Utilization of iot-based flood warning system

Sociology, Communication

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As a river maternal Country Bangladesh has to face the flood problem every year. When flood occurs, many communities can be destroyed and many lives can be killed.

Due to limited resources, it is not possible to warn people in street level. So, we crucially need a system that controls the root cause which is the flood precautionary system. We can set this system up to the street, canals across the city. When it found the water level in dangerous state, it senses it automatically and sends message to the people to warn them and keep them away from the particular place. For this, Ultrasonic sensor is used to sense the water level and send the data to raspberry pi. Raspberry pi calculates the water level from the top and pass the water distance to the web server. Then The System will check the water distance crosses the dangerous level or not. If the water level crosses the dangerous level then the system sent an email with the message to the nearest people.

Introduction

Flood is a common phenomenon which is increasing day by day. Many localities suffer because it is not well prepared. For the reason we need an automated system that can detects the water level and warns people when water crosses dangerous level.

As a river material country, Bangladesh experiences the flooding problem almost every year. Because of the unawareness, affected people face the extreme level of sufferings and the government spends plethora of taka to recover the affected area. For reducing the risk of flood, we crucially need a flood warning system that can detect the water level and warns people when it becomes dangerous. Getting a quick feedback regarding the rise of the water level would help the surrounding area to take early pre-caution such as move away quickly to a safer and higher place. For warning the people about the impending danger of flooding, this automated system uses IOT which is Internet of Things approaches. It uses the Raspberry Pi for collecting the data from the ultrasonic sensor and transmitting the data to send the alert. Through this ultrasonic sensor, it senses the water level from the top, when it finds water crosses dangerous level, it sends the message through email to the nearest people.

Literature Review

Researchers and engineers in the world have taken various approaches to the design of a flood management system. The Susquehanna Flood Forecast and Warning System (SFFWS), which is one of U. S premier flood warning systems, provides advanced flood/flash flood warning for residents of the 27,

500-square-miles Susquehanna River Basin. Its foundation is a network of more than 60 stream gages and 70 rain gages that read, record, and transmit critical hydrologic data, which is transmitted from the field by way of the GOES (Geostationary Orbiting Environmental Satellite) satellite network, for incorporation into hydrologic models that provides river forecasts at stream gages.

Chen-hang Yen had designed project to create an inexpensive flood detection system to monitor rising water in remote locations or residential areas.

Low a severe flooding in 2008 demonstrated the need for more extensive monitoring of the state’s rivers and streams in real time. To address this, the Iowa Flood Centre (IFC) developed and maintains a state-wide network of stream stage sensors designed to measure stream height and transmit data automatically and frequently to the Iowa Flood Information System (IFIS). The collected data is sent integrated into an advanced hydrological model.

Real Time Wireless Flood Monitoring System Using Ultrasonic Waves is another project by Abubakr Rahmtalla Abdalla Mohamed and Wang Guang Wei of Tianjin University of Technology and Education, Department of Electronics Engineering.

Rivers in Honduras flood frequently, causing a major trouble to people and their lives there. Seeing the pain that the Honduras citizens had to suffer from, daily prompted Robert Ryan-Silva, the director of DAI maker lab, to take on the “ Hidrosnico project”. Hidrosnico is a stream gauge using a

MaxSonar HRXL MB7369 sonar rangefinder, a Seeeduino Stalker v3 Arduino-compatible microcontroller platform, and a FONA 800 GSM module.

Automated system methodology

The automated system can be explained by dividing it into two parts: The whole system working and sensor working. The whole project methodology gives a general overview of how the system works as a whole. The sensor methodology shows how the water distance is actually calculated in the program.

a) The whole system methodology The whole system methodology can be done by the raspberry pi 3 and ultrasonic sensor to create the safety system. Here, ultrasonic sensors sense the level of water from the top. Raspberry pi 3 can be used as a medium between the sensor and the warning transmission channels. Here we use Gmail as transmission channels.

b) Water level measurement For this, we have to import the GPIO libraries. Then we need to assign GPIO pins as input or outputs. After that we set Trigger pin on sensor to low (0) and give a high pulse at Trigger pin for 10µs. Record the time taken by pulse to touch the surface in “ pulse start”. Record the time taken by pulse to reach back in “ pulse end”. Then calculate Pulse duration subtract from the pulse end to pulse start. After that calculate distance by Speed = Distance/Time. Then Store the distance in a variable for further use. Also, we have to add the email id and password of the raspberry pi 3 and receivers. By starting the Gmail email server using SMTP protocol, we measure the water level. This process will continue until the program execution is stopped.

Implementation of the automated system

After installing the GPIO libraries and connecting the raspberry pi with a monitor, keyboard, mouse and power the work has started. A Micro Sd card is needed here as hard disk. Components required for this project are Raspberry Pi (or Raspi) 3, HC-SR04 module, 330-ohm and 470-ohm resistors, and some jumper wires.

Working of HC-SR04 ultrasonic sensor is fairly simple. Circuit diagram of Raspi with HC-SR04 is shown in Fig. 3. The HC-SR04 module and its working are shown in Figs 2 and 3, respectively.

When the processor gives a high signal to trig pin of the sensor, the sensor emits out eight-cycle sonic bursts at 40kHz. After sending the sonic burst, the sensor sets echo to high till the sonic burst returns to the sensor—after reflection from the object. Hence, length of this pulse is proportional to how far the object is. Distance covered by the pulse is twice the distance that has to be measured, and speed of sound is roughly 340 meters per second.

Calculations can be carried out using the following relationship: We know, Speed= Distance/Time, or340=(2×Distance)/Time, or Distance= 170×TimeHence, distance between the object and the sensor in meters can be determined. To calculate in centimeters, we have to should multiply it by 100. After calculating water distance from the top of the river, water distance will store in a variable for further use. Then the system pass the water distance to the web server. Then Web server will check the water level cross the dangerous level or not. If the water level crosses the dangerous level then the system sent an email with the message to the nearest people.

Experimental results

The circuit program of resistors and jumper wires on breadboard is shown in figure.

Now, this breadboard should be connected with raspberry pi through jumper wires. The connection of raspberry pi 3 with jumper wires, power. and ethernet cable is shown here. The whole hardware system with all the connections among raspberry pi 3, ultrasonic sensor, and monitor will look like.

After setting up the hardware and software equipment as described above, it is time to test the system. We design a website as user interface for the system. Now, after opening the web browser the result of the system look like.

If the water level is at dangerous state, it will automatically mail the information through Gmail to the corresponding user.

CONCLUSION

A flood warning system is a way of detecting threatening events in advance. This enables the public to be warned en masse so that actions can be taken to reduce the adverse effects of the event. As such, the primary objective of a flood warning system is to reduce exposure to coastal flooding. The purpose of a flood warning service is to detect and forecast threatening flood events so that the public can be alerted in advance and can undertake appropriate responses to minimize the impact of the event. This is a

particularly important technology in developing countries, where flooding results in massive loss of life and property.

Once an event exceeds a given threshold, a warning will be issued. This message is likely to be disseminated to the ‘ at risk’ population via a number of channels. The media, services such as the police and fire departments and basic signals such as sirens and flags all have important roles to play.

Currently Automated IOT-based Flood warning system developed with the local web apache server. That’s why people from the outside network cannot access the web server. In Future we think that IOT-based Flood warning system will use Real IP address instead of local web server. If we use Real IP address anywhere anybody can access the web server and it will easy for common people. In Future, What’s App sharing option will also added in the IOT-based Flood warning system.