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# IoT Based Flood Detection and Avoidance System

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**ABSTRACT-** Flood is a natural disaster. Cataracts may be affected from heavy rain, snowfall, storms or overflow of heads or other water bodies. The Flood Monitoring system as in this paper collects data from different wireless detectors and all together combined of the data it gives warning before flood tide comes. So that the relief camps can be advised and so they can avoid or minimize the damage done by flood tide. The introductory work principle of this system is collecting data, the measured parameters compared with the set parameters for a flood tide in the set location. However, the system will induce an alert, If the measured parameters have exceeded the values of set parameters.

## I. INTRODUCTION

Flooding is a normal process during thunderstorm and to some extent, it's demanded to carry out some natural processes like bringing alluvial soil to fields, groundwater recharge or loss of waterbodies. However, due to irregular weather patterns and an increasing number of intense rainfall events, the floods have become incalculable and intractable. Flood disasters can be in large scale and powerful enough to carry big destruction to certain areas. It can cause significant loss of life, damage to properties. There are methods for controlling the damage done by floods. The most significantly used method is Remote Sensing of data.

The remote sensing method is the one which is said to be more accurate. This system uses data collected from the satellite like recording the image of the cloud and predict the rain formation. The system proposed here is based on Local sensing data, will measure the flood parameters in study which is at the river by installing sensor nodes along the river.

Remote sensing data using satellite can be precise, there is still need for the autonomous checking of the water velocity, the water level in the river and the temperature of certain areas to provide detailed information about whether there will be a flood or not and the condition level due to the cloud formation easily change from time to time depends on the wind blow.

To detect a flood the system observes various natural factors, like humidity, temperature, water level and flow level. For collecting data of mentioned natural factors the system consists of different sensors which collect data for all the parameters individually. For detecting changes in temperature and humidity factors system has a DHT11 Digital Temperature Humidity Sensor. The water level is observed by a float sensor, which works by opening and closing circuits as water levels rise and fall. It is initially in the closed position, which means the circuit is incomplete and no electricity is passing through the wires yet. Once the water level increased above a predetermined point, the circuit completes itself and the completed circuit triggers an alarm by sending electricity. The flow sensor on the system keeps an eye on the flow of water.

Arduino UNO is connected with all the sensors, which processes and saves data. The system has a Wi-Fi module, which is useful to access the system and its data over IoT.

## II. PROPOSED MODEL

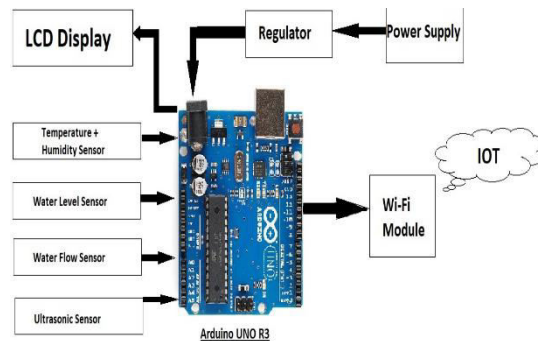
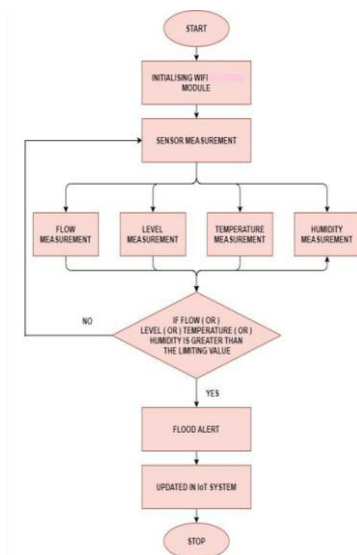
The proposed model is very much useful for monitoring of the water level, flow variations, humidity, and temperature variation in the river and the same can be used at various other water bodies. The measured values are regularly updated on the web server which is very useful to send flood alerts to authority and people for faster action.

The entire system consists of five different Arduino compatible sensors which are temperature, humidity, water level, flow, and ultrasonic sensors. Also, it consists of an Arduino controller, a Wi-Fi module, an LCD display, an alarm and an IOT remote server-based platform.

Nowadays most of the time the ordinary system notifies only the respective governed registered organizations, resulting in the slowdown of the process in rescuing citizens and most of their belongings cannot be stored. In present condition

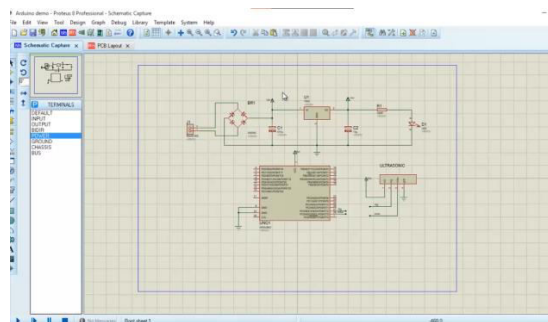
it is necessary to develop the design of accurate smart flood monitoring system using sensors and IOT thus the system efficiency can be increased and can be applied as the real time system for monitoring.

**Flow Chart:**



As given in the flowchart once the circuit is turned on Wi-Fi module will establish Wi-Fi connection and once the connection is successful the circuit is connected with internet, data measured by all the sensors can be accessed through internet. All the measured parameters are then compared from the Limiting values, if the measured value is greater an alert will be generated.

**Circuit Diagram:**



**Hardware Specifications:**

- A. **Ultrasonic sensor:** Ultrasonic sensor that functions by emitting a low frequency wave, inaudible to the human ears. These waves after being reflected by the zero point reaches back to the ultrasonic sensor, the time it takes while being reflected by the surface is calculated. This method facilitates a very low cost and easy method for measuring distance. The ultrasonic sensor selection is based on two conditions: first, maximum measuring distance of ultrasonic and second the measuring angle of ultrasonic sensor. Based on the data from various types of ultrasonic sensor it was decided that ultrasonic HC-SR04 was most suitable.

**Image Link:** -<https://images.theengineeringprojects.com/image/main/2018/10/Introduction-to-HC-SR04.jpg>

- B. **Temperature and Humidity sensor:** The temperature and humidity sensor DHT11 comes with a single row 4 pin package and operates on 3.5 to 5.5 v supplies. It can measure temperature which ranges from 0 to 50°C with accuracy of ±2°C. This sensor gives fully calibrated digital outputs for the associated measurements. It has proprietary 1 wire protocol, hence the communication between the sensor and Arduino microcontroller doesn't happens via a direct interface with any of its peripherals. The protocol must be executed in the firmware of the MCU with precise timing required by the sensor.



**Image Link:** - [https://cdn.shopify.com/s/files/1/0088/0056/7392/products/dht11-makerbazar\\_800x.jpg?v=1671886124](https://cdn.shopify.com/s/files/1/0088/0056/7392/products/dht11-makerbazar_800x.jpg?v=1671886124)

- C. **Water flow sensor:** Water flow sensor consists of a plastic valve from which water can pass. A hall effect sensor with water rotor is present which senses and measures the water flow. Flow of water through the valve causes the rotor to rotate. By rotating the rotor, the speed of the motor changes. This change is observed and calculated in the form of a pulse signal as an output by the Hall Effect sensor. This is how the rate of flow of water can be measured.

**Image Link:** - <https://microcontrollerslab.com/wp-content/uploads/2021/03/YF-S201-water-flow-sensor-pinout-diagram.jpg>

- D. **Water level sensor:** The working of the water level sensor is straightforward. The series of exposed parallel conductors, together act as a variable resistor (just like a potentiometer) whose resistance varies according to the water level. The change in resistance corresponding to the distance from the top of the sensor to the surface of the water. We can also say that the resistance is inversely proportional to the height of the water.

**Image Link:** - <https://lastminuteengineers.b-cdn.net/wp-content/uploads/arduino/Water-Level-Sensor-Pinout.png>

- E. **Arduino UNO:** Arduino Uno is an open-source microcontroller platform which is based on ATmega328P microcontroller. The Arduino board is assembled with digital and analog input and output (I/O) pins.

**Image Link:** - <https://circuitdigest.com/sites/default/files/field/image/Arduino-UNO-Description.png>

### III. EXPERIMENTAL OBSERVATION:

By employing this real time alert system, it will be very convenient to spread awareness to the public prior to the flood occurrence. The data from the various sensors are processed to reveal the probability of flood occurrence. As these parameters namely, temperature, humidity, water flow and speed of water flow are very important in prediction. Any sudden changes in these parameters or any unusual curve in the data will trigger the alert system. In the alert system and a very high frequency buzzer is raised and a system generated alert message is sent to the public. This system also stores this data in the cloud to train this system in a much more efficient manner.

### IV. CONCLUSION AND FUTURE SCOPE:

Flood monitoring and alert system using wireless sensor network is important as it deals with flood disaster that happens every year in different parts of the world. The flood monitoring and alerting system really makes a huge difference in helping the residents to be aware of the upcoming disaster. The flood alert would be generated in real time without delay and the action can be planned earlier such as the relocation of the resident and their belongings.

The Future scope of the project is, flood can also be related to the intensity of rainfall, which is the height of the water layer covering the ground in a period. Hence the development of a rainfall forecasting sensor eventually turns up to the early flood monitoring and detection, Scholarly studies are ongoing and can be implemented to our existing system in future.

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