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Implementation Of Early Flood Monitoring System Using IOT Applications

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Abstract – Flood is an unavoidable natural disaster in all over the world, causing heavy flow of water and also severe damage to properties and lives. For this reason we need to create a flood detection system to monitor rising water residential areas. By using ultrasonic sensors we need to create flood level sensing devices which will detect the water level. This system is integrated to the microcontroller board which will help to send the data each time the water reaches the threshold value. The wifi module will help to connect the internet and keep track of data on a daily basis. The data through the wifi module will be stored in a cloud. The data stored in the cloud will help to send it to the users. The user will get real-time information on monitoring flooded roads through android application. Due to the android application it is user friendly and helps to get information in one touch. And in order to alert the people at that locality, the buzzer and LEDs are used. This system also predicts the possibility of flood with the help of previous records they stored. It is done from the historic data stored in the cloud. Machine learning algorithm is used for this prediction.

Key Words: ultrasonic, threshold, microcontroller, android application, prediction, machine learning

1. INTRODUCTION

Flood is an unavoidable natural disaster in all over the world, causing heavy flow of water and also severe damage to properties and lives. Material, human, economic and social losses in flood areas, infection from water are the main effects of flood. As well as the risks to life suffered by families in these areas, the economic damage has also imposed the burden of having to recover from their financial losses. Nature is a blessing for the humanity. But sometimes this scenario changes as the natural calamities take place. Natural disasters have become a major concern throughout the world. especially in the developing countries such as Bangladesh, Malaysia etc. Flood is also one of the natural calamity. In order to prevent the devastating effects of floods before such events occur, early warning for people to evacuate in the nearby areas can be effective in saving lives and to prevent disasters . Generally, flooding cannot be stopped and unavoidable, but early detection or warning system can be used to reduce losses faced by the citizen and government. For this reason, we need to create flood level sensing devices which will detect the water level.

2. PROPOSED MODEL

2.1 Overview

The system is integrated to the microcontroller board which will help to send the data each time the water reaches the threshold value .Ultrasonic sensor is used to detect the water level. The wifi module helps to connect the internet and keep track of data on a daily basis. The data through the Internet module is stored in a cloud. If water level reaches threshold value, people will get information on their phone through android application. And LEDs and Buzzer can be used to alert people at that locality. This is done through prediction algorithms. Machine learning is used for prediction. This system also predicts the possibility of flooding before flooding takes place.

2.2 Existing System

The existing flood monitoring system consists of two microcontrollers and one sensor. The microcontroller used here is nodeMCU and the sensor used is an ultrasonic sensor which senses the level. The ultrasonic sensor continuously monitors the level of water each time it reaches the certain defined level. It records the data through ultrasonic and these data are sent to nodeMCU from time to time. Two nodeMCU are used here, the first one acts as transmitter and second as a receiver. Initially, the first NodeMCU attached with an ultrasonic sensor will detect the flood level. Then, it will display the data on the LCD screen. The data will be sent to the Blynk application via wireless connection. The data also will be displayed in the Blynk application. At the same time, the data is stored in a CSV database, through email this data can be converted into excel form, as well as being transmitted to the second NodeMCU via Blynk Bridge. This data will alert the local authority for further action once the level reaches warning and critical level which triggers the buzzer and LED. Though this system sends the alert messages to authority and displays it in LCD but this is done only when the water reaches the critical level. It cannot predict the chances of flood prior so that it can be prevented in the first place.

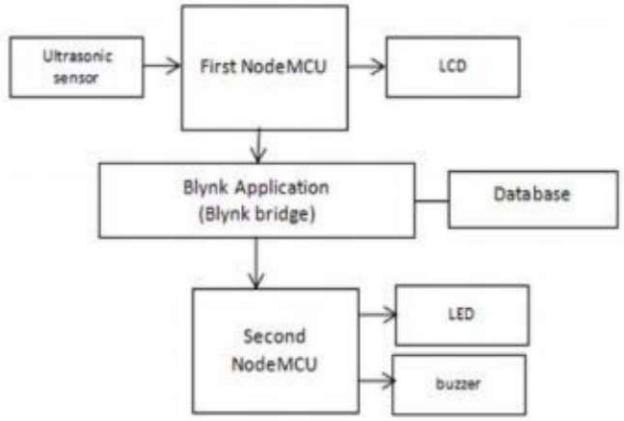

Fig-1: Existing System Architecture

2.3 Proposed System

Flood is an unavoidable natural disaster in all over the world, causing heavy flow of water and also severe damage to properties and lives. We can't control it, but we can monitor and predict it and alert the people about the flood before the flood causes severe damage.

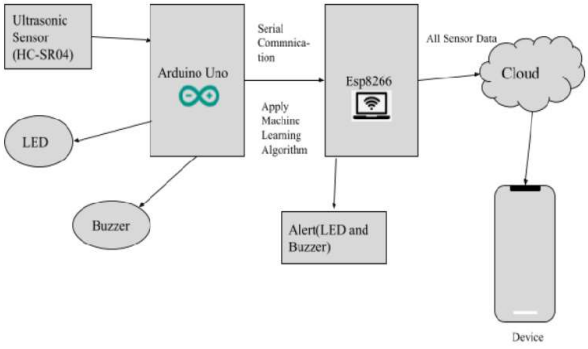

Fig-2: Proposed system Architecture

In our proposed system, an Ultrasonic sensor is used to create flood level sensing devices which will detect the water level. Ultrasonic Sensor is connected to an Arduino Uno from which we can see the readings. Arduino Uno is connected to LED and Buzzer is connected. Serial Communication will take place between Arduino Uno and ESP8266. ESP8266 will connect to the cloud. The water level readings will be stored in the cloud. For Prediction purposes we need the data in csv format. From the cloud we can convert the data in csv format because we need historical data for prediction purposes . Then we will use a machine learning algorithm to predict the water level. The Classification algorithm will be used because we have a training dataset. These algorithms are simple, easy to implement, robust to noisy training data, and effective if training data is large. To Alert the people, LED light and Buzzer is used. To Check the Water Level and Prediction Rate, Mobile Application is used to monitor on regular basis.

2.4 Hardware and Software Specifications

The experiment setup is carried out on a computer system which has the different hardware and software specifications as given in Table 1 and Table 2 respectively.

Table-1: Hardware details

Processor	3-4 GHz Intel
HDD	1 TB
RAM	8 GB

Table-2: Software details

Operating System	Windows 10
Programming Languages	Python, Java

3. CONCLUSIONS

The project is IOT, it consists of two module as hardware and software. The hardware section consist of ultrasonic sensor, a beaker to fill the water, a buzzer, LEDs, esp8266, Arduino Uno whereas the software section consists of Android application which is used to display and process all the hardware things. We have built a mobile application which will display all the data that is water level, date and time and will also predict the possibility of flood.

3.1 Input Details

The input or hardware model consists of ultrasonic sensor, a beaker to fill the water, a buzzer, LEDs, esp8266, Arduino Uno. Ultrasonic sensor is used to detect the level of water from the top of the beaker. If the water level is below the threshold level, green led is turned ON and if the water level reaches the threshold level, red led and buzzer is turned ON. The sensor sends the collected information to the wifi module. The wifi module further sends the data to cloud and then that data is sent to android application.

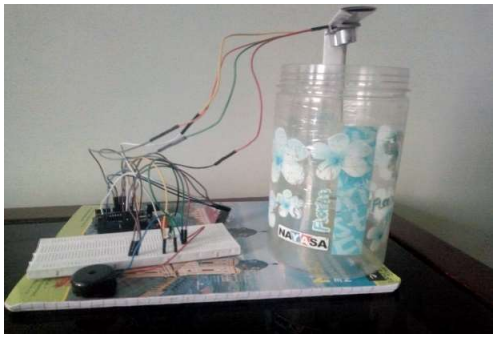

Fig-3: Physical Model

3.2 Evaluation Parameters Details

The Data Collected from sensor gives us the current water level along with date and time. Along with that we are predicting the possibility of flood i.e., it gives us the chances of flood in percentage. For Prediction we are using Mumbai Flood dataset from the year 1900 -2020. It consists of columns like subdivision, year, month from January to December, Annual water Level and Floods. Below is table used for prediction purpose:

	SUBDIVISION	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL WATERLEVEL	FLOODS
115	MUMBAI	2016	522.2	412.3	325.5	125.4	225.9	2.4	3.8	35.9	143.0	186.4	173.2	23.6	2176.6	YES
116	MUMBAI	2017	498.5	319.6	531.8	92.5	192.4	1.9	6.8	8.9	43.6	173.5	209.5	38.1	2117.1	YES
117	MUMBAI	2018	625.4	1048.5	1398.9	125.4	356.1	29.1	52.1	48.6	116.4	183.8	423.6	65.1	4473.0	NO
118	MUMBAI	2019	764.9	654.1	826.1	87.2	341.9	7.9	45.2	79.3	145.2	168.4	298.5	16.3	3418.7	NO
119	MUMBAI	2020	560.0	975.0	762.9	67.1	167.8	2.7	76.2	58.2	209.3	187.7	563.1	56.3	3630.0	NO

Fig-4: Dataset used in this project

This is the dataset we have used for prediction purpose. It consists of month wise and year data. If the water level reaches the threshold value, then flood arises, otherwise it is safe.

3.3 Output Details

The output of this whole system is seen on both model and application. The green led is turned on when the water level is normal or below the threshold value whereas red led and buzzer is turned on when the water level is high or above the threshold value.

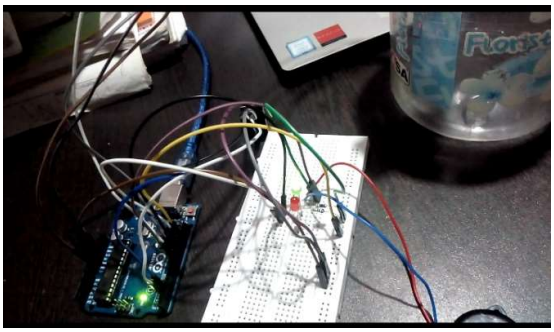

Fig-5: Green LED turns on

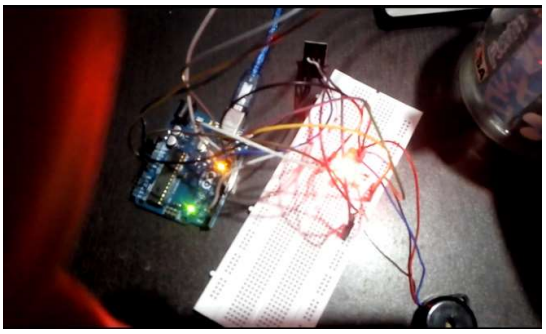

Fig-6: Buzzer and Red LED turns on

In the android application there are four buttons current water level, flood prediction, about us and Q and A. The current water level button gives information about the level of water. The flood prediction button gives information about prediction and accuracy. The about us button gives information of the application and details of developers. The Q and A button has most common questions with answer about flood.

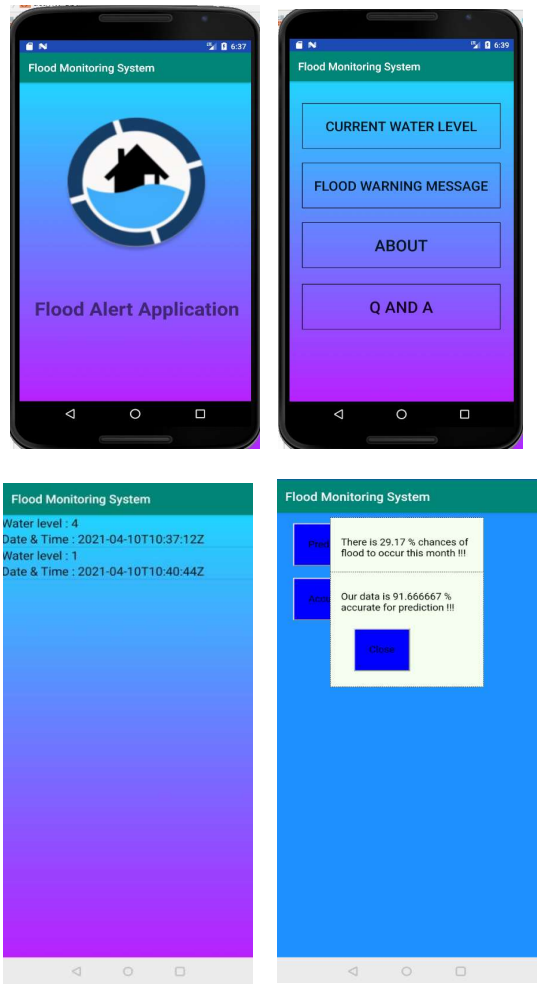

Fig-7: Information displayed on Mobile Application

4. CONCLUSION

This project based on the Early Flood Monitoring using IOT to detect & monitor the water level. In this project we are using LEDs, Buzzer, ultrasonic sensor, esp8266, Android Application. Through Android Application the user can get information about flood. The people at that locality will be alerted by using LEDs & Buzzer. This system will also predict the flood by using historic data. Prediction of flood is done by Machine Learning Algorithm. Through this system one can monitor & predict the flood.

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