
IOT BASED FLOOD MONITORING AND ALERTING SYSTEM

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ABSTRACT

India has a sub-tropical monsoonal climate characterized by heavy rainfall which in turn causes massive flooding. To avert such situations, it is very important to monitor and receive timely emergency alerts about the flow of water and water level situation based of the riverbed. This project focuses on developing a system based on advanced sensors and Wi-Fi module that will sense the current water level and flow of water in riverbeds, in case of the level reaching the threshold, system will generate early email alerts making everyone aware of the flood possibilities. We have connected all the sensors to Arduino UNO, which helps us to process and store data. The system is enabled to send email alerts as well to notify a larger audience.

Keywords: Wi-Fi, Flooding, Water Level, Monitor, Emergency Alerts, Arduino, Email Alerts, Sensors.

I. INTRODUCTION

We are aware of the flooding incidents that takes place in majority of the Indian States each year leading to massive destruction of both lives and property. To detect a flood, the system we observed various natural factors like humidity, temperature water level, and flow level.

The system consists of different sensors for collecting data on the above-mentioned natural factors:

1. DHT11 (Temperature-Humidity Sensor): It is an advanced and popular sensor module used to detect the changes in humidity and temperature. It consists of resistive humidity and temperature detection components.
2. Flow Sensor: It is an advanced sensor that detects the flow of water. It consists of a plastic valve body, a water rotor, and Hall-Effect sensor. As the water level rises and falls the working is occurred by its opening and closing the circuit. When circuit is closed, no electricity passes which makes the circuit incomplete and it is in rest position. When circuit is closed, the water level drops below a predetermined point to complete the circuit and alarm is triggered.
3. HC-SR04 (Ultrasonic Sensor): It is an advanced Ultrasonic sensor used to measure the distance using ultrasonic waves. The sensor will be continuously monitoring the water level in terms of distance, and when the water level crosses the threshold, Email Alerts are triggered.

II. METHODOLOGY

After going through literature survey and various research papers we finalized our hardware and software requirements.

Various natural factors, which includes humidity, temperature, water level and flow level are observed by system to detect flood. Our system consists of different sensors which helps to collect data for individual parameters.

1. For detecting changes in humidity and temperature the system has a DHT11 Digital Temperature Humidity Sensor. It is a sensor which detects humidity and temperature.
2. The water level is always under observation by an Ultrasonic sensor, which works by constantly monitoring as water levels rise and fall. Once the water level increases beyond threshold, a trigger is generated which sends an Email Alert indicating the rise of Water and possibility of Flood.
3. The Flow sensor on the system keeps eye on the flow of water. The speed changes when water falls on rotor which makes it to rotate.

After the successful completion of hardware setup, we move towards software setup and using Arduino IDE and Visual Studio Code. We created a Project Email for sending Email Alerts.

Using Python Scripting and interfacing the Arduino outputs with Python, the program reads the inputs from the sensors via Arduino. We set a threshold value for the water level, once the water crosses the threshold level, a trigger causes the program to send an Email Alert notifying people regarding rise in water level and possibility of flood.

~ [For sending Email alerts, we have interfaced Python with the Arduino’s inputs, as the distance decreases and crosses the threshold value, python program reads the data from Arduino and triggers an Email Alert].

We are also using BLYNK App for displaying real-time values of sensors which provides a plus factor in terms of remote monitoring.

III. MODELING AND ANALYSIS

Flood is a huge threat to humanity as it is also considered one of the most devastating natural disasters in the world. Since flooding results in great damage to agricultural land, residential area, and the economy of the country. In a country like India, with extreme weather and climatic conditions, the occurrence of heavy rainfall is normal.

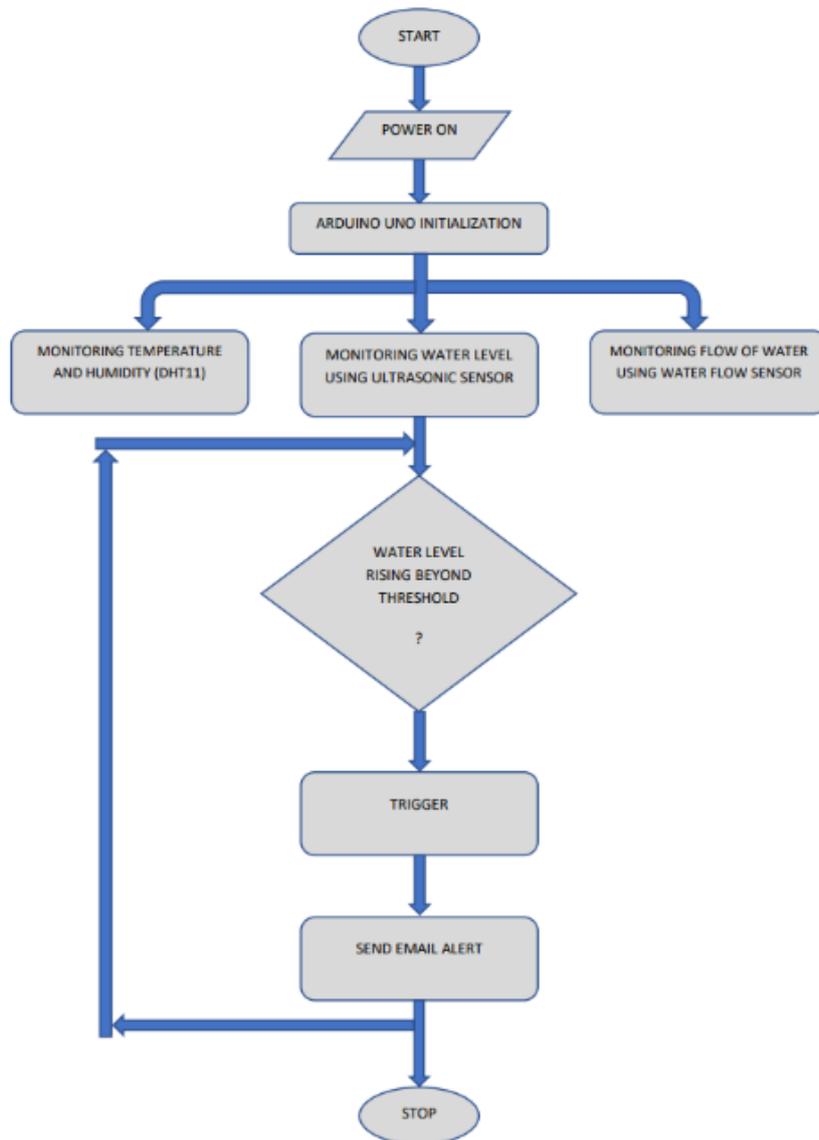


Figure 1: Flow Chart of the System

We are not just monitoring the water level using Ultrasonic Sensor, but also monitoring the flow of water using Flow Sensor which gives an upper hand for immediate alerting the danger. We are using advance Temperature and Humidity Sensor for getting more accurate and correct values of temperature and humidity of surrounding, this sensor works in all extreme conditions. We are using a Wi-Fi module which can send data over the internet. We have used Python for sending Email Alerts interfacing it with the arduino. `readline().decode()` command which allows us to read values and send Email Alerts according with the increase in water-level of the water body.

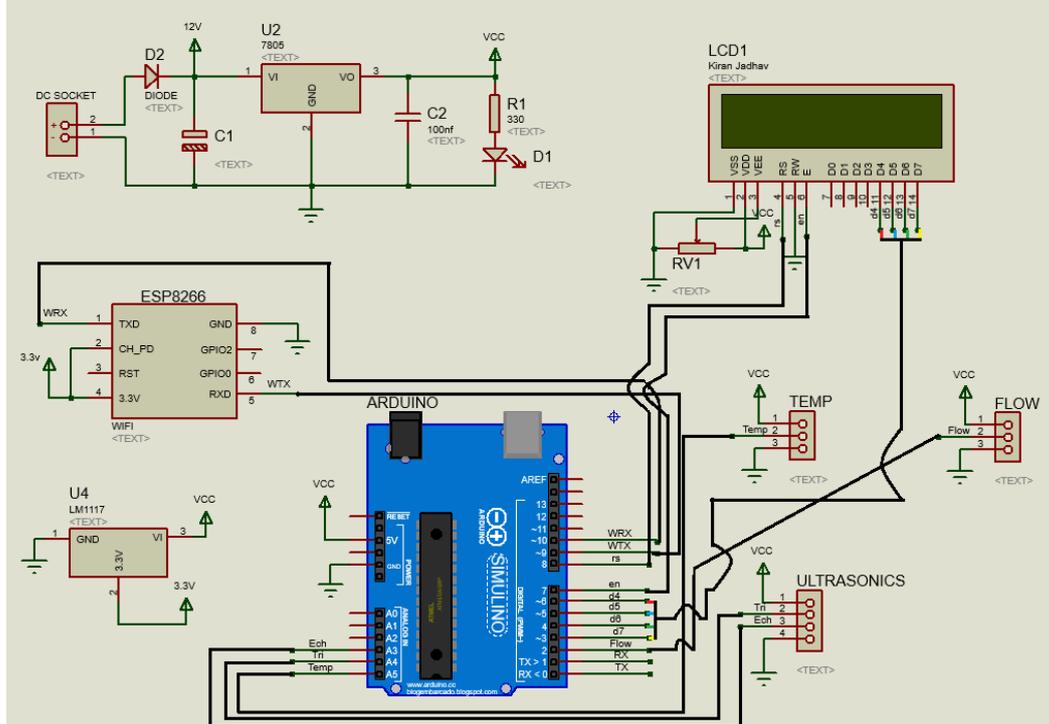


Figure 2: Circuit Diagram of the System

The App and Email Alerts allows Remote Monitoring and Alerting, which has great future scope in future in Disaster Management Sector.

It can also contribute to multiple government agencies or authority that can ultimately help the society and humanity about the flood like hazardous natural disaster.

The model proposed has been already tested and it is working fine. It will monitor every aspect that can lead to flood. Email Alerts will be sent immediately as soon as the water level rises and crosses threshold. It also ensures increased accessibility in dealing and reverting to this catastrophic incident.

To conclude, it will help the government authorities in taking quick decisions and planning against any possible disaster.

IV. RESULTS AND DISCUSSION

We have successfully created the Flood Monitoring and Alerting System using Arduino UNO, ESP 8266 Wi-Fi module, DHT11 (Temperature and Humidity Sensor), HC-SR04 (Ultrasonic Sensor), Flow Sensor, LCD display.

We have also implemented Email Alerts and Real-time readings on the BLYNK App which allows us for Remote Monitoring of the system.

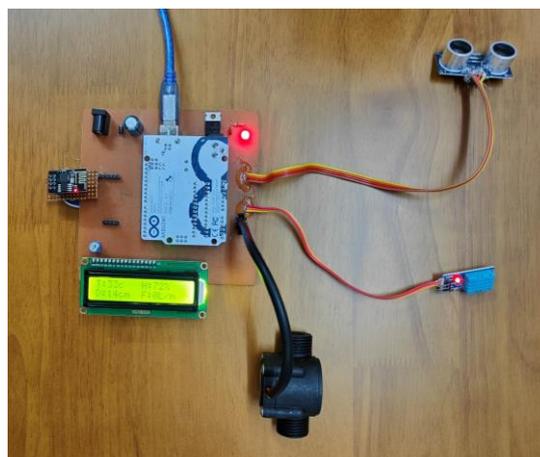


Figure 3: Hardware Setup

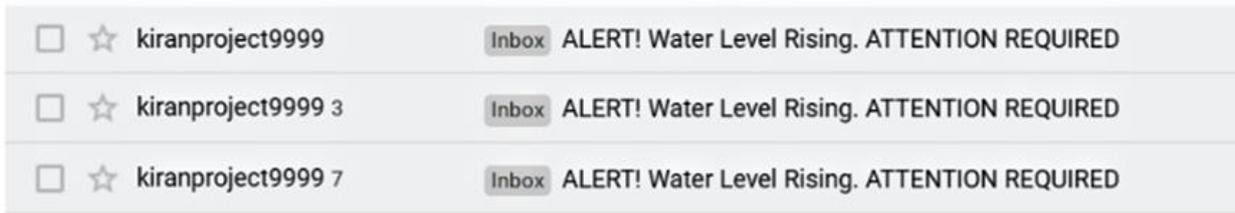


Figure 4: Email Alerts



Figure 5: LCD Display

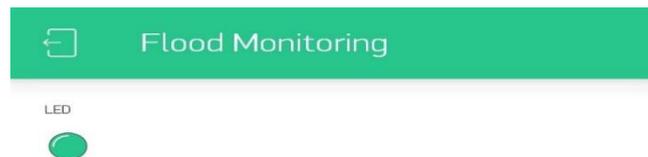


Figure 6: BLYNK App (Realtime Display)

V. CONCLUSION

In this paper, a real-time-based Flood Monitoring and Alerting System has been developed in Arduino UNO-enabled environments using rigorous mathematical models. Internet of Things (IoT) is an emerging platform and broadly used worldwide, this system will display the data of the water level measured on an LCD display. This device can save lives and properties and reduce hazards to a great extent. The future scope of the proposed design is to predict the risk analysis of the effect over the low-lying areas and adverse effect analysis over that condition. It is cost-effective and flexible making it easier to implement.

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