4. RESULTS OBTAINED

While running the code we got the following results:

1. The upper LCD constantly display the distance value.

Figure 7: Distance Value Sensed by the Ultrasonic Sensor

2. The lower LCD constantly display the float value.

Figure 8: Float Value Sensed by the Float Sensor

3. When the distance value dropped below 5, the left LED blinked.

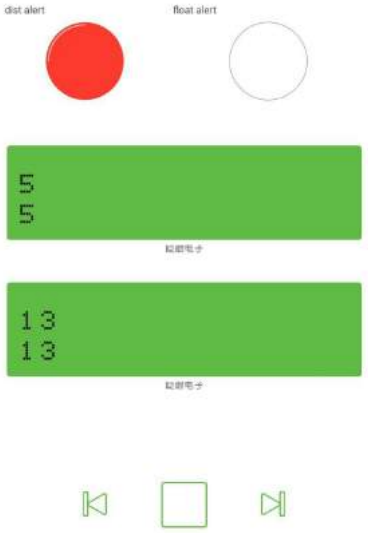

Figure 9: Left LED blinking

4. When the float value dropped below 7 the right LED blinked.

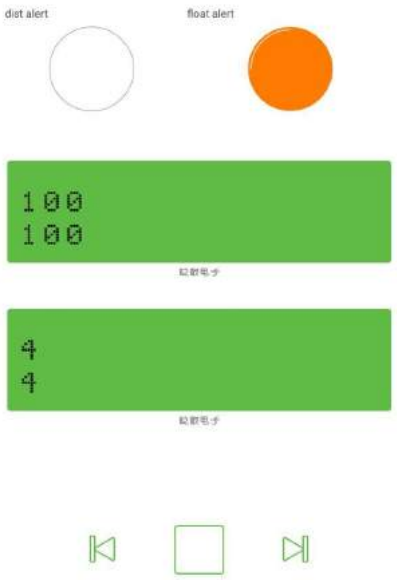

Figure 10: Right LED blinking

5. CODE

```
// Template ID, Device Name and Auth Token are provided by the
Blynk.Cloud
// See the Device Info tab, or Template settings
#define BLYNK_TEMPLATE_ID           "TMPLq7LC233B"
#define BLYNK_DEVICE_NAME           "Quickstart Device"
#define BLYNK_AUTH_TOKEN
"Xkp5FRk5LgDtdbAjJ89R1msFHnJWUide"


// Comment this out to disable prints and save space
#define BLYNK_PRINT Serial


#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>

char auth[] = BLYNK_AUTH_TOKEN;

// Your WiFi credentials.
// Set password to "" for open networks.
char ssid[] = "PNH3032";
char pass[] = "2711196928051975230601";

const int trigPin1 = D3;
const int echoPin1 = D2;
#define redled D4
int duration1,distance1;
int count=0;

void ICACHE_RAM_ATTR ISRoutine();

WidgetLCD lcd(V1);
WidgetLCD lcd1(V2);
WidgetLCD lcd2(V4);
WidgetLCD lcd3(V5);
WidgetLCD lcd4(V6);

void setup()
{
  pinMode(trigPin1, OUTPUT);
  pinMode(echoPin1, INPUT);
```

```
  pinMode(A0, INPUT);
  digitalWrite(A0, OUTPUT);
  pinMode(redled, OUTPUT);
  digitalWrite(redled, LOW);
  Serial.begin(115200);
  Blynk.begin(auth, ssid, pass);
}
void loop()
{
  int float1=analogRead(A0);
  digitalWrite(trigPin1, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin1, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin1, LOW);
  duration1 = pulseIn(echoPin1, HIGH);
  distance1 = duration1 * 0.034 / 2;
  Serial.print("Float Sensor");
  Serial.println(float1);
  Serial.print("Ultra Sonic");
  Serial.println(distance1);
  //lcd.print(0,0,"Hello");
   Blynk.virtualWrite(V4,LOW);
   Blynk.virtualWrite(V5,LOW);
   Blynk.virtualWrite(V1,distance1);
   Blynk.virtualWrite(V2,float1);
   if(distance1 < 10)
   {
    Blynk.notify("Blockage Alert!");
    Blynk.virtualWrite(V4,HIGH);
    Blynk.virtualWrite(V6,"play");
   }
   if(float1 < 7)
   {
    Blynk.notify("Overflow Alert !");
    Blynk.virtualWrite(V5,HIGH);
   }
   delay(100);
   Blynk.run();
}
```

6. CONCLUSION

We have successfully built a prototype for a sewage monitoring and maintenance system. It is proven to work experimentally by connecting the necessary sensors and coding it with the help of arduino. We were able to successfully detect blockages as well as measure water levels of a dummy setup.

The system works by monitoring the distance between the ultrasonic sensor and the blockage as well as measuring the water level with the help of the float sensor. This can be further implemented in actual sewage systems hence making our project extremely scalable and worthwhile.

If this monitoring system is installed in every sewage system and pipes and drains all over the world, then the alert and responses for sewage leaks and damages can be fixed at a much faster and efficient rate with the bare minimum of consequences.

7. REFERENCES

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