

# IoT Based Early Flood Detection and Avoidance

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**Abstract**—Now a days, natural disasters like flood lead to huge property damage and take many lives. Flood puts both human and vulnerable wildlife at risk. In India, both flooding and landslide claim more than thousands of human lives and affect millions of people every year. Early flood detection can save not only human lives and huge property damage but also save various wildlife.

## I. MAIN OBJECTIVE

The main goal of this project is to develop an IoT based system to detect the possibility of flooding in its early stage so that necessary precautions can be taken beforehand.

## II. IMPLEMENTED ATTRIBUTES

### A. Connection between Sensor and NodeMcu

A general purpose input-output pin is connected to a float sensor which sends a signal to the nodemcu when the sensor trips. The sensor is connected to the gpio in a pull up configuration mode.

### B. Connection between NodeMcu and router

All the NodeMCU's in the different locations i,e A and B as well as the server are set in WIFI STA mode and are connected to a router in a star topology with the router acting as the central hub

### C. Transfer data from NodeMCU to NodeMCU through router

The server NodeMCU is configured with a static IP address and the data from NodeMCUs in the location A and B are sent to that particular IP through the router. The nodeMCUs in Location A and B are time synchronised using an NTP server and share data with the server through Http request alternately so that data loss is prevented

### D. Transfer data from NodeMCU server to Arduino

Once data reaches the server, it is forwarded to the Arduino board using Serial communication.

### E. Send data to cloud from NodeMCU server

The data received in NodeMCU server is also sent to Thingspeak cloud where is can be used for analysis and visualization

### F. Use GSM module to send SMS

The arduino borard is coded with identifying flood levels using the data received from the NodeMCU. If the condition satisfies, it sends AT commands to the GSM module which is connected over serial communication, which allows the GSM module to send an appropriate SMS or alert.

### G. Display data in LCD

The data received from the NodeMCU server in Arduino is also displayed in an LCD screen which is connected using I2C.

### H. Visualize time-series data on mobile app

Additionally, a mobile app has been developed which can be utilized to visualize the sensor values in a time-series visualization by retrieving the data from the thingspeak cloud in real-time.

## III. DIAGRAM

### A. Configuration Diagram

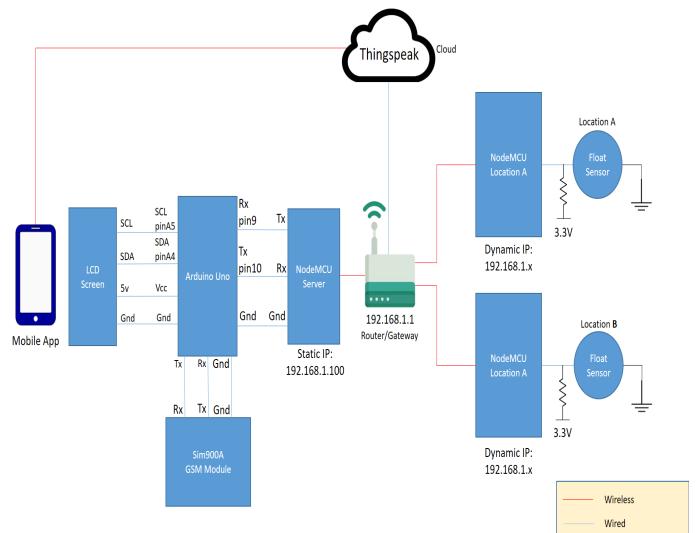


Fig. 1. Configuration Diagram.

#### IV. SAMPLE OUTPUTS

##### A. Output Table

Sl No.	Previous State A	Current State A	Previous State B	Current State B	Output
1	Safe	Safe	Safe	Safe	No action
2	Safe	Alert	Safe	Safe	Update LCD, send SMS- move to Location B
3	Safe	Safe	Safe	Alert	Update LCD, send SMS- move to Location A
4	Safe	Alert	Safe	Alert	Update LCD, send SMS- move to other Location
5	-	-	Alert	Safe	Update LCD, send SMS- location B is safe now
6	Alert	Safe	-	-	Update LCD, send SMS- location A is safe now

##### B. Output Images

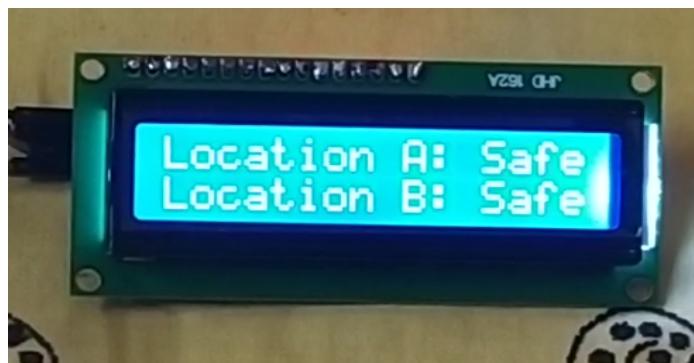


Fig. 2. LCD safe condition



Fig. 3. LCD Alert condition

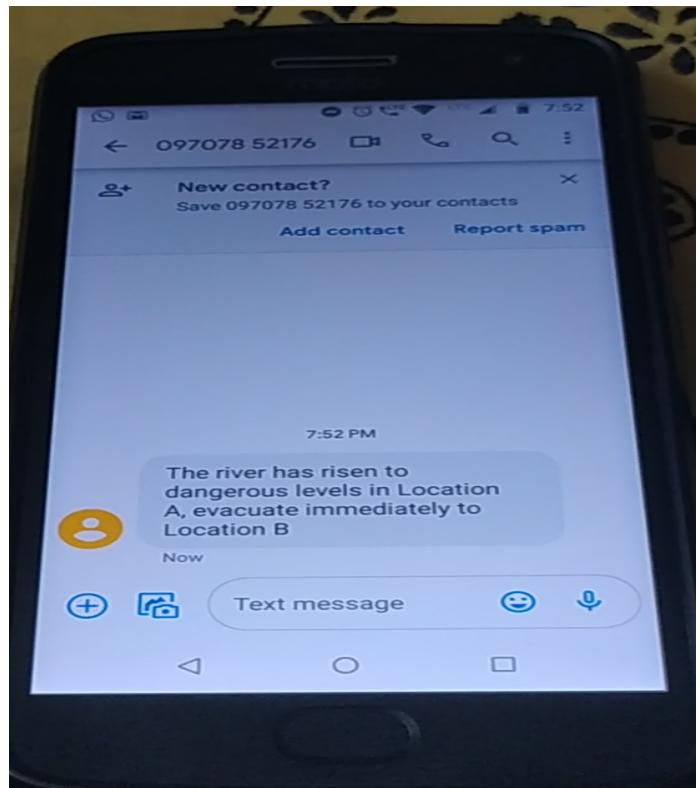


Fig. 4. SMS sent to mobile

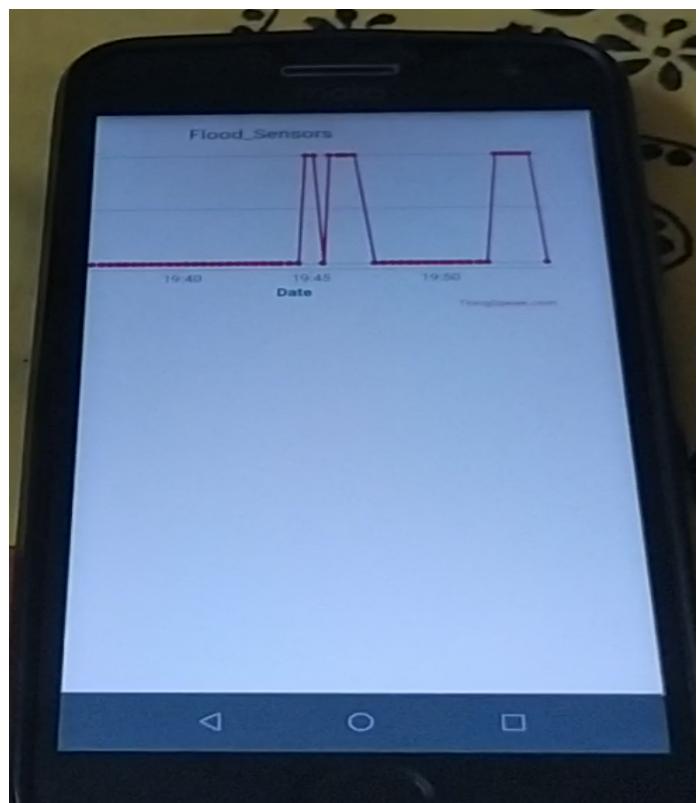


Fig. 5. mobile application



Fig. 6. component setup

## V. USER MANUAL

### A. Components required

- NodeMCU - 3
- Arduino Uno - 1
- SIM900A GSM Module - 1
- LCD monitor - 1
- Sim Card - 1
- Smartphone - 1
- Float sensor - 2
- Router/gateway/mobile hotspot through which internet can be accessed
- peripherals, power supply, jumper wires, bread board, additional equipments - as per requirement

### B. Setup and usage

Once the necessary components are procured, configuration changes i.e. staticip, gateway, subnet and dns for the server, host ip for the transmitters NodeMCUs and phone number in the arduino code(if required) should be made in the code and the respective code has to be uploaded into the NodeMCUs acting as transmitter, server and Arduino Uno using Arduino IDE. The apk file should be used to install the application in the smartphone. Necessary permissions should be provided for installing the application. The connections have to be made as per the configuration diagram. The sensor should be affixed to a body at a certain height close to the water body such that when water rises to that level the sensor gets triggered.

Once the setup is completed and power supply is provided to the various components, the system starts working automatically without the need for any human intervention.