

# Flood Monitoring and Warning System Using IoT

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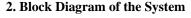
Abstract: Floods have large social consequences for communities and individuals. The immediate impacts of flooding include loss of human life, damage to property, destruction of crops, loss of livestock, and deterioration of health conditions owing to waterborne diseases. Currently available flood monitoring systems works more globally considering the water levels of rivers and weather information of different states in a country. One of the most and the preliminary step is to alert the local people before the occurrence of flood by considering the water level of rivers nearby and updating the emergency opening of dams. The alert system and flood monitoring system update the emergency opening of dams, current water level of rivers nearby particular localities to a website showing IoT logs which can be accessed by the technical authorities and sends the information or notifications in the form of SMS to the affected zones for the further steps.

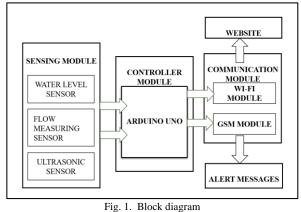
*Keywords*: Arduino Uno, Flood monitoring, Dam monitoring, SMS alerts.

#### 1. Introduction

In recent years flooding became one of the major natural disasters occurring in India. India is among the top 10 in the world's most food-threatened country [1]. There are many effects of floods where the material, human, economic and social losses are considered as some of the main effects of floods. Heavy rains are also one of the major aspects for the causes of flash floods.

The current method of monitoring the river banks and dams are done manually using markings and gauges. This is time consuming and it takes a lot of time for the authorities to get accurate informations.so there raised a need to develop a Real Time Solution to Flood Monitoring Using IoT and Wireless Sensor Network [2].The scope of the system will be mainly focused with the Department of Irrigation and Drainage, Public Authorities including Rescue and Relief Operation teams and local individuals to be prepared for evacuation activities before the water level reaches their respective zones [3].A flood warning system is proposed with a scheme which requires attention to three basic factors: Data collection via sensor networks, data processing, the hardware and software required, and the dissemination of flood warning information. The system aims at alerting the authorities and local citizens about an imminent flood by monitoring the water systems in local areas [4].





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# A. Flood monitoring mechanism

The system consists of mainly six modules. The sensing module consists of water level sensor for measuring the real time water level of water bodies, water flow sensors for measuring the flow rate and ultrasonic sensor for measuring water level of dams. This data is transferred to the controller over Wi-Fi using NodeMCU. The controller module is Arduino Uno, a microcontroller board based on the ATmega328P.The communication module consist of Wi-Fi module used for updating collected data from controller and GSM module for sending alert messages. At the server side, the data is received through python socket and is updated to a csv file created in the local memory of the controller. The incoming data is measured against the threshold and when the values rises above the limit, an alert system is enabled. The website module consists of a website displaying the real time data from the sensors and alert conditions which can be viewed by the corresponding technical authorities of the particular localities based on the location of installation of sensor.



# B. Client side

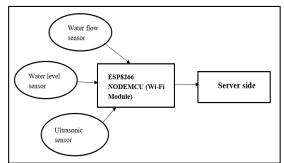


Fig. 2. Block diagram-client side

At client side, the collected sensors data which includes ultrasonic sensor used to measure the water level of dam, water level sensor used to check the water level of river and the flow sensor with the custom hardware is used to measure the water flow rate in rotations per minute. The collected data from both the sensors is transmitted over Wi-Fi (NodeMCU ESP8266) to the central controller Arduino and processed at the Server side received through HTTP localhost by using User Datagram Protocol.

## C. Server side

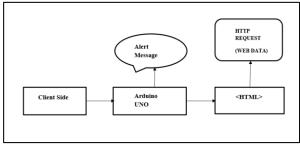


Fig. 3. Block diagram-server side

At the server side, the incoming data is measured against the threshold and when the values rise above the limit, an alert system is enabled. The alert system contains a warning to the authority and local individuals by means of a message when the chances of flood are large, as an indication of flood. The webpage is loaded on the browser by http server. The sensor data is updated dynamically as the data is received which enables the authority to examine the condition of the system at different intervals.

# D. Algorithm

# Step 1: Start

Step 2: Initialize variables for ultrasonic sensor, water flow sensor and water level sensor.

Step 3: Measure water flow and water level using the sensor nodes.

Step 4: Data from sensor node 1, sensor node 2 and sensor node 3 is transferred to the micro controller using wi-fi module.

Step 5: Store values in the local memory of the controller.

Step 6: compare received values with threshold value given

for the sensors.

Step 7: If received sensor values are greater than the threshold, send alert using GSM Module.

Step 8: Update sensor values in the webpage.

Step 9: return to step 3

Step 10: stop

3. Result

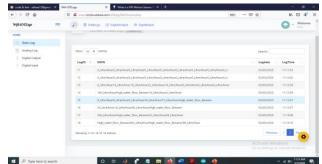


Fig. 4. Screenshot showing the water level and water flow data received

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Fig. 5. Screenshot showing the dam water level and emergency opening alerts

# 4. Conclusion

Flood forecasting and the issuing of flood warnings are effective ways to reduce damages and losses in the society. The system provides a real-world application of internet of things and offer services like accurate level monitoring directly. Sensors are used to obtain the real time water level and flow rate of near-by river basins and water level of dam reservoirs. The sensor data will be updated in a website and alerts will be provided if the water levels are not with in the safe range. The system will help in the detection and also prediction of flood by updating the condition of the floods, emergency opening of near-by dams, current water level of local river basin so that data can be transmitted easily the local station and sends the alert notifications in the form of SMS to the affected zones.

# 5. Future Scope

The current system can be improved by adding many nodes so that data can be compared to improve accuracy. Also, a system that predicts water flow patterns in order to identify the



most vulnerable areas using machine learning can be developed. By considering more parameters such as soil structure, weather data and so on, a highly accurate and efficient system can be developed. A more advance system will allow the authorities to divert the water using gates and hence provide greater control.

### References

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