IOT BASED FLOOD MONITORING AND ALERTING SYSTEM WITH WEATHER FORECASTING

A Project Report

submitted to

Faculty: Prof. Manimaran P

Slot: G1

In

IOT Fundamentals (ECE3501)

By:

- **Joshua Alwin (18BEC0986)**
- **Nirmal Harikrishnan(18BEC855)**
- **Amrit Sriram (18BEC896)**

VIT®
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

School of Electronics and Communication Engineering

Certificate

It is certified that the project entitled "**IOT BASED FLOOD MONITORING AND ALERTING SYSTEM WITH WEATHER FORECASTING**" is the Bonafide work for project component of "**IOT FUNDAMENTALS**" by the following students.

Joshua Alwin(18BEC0986)

Nirmal Harikrishnan(18BEC0855)

Amrit Sriram(18BEC0896)

Under my supervision in G1 slot during Fall Semester – 2020 at VIT university

Vellore-632014

Faculty Signature:

Date:

CONTENTS

Abstract

The main objective of our project is to make IOT Based flood monitoring system using NodeMCU, Ultrasonic HC-SR04 Sensor & Thingspeak IOT platform.

The purpose of this project is to sense the water level in river beds and check if they are in normal condition. If they reach beyond the limit, then it alerts people through LED signals with buzzer sound as well as internet applications. Here we are using the **Ultrasonic HC-SR04 sensor** for the water level detection by capturing the time between transmitting and receiving sound waves, **NodeMCU ESP8266 Microcontroller** for data processing, ,**Buzzer** to send an alert that the water levels have risen above the certain limit and the processed data will be uploaded to the **ThingSpeak IoT Cloud Platform** after using which river levels can be monitored graphically from anywhere in the world.

This combination of sensors is used to predict flood and alert the respective authorities with help of IOT and sound instant alarm as a SMS to nearby residents to instantly transmit information about possibility of occurrence of any floods. These sensors provide information over the IOT using Wi-Fi module.

.

Introduction

In a peninsular country like India, with extreme weather and climatic conditions, the occurrence of heavy rainfall Is normal**.**

Multiple times, the arrival of very heavy rains results in the heavy discharge of water or because of the sudden melting of the glaciers due to global warming. Especially, in the monsoon which normally begins in the mid of June and lasts till October, thousands of people lost their lives by drowning and their habitats were collapsed. Even if it is difficult to abandon the natural calamity but the mandatory steps are to be taken by the government agencies to shift the population to a safe region and the losses will get reduced to less than 30%

In order to save the lives of the people, their habitat and the economy, the major step is to monitor the data on real time basis and if the situation is reaching a certain threshold, then alert is to be provided to each individual living in the area which is currently at risk

In our system, it is combined with prediction through weather forecasting.

Objective

The aim of this project is to develop a certain system which is efficient enough to predict the level of the water with the help of the proposed hardware module, alert will be provided when values reach a pre-defined threshold depending on the region.

The idea is to develop a device which is going to save economy, society, lives and their habitat. Using various gadgets and sensors will increase the precision

Components Required

- NodeMCU ESP8266

- Ultrasonic Sensor HC-SR04

- LED's

- Power Supply

- Breadboard

- Jumpers

- Buzzer

NodeMCU ESP8266
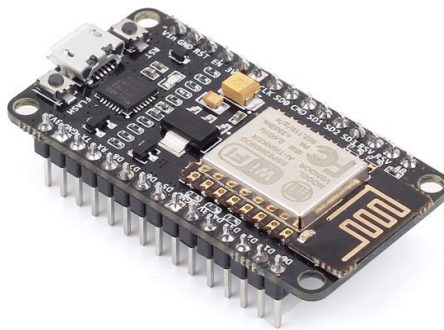
ESP8266 Wi-FI Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. It is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 comes pre-programmed with an AT command set firmware

Ultrasonic Sensor HC-SR04

For water level measurement, we have used ultrasonic sensors. This sensor will work on sound navigation and ranging. It will work by transmitting the wave of short and high frequencies and echo will get reverted back, depending on these the level will be measured. The distance between sensor and water level will be calculated as – Distance L = ½×T×C Where L=Distance C=Sonic speed T=Time between transmission and reception

Ultrasonic distance sensor consists of two ultrasonic transducers. Among them, one acts as a transmitter which converts the electrical pulse of microcontroller into ultrasonic sound pulse and the receiver receives for the transmitted pulses. If it receives them, then it produces an output pulse whose time period can be used to determine the distance from the object

ThingSpeak Web Server

ThingSpeak is an open source IoT application and API that allows you to aggregate, visualization and analyse live data streams in the could. ThingSpeak utilizes HTTP Convention to communicate. You can send data to ThingSpeak from your devices and also we can use the graphs as well as numerical display to monitor the data which is updated from sensor via internet. It also create instant visualization of live data and send alerts using web services like twitter and Twilio. The main advantage of the ThingSpeak is triggering the certain link if certain conditions are meeting

Block Diagram
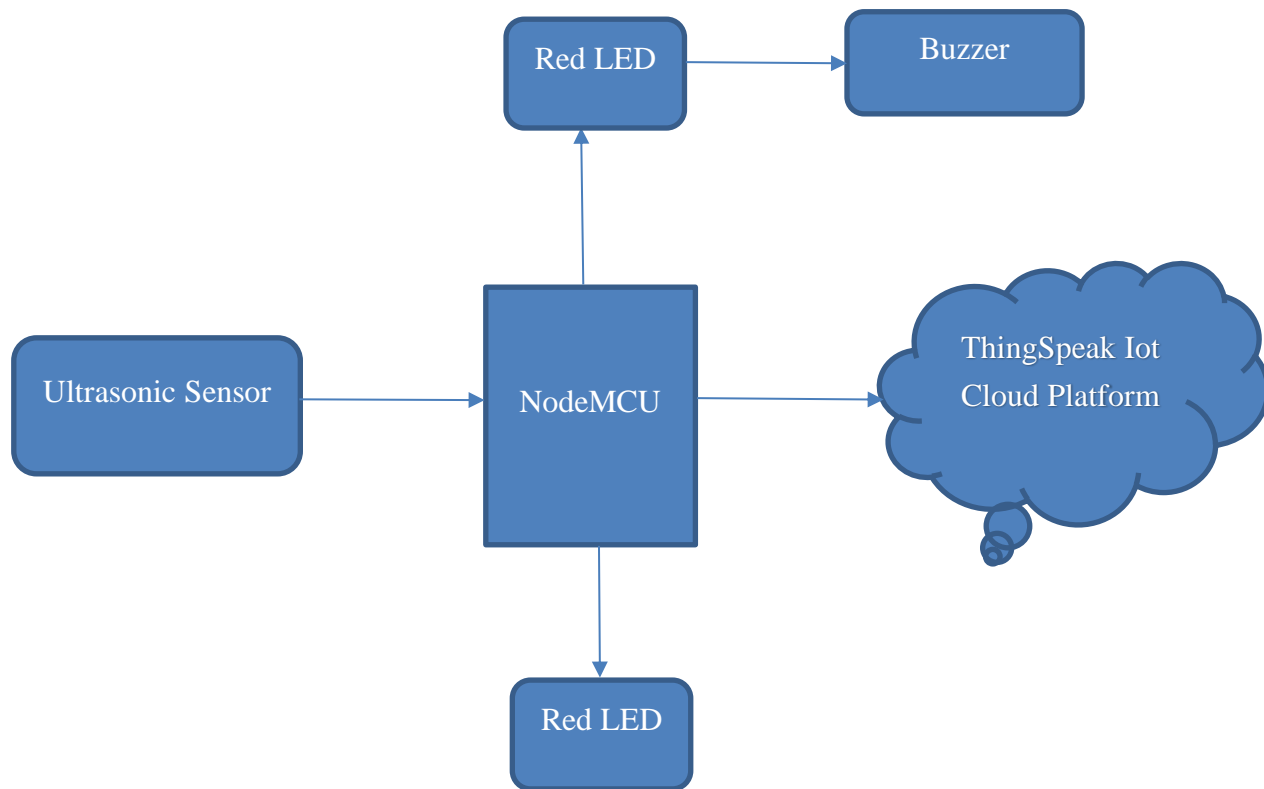
Circuit Diagram
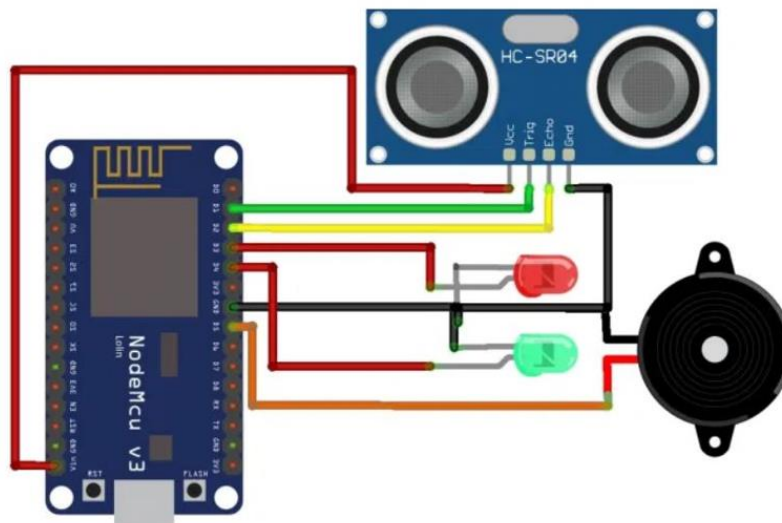
NodeMCU Code

```
#include "ThingSpeak.h"
#include <ESP8266WiFi.h>
const int trigPin1 = D1;
const int echoPin1 = D2;
#define redled D3
#define grnled D4
unsigned long ch_no = 1204578;
const char * write_api = "ZM2NTNTRWZZO6W0S";
char auth[] = "amrith2166";
char ssid[] = "RAM";
char pass[] = "Brinda63";
unsigned long startMillis;
unsigned long currentMillis;
const unsigned long period = 10000;
WiFiClient  client;
long duration1;
int distance1;
void setup()
{
  pinMode(trigPin1, OUTPUT);
  pinMode(echoPin1, INPUT);
  pinMode(redled, OUTPUT);
  pinMode(grnled, OUTPUT);
  digitalWrite(redled, LOW);
  digitalWrite(grnled, LOW);
  Serial.begin(9600);
  WiFi.begin(ssid, pass);
  while (WiFi.status() != WL_CONNECTED)
  {
    delay(500);
    Serial.print(".");
  }
  Serial.println("WiFi connected");
  Serial.println(WiFi.localIP());
  ThingSpeak.begin(client);
```

```
 startMillis = millis();  //initial start time
}
void loop()
{
 digitalWrite(trigPin1, LOW);
 delayMicroseconds(2);
 digitalWrite(trigPin1, HIGH);
 delayMicroseconds(10);
 digitalWrite(trigPin1, LOW);
 duration1 = pulseIn(echoPin1, HIGH);
 distance1 = duration1 * 0.034 / 2;
 Serial.println(distance1);
 if (distance1 <= 4)
 {
  digitalWrite(D3, HIGH);
  digitalWrite(D4, LOW);
 }
 else
 {
  digitalWrite(D4, HIGH);
  digitalWrite(D3, LOW);
 }
 currentMillis = millis();
 if (currentMillis - startMillis >= period)
 {
  ThingSpeak.setField(1, distance1);
  ThingSpeak.writeFields(ch_no, write_api);
  startMillis = currentMillis;
 }
```

Results

The project "**Flood Monitoring System Using IOT**" has been successfully designed and tested. In this project, a device is built with the help of NodeMCU and a few other components along with Thingspeak webserver which can be used in flood prone areas to detect water flow level and if the level reaches the threshold then it alerts the authorities. It is of low cost, and best solution to for detecting the floods. This Connections are as shown below
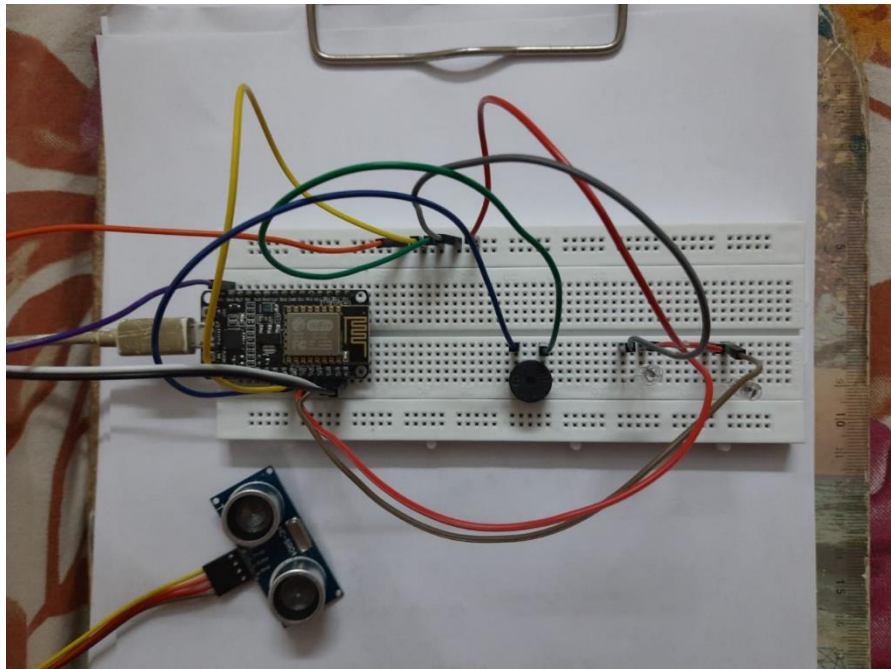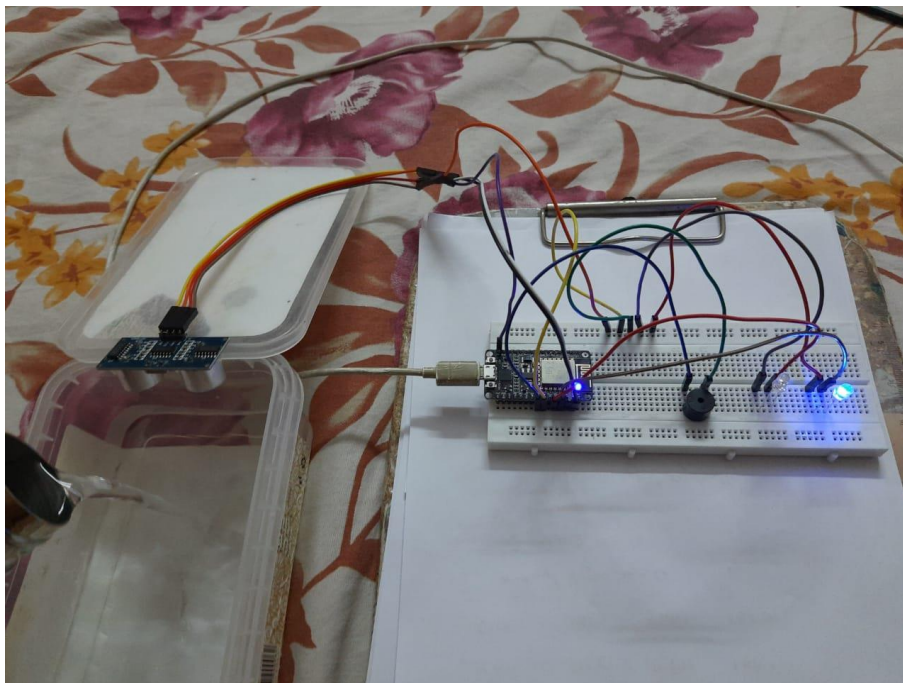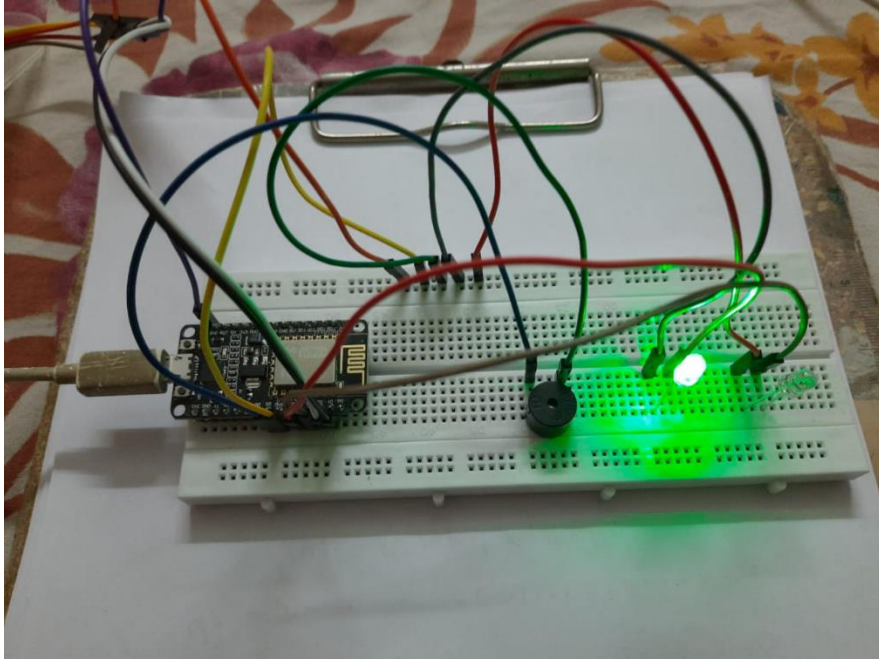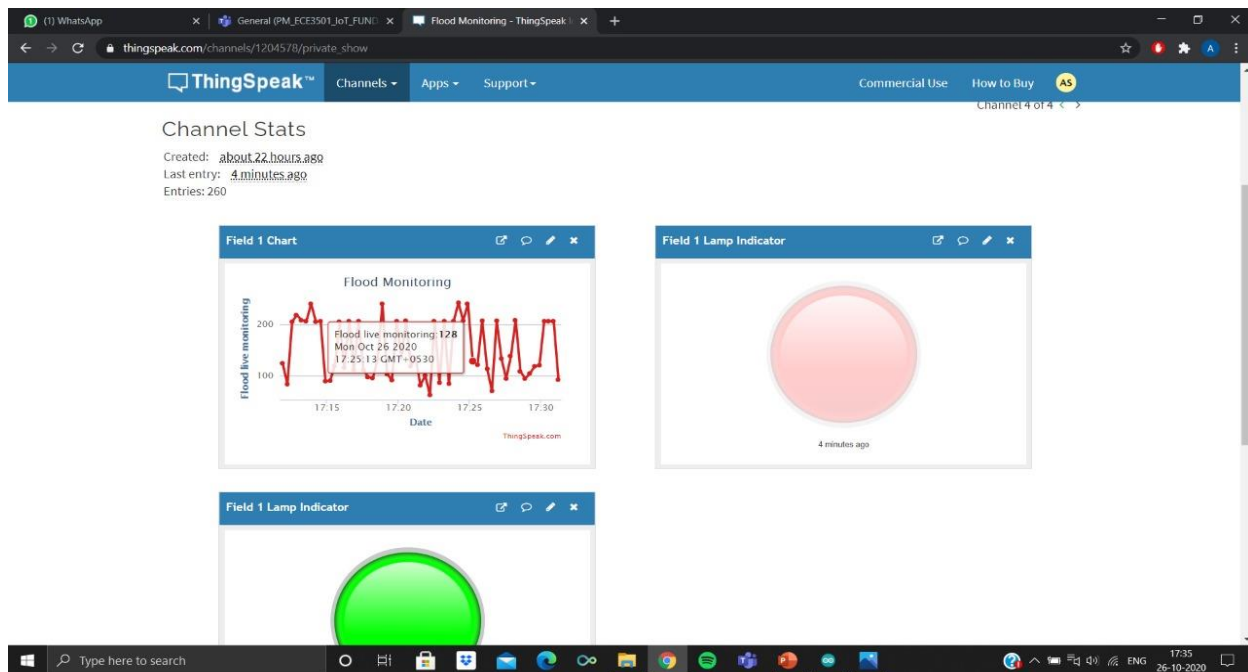
Link for the Video Demonstration

https://drive.google.com/file/d/1hvZaMFzxFv-O-xFlJ8ofj0xaZvZMVvfd/view?usp=sharing

Conclusion

This project highlights the possibility to provide an alert system that will overcome the risk of flood. It can also contribute to multiple government agencies or authority that can ultimately help the society and mankind about the flood like hazardous natural disaster

This model has been tested and its working as presented in this project, It will monitor each and every aspect that can lead to flood. If the water level rises along with the speed, it will send an alert immediately. It also ensures increased accessibility in dealing and reverting to this catastrophic incident. It is of low cost and one of the best solutions for detecting the floods and it can also contribute to multiple government agencies or authority and can ultimately help the society and mankind about the flood like hazardous natural disaster.

References

- H. Hamidon, "Flood level indicator and risk warning system for remote location monitoring flood observatory system", WSEAS Trans. Syst. Control, vol. 5, no.3, pp. 153-163,2010

- M. Mathematic and R. Grace, "Flood alert management system using iota and microcontroller," International journal of innovative research in computer and communication engineering, vol. 5, no. 4, April 2017

- https://onprojects.com/iot-early-flood-detection-avoidance/

- https://create.arduino.cc/projecthub/samadabdul2157/flood-water-level-alert-cf5460

- https://www.ijeast.com/papers/639-643,Tesma501,IJEAST.pdf

- https://theiotprojects.com/iot-based-flood-monitoring-system-using-nodemcu-thingspeak/