Flood Detection System

B. E. Information Technology

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DECLARATION

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources.

We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in this submission.

We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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CERTIFICATE

This Internet of Everything Lab Mini-project Flood detection System by Lavia Suvarna, Shweta Pai and Malcolm D'souza is complete in all respects and was successfully demonstrated on 25th May 2021.

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CONTENTS

Chapter 1

Introduction

IoE is the intelligent connection of people, process, data and things. The Internet of Everything (IoE) describes a world where billions of objects have sensors to detect, measure and assess their status; all connected over public or private networks using standard and proprietary protocols.
The domain of our project is disaster management which involves mitigation, preparedness, response, relief and recovery. Floods cause damage to human lives, property and cause extensive losses to a society.
To this problem we have proposed a solution where we can detect the floods before it takes place and analyze the water levels with respect to time using the LSTM algorithm.

Chapter 2

Literature Review

Sr. No.	Title	Summary	Gaps Identified
[1]	Design of river height and speed monitoring system by using Arduino.	In this paper, a system is designed to measure the altitude and speed of the river. In this work Arduino Uno, ultrasonic sensors and flow rate sensors are used. Ultrasonic sensor HC-SR04 is used as a river height meter. Based on the test results the accuracy of the sensor is calculated.	There is no analysis or predictions done in this system. Only sensor accuracy is calculated.
[2]	Design of Automatic Water Flood Control and Monitoring Systems in Reservoirs Based on Internet of Things (IoT)	The IoT on this prototype is used for real-time control and monitoring of water levels by using a web server as an interface. The components used consist of ESP 32 micro-controller, ultrasonic sensors for reading water level data and stepper motor actuators to control sluice gates with 3 water level conditions: low, medium, high.	Lack of prediction or algorithm used for analyzing the data on the server. Analysis is focused on the stepper motor readings and not flood detection.
[3]	Fuzzy Logic-Based Flood Detection System Using Lora Technology.	The system consists of two parts which are, the branch nodes and the main controller. The branch nodes send soil moisture and surface runoff data of its surrounding environment, to the main controller. The system uses LoRa communication signals for communication in which the	Battery supply is provided which can last only for 4 months.

		outputs are flood consequence and flood probability. The product of these two will produce the flood risk in percentage.	
[4]	Flood Monitoring System Using IoT and Machine Learning.	The system is developed using a Raspberry Pi, camera to detect the rising water level. We employ image processing, edge detection and prediction methods to detect the rising water level and predict the time of impact.	Cost to develop the system is very high as compared to our system, also the high level of computing and processing required as images need to be cleaned before performing any analysis.
[5]	An IoT-BasedRain Alerting and Flood Prediction using Sensors and Arduino for Smart Environment	The sensors collect data from the environment and store in a form of a csv file on a local storage using Tera Term. The users are notified in a form of SMS, and Buzzer. The stored data were analyzed using a Multilayer perceptron to predict floods with Weka. This proposed system uses the data from the local environment, stores it in local storage and performs the analysis.	No internet connectivity, though there is analysis and predictions, the data can't be analysed online.
[6]	Early Flood Detection and Alarming System Using Machine Learning Techniques	Predicting the upcoming floods on the basis of rainfall and current water levels would surely help in forestalling the large-scale life and property damages incurred due to the floods. In this paper they have experimented with different ML algorithms like SVM, KNN, Logistic Regression, Naive Bayes, etc., for the available rainfall dataset.	Real-time data is not used.

Chapter 3

Problem Statement

In this project, the objective is to sense the water levels at river beds.Here we are using an ultrasonic sensor to sense the river levels and a NodeMCU ESP8266 to process this data. The data will be uploaded to ThingSpeak IoT cloud, using which the river levels can be graphically monitored from anywhere in the world.We will collect the data from the object and store it on the cloud and retrieve it in a csv format. This data will be then used for analysis. The algorithm used is Long Short -Term Memory (LSTM).

Chapter 4

System Design and Requirements

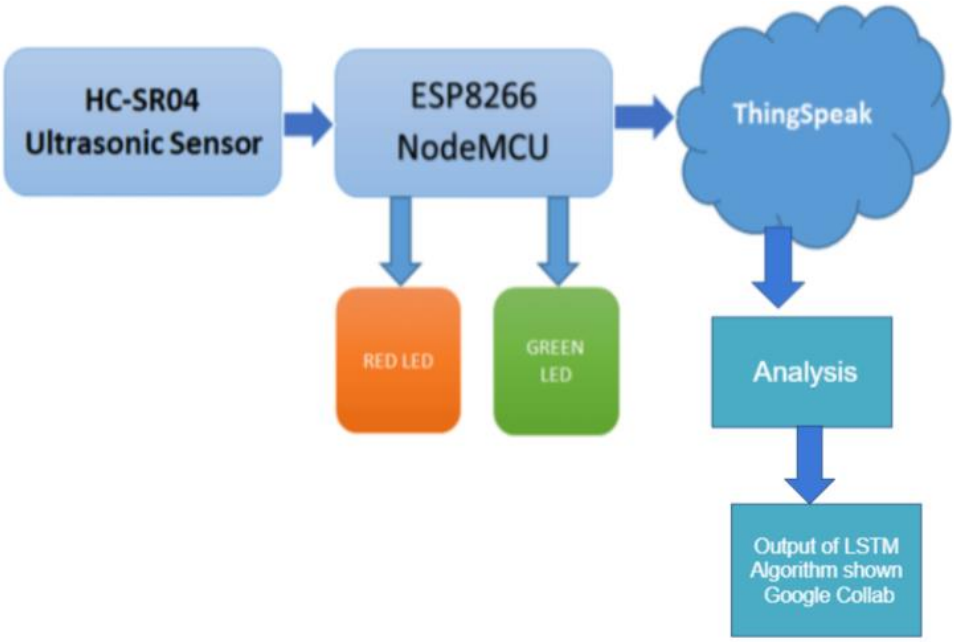


Fig 4.1 System Design

	Hardware Requirements
1	ESP8266 NodeMCU
2	Ultrasonic Sensor
3	Power Supply
4	LEDs(Red & Green)
5	Breadboard
6	Jumper Wires
	Software Requirements
1	Thinkspeak cloud
2	Google Collab
3	Arduino IDE

Table 4.1 Hardware and Software Requirements

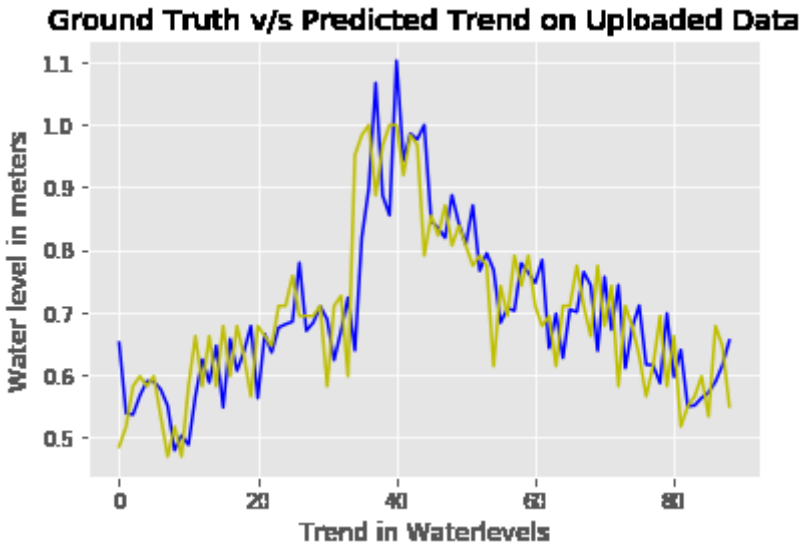
Chapter 5

Data Analytics

Long short-term memory is an artificial recurrent neural network architecture used in the field of deep learning. Unlike standard feedforward neural networks, LSTM has feedback connections. It can not only process single data points, but also entire sequences of data.
We have developed a model which predicts the flood occurrence. The parameters considered are water level and number of records (date and time). The algorithm used is Long Short -Term Memory (LSTM). In this future water level is predicted using the past recorded data.

Chapter 6

Results



Our Dataset had about 50000 plus records and divided the data into two file one is seen and other is unseen. The seen data was split into 70% train and 30% test and built a model using LSTM algorithm . The accuracy is 95.03% for training and 97.97% for testing. The unseen data we used for prediction of water level vs trends in water level i.e. the future records w.r.t. time. The graph above shows the predicted water levels along with the actual water levels (ground-truth).

Chapter 7

Conclusion

Flood is a major known natural disaster that causes a huge amount of loss to the environment and living beings. Floods impact on both individuals and communities, and have social, economic, and environmental consequences. The consequences of floods, both negative and positive, vary greatly depending on the location and extent of flooding, and the vulnerability and value of the natural and constructed environments they affect.

So in these conditions, it is most crucial to get the emergency alerts of water level status at river beds in different conditions.Our project will provide real-time analysis of floods and help the locality to take necessary preventive measures.

Future Scope

Further improvisation can be done for this system wherein various other factors can be considered in the analysis like Geographic Area, Speed of river water flow, location, etc.

It can be enhanced by adding a messaging system where people residing in that area can be alerted about the occurrence of the flood.

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