

# ABSTRACT

## FLOOD MONITORING AND WARNING SYSTEM

## EARLY

The human are still not able to battle the natural calamities besides huge development in technologies. The fact is that the natural calamities can neither be abolished nor be prevented. But the technology has been developed gigantically in order to prevent loss of life. This project is totally based on informing the civilians about the upcoming flood so that they can evacuate the danger area before the flood hits. For detecting the rise in water level Ultrasonic Sensor and Water Level Sensor is used. For detecting the change in humidity and temperature Humidity and Temperature Sensor is used. The data from the DTH11 and HC-SR04 is read by the microcomputer and analyze the data in order to detect the level of water. If the level of water is less than the defined threshold value then the microcomputer turns the LED and buzzer on. Furthermore, the data obtained from the microcomputer is uploaded to the database. The values of the sensors updating in real time can be monitored in database table. The content of the database table is now linked with the web API (Application Programming Interface) and trigger is set. And now when the level of water crosses the threshold value the trigger is triggered and the web API sends the SMS to the phone number registered to it.

# INTRODUCTION

## Background

An overflow of a large amount of water beyond its normal limits, especially over what is normally dry land. A flood is an overflow of water that submerges land .In the sense of “flowing water”, the word may also be applied to the inflow of the [tide](#). Floods are an area of study of the discipline [hydrology](#) and are of significant concern

in [agriculture](#), [civil engineering](#) and [public health](#). Flooding may occur as an overflow of water from water bodies, such as a [river](#), [lake](#), or ocean, in which the water overtops or breaks [levees](#), resulting in some of that water escaping its usual boundaries, or it may occur due to an accumulation of rainwater on saturated ground in an area flood. While the size of a lake or other body of water will vary with seasonal changes in [precipitation](#) and snow melt, these changes in size are unlikely to be considered significant unless they flood [property](#) or [drown domestic animals](#). Some floods develop slowly, while others such as flash flood scan develop in just a few minutes and without visible signs of rain.

Flooding is not new to the Terai districts of Nepal. Every year, the monsoon floods have caused significant damage and loss to human lives and livelihoods within these southern flood plains. Yet each time the rescue and relief operations seem slow and insufficient and the government comes under fire for not responding quickly enough. A critical review – that is, reflecting and building on lessons from past flood events along with institutional memory – is seriously lacking, particularly across the government entities. Identifying lessons and learnings from past events is critical in order to recognize the simple lapses that can be avoided and solutions that can immediately be put into effect. This Post-Event Review Capability (PERC) report discusses the overall disaster management landscape, i.e. disaster risk reduction, preparedness, response, and recovery during the 2017 floods in Nepal. Focusing on the four river basins -Karnali, Babai, West Rapti, and Kankai – an effort is made to critically examine the flood event and impacts together with response and recovery measures undertaken by government and various other agencies in flood-affected

areas of these rivers. Comparing the 2017 flood effects and impacts with previous flood response in the region, this review tries to identify the most useful lessons to take forward, and what could now be done differently to lessen the risks of future floods.

## Objectives

The main objectives of the project are:

To read the temperature and humidity of the environment continuously

To warn the people through SMS system using web API

To detect the level of water in real time

## Scope

The main purpose of application is to know nearest flood situation.

## Application

The early flood detection and avoidance system has following applications:

Early information about flood.

Gives the real time temperature and humidity data along with level of water.

## LITERATURE REVIEW

The projects addressing similar problem like in this project, have been already done in national and international level but each of such projects are provided with different features but here in this project all such special features from different projects are combined into a single project.

**“IOT-based-Centralized-Remote-Sensing-for-Early-Flood-Detection” [1]** the objective of this telemetry based project is to monitor the flood situation at the earliest and send a notification in case of danger on the webpage. The notification sent can be read globally through IOT. An ultrasonic sensor is connected to the microcontroller that measures the value of water in the dams or rivers and sends that information to the

microcontroller. The GPRS sends that notification through the internet on the webpage using IOT network.

**“Flood Monitoring and Early Warning System Using Ultrasonic Sensor” [2]** it envisions a safe, prepared and less casualty community before, during and after typhoon devastation. The model also promotes the use of real-time monitoring system through the developed web-based application and SMS notification system as an easy medium in disseminating information particularly in the remote areas. By allowing the system in two-way communication, it gives more flexibility in providing important information to the community.

**“SMS Based Early Flood Warning System Using Raspberry Pi” [3]** this project is about designing a system that can measure the speed of the rise of the water level at the potential flooded area. Raspberry Pi is used to collect the data from the water sensor and transmit the data to GSM Module to send the alert by using an SMS via a mobile phone. The analysis will be done to show how the Raspberry Pi will be integrated with the smartphone to give an alert. The system will be tested in order to ensure that all specifications needed have been met. A performance test will also be run in order to see the efficiency of the system.

**“Design of early warning flood detection systems for developing countries” [4]** in this project the Warning communities of the incoming flood provides an effective solution to this by giving people sufficient time to evacuate and protect their property.

**“Flood Monitoring and Early Warning System Using Ultrasonic Sensor” [5]** The two monitoring devices are composed of Ultrasonic sensor to measure the distance of the water level, Arduino micro-controller that process the signal from the sensor, GSM module to send the data or information from the micro-controller to the computer server and a power source using Solar Panel, Regulator and Battery. Once a sensor is triggered, an output signal will be relayed to the micro-controller which serves as a switch that triggers the connected GSM module to send an alert message or water level status to another GSM modem connected to a computer server. Then, the developed

program installed in the computer server will interpret and analyze the message received then automatically send a text message to the concern agencies' numbers stored in a database. Also, the developed program will then automatically relay the alert message or status by uploading to the developed website. Furthermore, concern agencies, local officials and the local communities could inquire about the current status by sending a message that contains keywords.

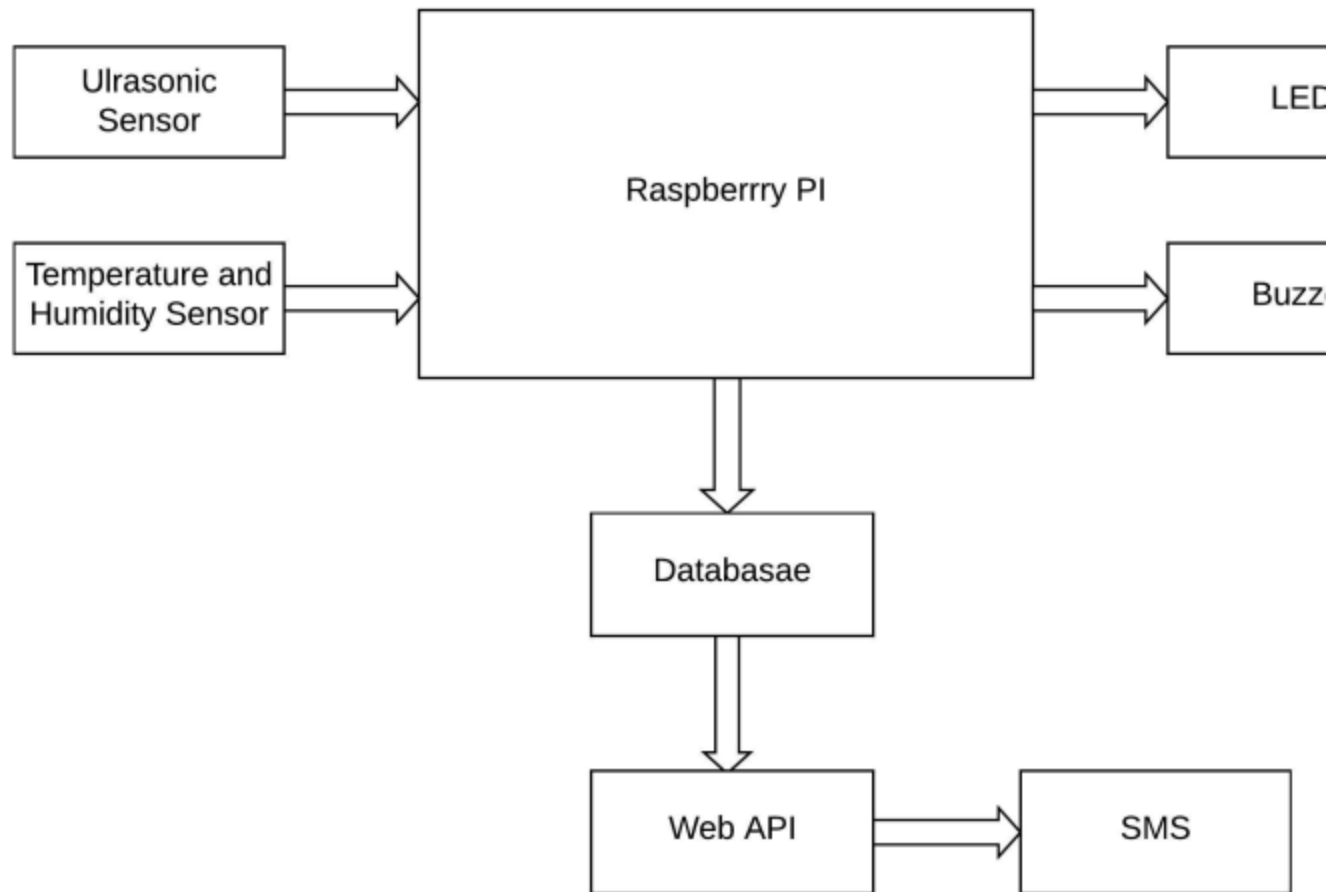
**“Early Flood Detection and Monitoring System Based on Wireless Sensor Network” [6]** the system involves the deployment of sensor nodes at specific flood vulnerable locations for real-time flood monitoring and detection. Flood events relating to flash flooding and run-off water or overflow are successfully monitored in real time which saves individuals plenty of time to prepare against predicted flood occurrence, saving them from the aftermath of flood disaster. The system was tested via simulation of different flood scenarios, and the outcome was efficient and accurate.

**“Flood level indicator and risk warning system for remote location monitoring using flood observatory system” [7]** FOS can be deployed in flood prone areas in afford to create a well-used standard for remote flood observation systems. The ability to receive real time information on flood level empowers both government and private organizations to react to imminent danger in an effective manner. With the real time flood information, allows public safety organizations and other emergency managers to effectively plan their resource deployment within the limited time of alert. Warning as flood rises could be used to save life's and properties in many ways can help such organization and government to spend sufficient amount of money in restoration process.

## METHODOLOGY

### System Block Diagram

The block diagram of the overall system is shown in the figure below. The sensors placed at the different places reads the data which are manipulated through the microcontroller and the values of the sensors are displayed. The values obtained repeatedly are send to database and through the web API, warning message is sent into the phone.



The raspberry Pi used is the brain of the project. It is responsible for acquiring, processing, storing and communicating the information from sensors, and then executing the events respectively. Raspberry reads the data from the Ultrasound sensor (HCSR04) and Temperature and Humidity sensor (DHT11). Then the Raspberry pi

processes the obtained value of the sensor and displays it. The value from the Ultrasound sensor is used to determine the level of water. The certain threshold value for

the distance between the ultrasonic sensor and the river is fixed. The value of distance obtained from the ultrasonic sensor is updated repeatedly with the change in the water level. If the value of the distance is less than the fixed threshold value then the led and buzzer will turn on which signifies that there is high chances of occurring flood. If the value of distance is greater than the fixed threshold value then the LED and the buzzer will remain off which signifies that there is nothing to worry about. The Raspberry pi displays the value of temperature, humidity and the distance between the sensor and the river in its local terminal too.

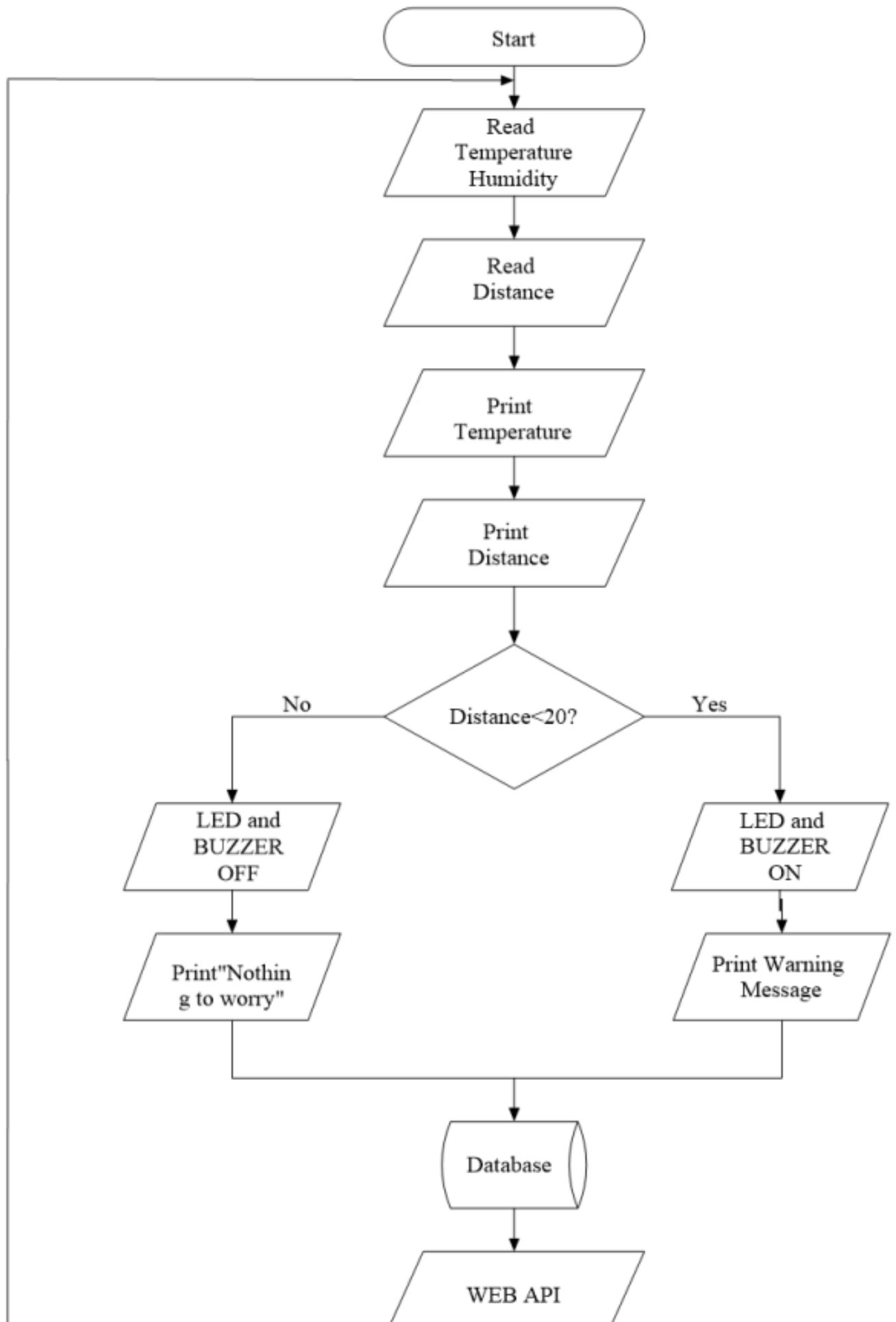
The values of the sensors are obtained repeatedly in the certain interval of time. So the real time values of the sensors are obtained. The values obtained are uploaded to the local server of the Raspberry Pi using the MySQLdb. The data obtained in MySQLdb from the Raspberry pi are date and time, temperature, humidity, distance of ultrasonic sensor and river and the remarks regarding the flood. The date and time is auto incremented since it doesn't require any sensor input data. The values of temperature and the humidity changes corresponding to the changes in the environmental temperature and humidity and gets updated in the database table. The main role here is of the ultrasonic sensor. The value of the ultrasonic sensor is updated repeatedly in certain interval of time and shows the distance. If the value of the distance is less than the threshold value then the warning message regarding flood will be displayed in the remarks and if the value of the distance is greater than the threshold value then remarks will display default message. The data in the database table are updated automatically every 6 seconds.

Now, the main motive of the system to alert the people about the coming flood is done by the web API. The data from the database is linked to the web API. What the web API does is, it continuously keeps on reading the value of sensors from the data base. And when the value of distance becomes less than the threshold value the web API indicates it so by changing the color the trigger used there. The contact or phone number of the residents are also uploaded in the web API so, it quickly informs the local

people about flood by sending the warning SMS to the people whose numbers are registered in it.

## **Flowchart**





# Hardware Description

## Raspberry Pi

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn