International Journal of Engineering and Advanced Technology (IJEAT)
ISSN: 2249-8958 (Online), Volume-8 Issue-5, June 2019

Early Flood Monitoring System using IoT Applications

S Vara Kumari, O Sailaja, N V S Rama Krishna, Ch Thrinisha

Abstract: ***This paper represents the development of flood monitoring system using the platform of Thingspeak application for storing and retrieving data from the systems using the HTTP protocol over Local Area Network. This system is based on one NodeMCU board integrated with the Thingspeak application. Firstly, a NodeMCU is placed in the flood prone areas where the NodeMCU acts as the transmitting unit which consists of an ultrasonic sensor that is used for the detection of the water level at the time of floods and then the data is displayed through the LCD. Now the data collected by the ultrasonic sensors will be passed to Thingspeak web application. In order to find the rate of flow a water flow meter is used which writes the flow rate to the Thingspeak application. Thingspeak stores data in private channel by default, but there is an opportunity to share data among the public by using the public channel. Thus the result obtained shows the designed system is capable of monitoring the flood prone areas.***

Index Terms: Thingspeak, NodeMCU, Ultrasonic Sensor, HTTP.

I. INTRODUCTION

In Recent years flooding became one of the major natural disasters occurring in India [1]. India is among the top 10 in the world's most food-threatened country. There are many effects of floods where the material, human, economic and social losses are considered as some of the main effects of floods [2]. Heavy rains are also one of the major aspects for the causes of flash floods [3]. In order to reduce the human and economic losses there are some necessary steps to be followed. One of the most and the preliminary step is to alert the people before the occurrence of the disaster. There are some places with early flood alert systems but most of them are not most efficient as they can usually send the information to only some respective organizations with limiting distances [4].

Manuscript published on 30 June 2019.
***** Correspondence Author (s)
S Vara Kumari Asst.Prof, Department of Electronics and Communication Engineering, KLEF, Guntur, India.
O Sailaja, B. Tech student, Department of Electronics and Communication Engineering, KLEF, Guntur, India.
N V S Rama Krishna, B. Tech student, Department of Electronics and Communication Engineering, KLEF, Guntur, India.
Ch Thrinisha, B. Tech student, Department of Electronics and Communication Engineering, KLEF, Guntur, India.

So, in case of floods it is taking more time for passing the message to the people living in the nearby areas so that the people could not save most of their belongings as water rises rapidly within less time. Usually, the flooding cannot be abandoned but the early detections can be made i.e., early alerting system with help of continuous monitoring can be used to reduce the losses faced by the society.

In this advanced technology there are some projects related to early flood monitoring system. At the initial stage a project to indicate the level of water and to alert the surrounding people in remote areas using flood observatory system is bought up where the observatory system communicates with the monitoring system via GSM modem in order to send the information of flow rate and to retrieve commands from the monitoring system [5]. Secondly, the flood detections [6] which estimates the instantaneous water level at any instant of time by means of wireless sensor networks and provides GSM modem and then sends the notifications through the social networks such as the Facebook and Twitter. Thirdly, the real-time flood monitoring system using wireless sensor networks are introduced [7] which monitors the altering and real-time data of river conditions.

The sensor in this utilizes the mobile GPRS communications for transmission of data to the server. It also utilized to detect the monitor timely and sends the location status of the control unit using relative temperature and humidity which indicates the flood conditions whose data is gathered by the sensors. The alert system and flood monitoring system updates the condition of the floods and sends the information or notifications in the form of SMS to the affected zones for the further steps. There is also an implementation of wireless sensor network using flood monitoring system based on the Zigbee technology [8]. In this when the water level rise to the primary level an electromagnetic water level sensor will sense the rising in the water level and process the signals to the Central Processing Unit and triggers Global System for Mobile modem which in turn sends an alert SMS.

Whenever the natural disasters like floods occur, we observe many losses in the form of properties, death of many living organisms. Nowadays at most of the times the present systems notifies only to the respective governed registered organizations, resulting in the slowdown of the process in rescuing citizens and also most of their belongings cannot be stored. Thus, in present condition it is necessary to develop the design of accurate smart floods monitoring system using wireless sensor networks so that the system efficiency canbe increased and can be imposed as the real time monitoring system.

In this paper the main objectives are to implement a system which covers both the NodeMCU-based technology and ultrasonic sensor network components for detecting the floods for sending an alert to the organizations. Ultrasonic sensors processing integrations for sensing the level of water and NodeMCU as a means of communication protocol for transmission. The LED and buzzer act as alerting system when there is rise in the water level.

Firstly, the NodeMCU will send data to the thingspeak application. The public channel present in the thingspeak helps the information to pass in the public. Thus, the people get notified whenever there is a change in the rate of the

II. METHODOLOGY

The Flood monitoring developing system can be divided as software and hardware modules. The methodology discussed as follows:

A. Block Diagram

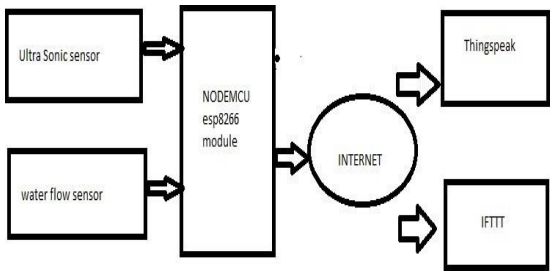

Figure 1: Block diagram of the system

Figure 1 shows the block diagram of the riverside flood monitoring system. In this project we are using two sensors to find out the two different parameters. One is ultrasonic sensor which is used to find the water level of a river and other is water flow sensor which is used to determine the flow rateof the river. For sending the SMS to local peoples to alert the situation during flood times we are using IFTTT web server. For monitoring the data of these two parameters we areusing an external web server named as Thingspeak.

B. Ultra-Sonic Sensor

The ultra-sonic sensor will give the accurate distance with minimum error possible. It consists of four pins; those are VCC, GND, TRIG, ECHO pins. It requires 5v to operate and it ranges is up to 5 meters far from the sensor. In our project in order to find the water level of a river we use this ultra-sonic sensor. The echo pin of ultra-sonic sensor is connected to D3 pin of our nodeMCU and D4 pin of nodeMCU is connected to trig pin of ultra-sonic sensor. The ultra-sonic sensor emits the sound waves which are at high frequencies that a human can't hear. When the sound waves are emitted and when they hit any object or obstacle then the sound waves get reflected back to the ultra-sonic sensor. The ultra-sonic sensor will calculate the time duration between emitted and reflected soundwaves and with that time it can tell at what distance the object or obstacle is located.

Figure 2: Ultra-Sonic Sensor

C. Water Flow Sensor

Water flow sensor is used to find the water flow rate and we can find the quantity of water that is flowing through river. It consists of 3 pins. VCC, GND and Data pin. It requires 5V to operate. The Data pin is connected to D2 pin of nodeMCU. When water flows into the sensor then the force of the water will rote the wheel which is placed inside of the sensor. The water flow rate can be found by calculating the number ofrotations that wheel has done.

Figure 3: Water Flow Sensor

D. Thingspeak web server:

Thingspeak is an open source IoT application and API to peruse and compose the information from things. It utilizes HTTP convention to communicate. In thingspeak we use the graphs as well as numerical display to monitor the data which is updated from sensor via internet. Thingspeak has many advantages like triggering the certain link if certain conditions are meeting.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication (BEIESP)

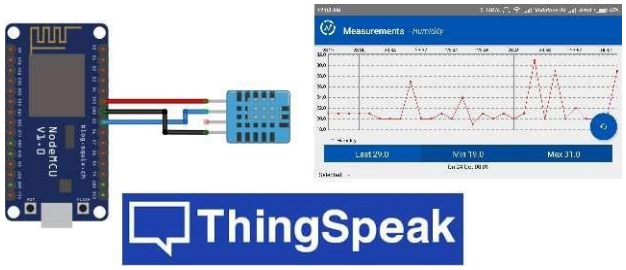

Figure 4: Thingspeak

E. IFTTT Web Server

IFTTT stands for If This Than That. It means that if some trigger happens then some action has to perform. IFTTT is a free web-based service to create applets. In our project we have created an applet which contains two apps, one is webhook and other is SMS app. For creating this applet, it contains 7 different steps and we only need one operating mobile phone with active sim. After completing seven steps we will get an URL which is used to trigger the SMS applet. In this IFTTT we can not only able to send SMS's but also push Gmail notifications, Facebook notifications etc... IFTTT was very easy to use. It only supports HTTPS protocol, so for establishing a communication between them we need certifications of the website like fingerprint. It makes our job little bit tough, so we placed the URL
which is used to trigger the SMS

website. Without the interaction
of our nodeMCU, the SMS's will be sending. One disadvantage of this IFTTT is there is only limit to the messages to send, which means we can only trigger the URL in limited time only.

Figure 5: IFTTT SMS Applet

F. Hardware schematic Diagram.

The circuit diagram for this project is given as follows

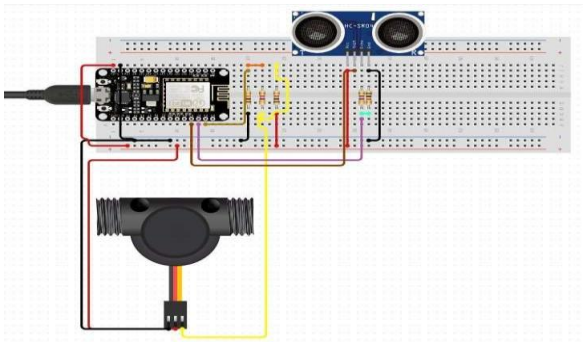

Figure 6: Circuit diagram

For measuring the water level, we are using Ultra-Sonic sensor. This Ultra-Sonic sensor will emit the high frequency sound waves which can't be hear by human ears through a transducer. When this wave travels and hit a planer surface the ultra-sonic waves will travel backward and again reaches the ultra-sonic sensor via same transducer. The sensor will calculate the time lapse difference from those two waves and gives the approximate distance. The ultra-sonic sensor gives very accurate value than other things, so ultra-sonic sensor is more reliable For calculating the water flow rate, we are using water flow sensor, its operating flow rate is0L/min to 50L/min. So, this sensor is sufficient to calculate the flowrate of a river. For processing of the data, we are using NODEMCU latest version, make sure that ultra-sonic sensor and water flow sensor are having the supply voltage of 5V but, the output voltage of the NODEMCU is 3v3. In this case we need to use the voltage converter IC 7805 which takes input of 9V and gives output around 5v which is needed for the two sensors to work.
We are using serial monitor to watch the output when NODEMCU is connected to Arduino software. Before uploading the code, you need to make sure that you have downloaded the esp8266 Board management tools and all respective downloads otherwise the code won't work.

G. Flow chart

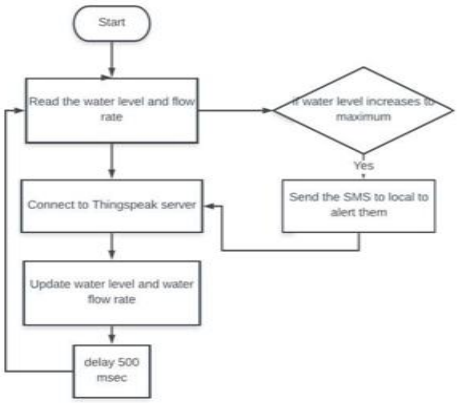

Figure 7: Flow chart

From the flow chart first read the water level and water flow of the river through NODEMCU and next update those values into thingspeak. The Thingspeak will check the updated water level and if that water level is more than 20cm then the thingspeak will automatically trigger to the external website that is IFTTT. com in which our applet is there. Whenever the Thingspeak trigger the URL, with in 2 to 3 seconds the SMS request will be send to the mobile to alert.

III. RESULT AND DISCUSSION

After the task has been finished, the undertaking was prepared to be tried. The remote correspondence between nodeMCU and Thingspeak web server and Thingspeak to IFTTT are successfully achieved. The data was updating the field in thingspeak channel and triggering is also done successfully. This prototype is tested on only at one location and the results are shown below.

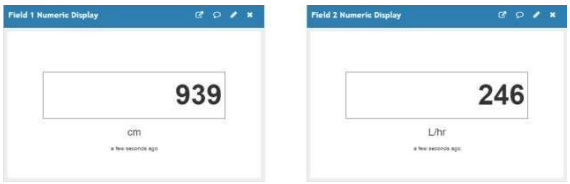

Figure 8: result from the Thingspeak website

From the figure 5, we can see two numerical displays in which 1st one shows the water level of the river and the second one is water flow rate in terms of Liters per hour. If the water level has increased to 1000cm then IFTTT will be triggered b thingspeak server.

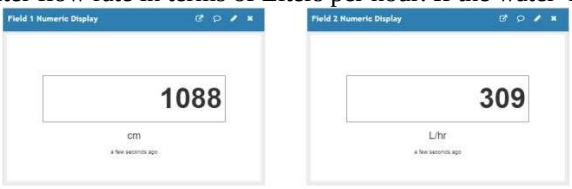

Figure 9: increased water level

If Water level increases to 1000cm the message we get is shown below

This message will be received to mobile if the water level has increased to the 1000cm or above.

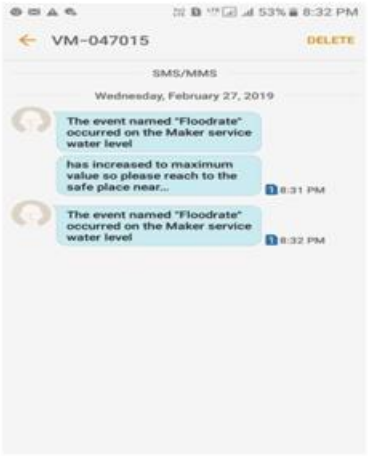

Figure 10: IFTTT applet message

REFERENCES

1. Sebin Sabu1 and Nora Elizabeth ,"Kerala Floods - A Model of Rescue and Rehabilitation using Information Technology and Social Media based Crowdsourcing ," IEEE India Info. Vol. 13 No. 3 Jul - Sep 2018
2. H. A. Rahman, "Global Climate Change and Its Effects on Human Habitat and Environment in Malaysia," Malaysian J. Environ. Manag., vol. 10, no. 2, pp. 17–32, 2009.
3. "Heavy mid-afternoon rain causes flash floods in city centre - Nation | The Star Online." [Online]. Available: http://www.thestar.com.my/news/nation/2017/03/28/heavy- mid-afternoon-rain-causes-flash-floods-in-city-centre/. [Accessed: 24-Nov-2016].
4. S. K. Subramaniam, V. R. Gannapathy, S. Subramonian, and A. H. Hamidon, "Flood level indicator and risk warning system for remote location monitoring using flood observatory system," WSEAS Trans. Syst. Control, vol. 5, no. 3, pp. 153–163, 2010.
5. [5] S. K. Subramaniam, V. R. Gannapathy, S. Subramonian, and
6. H. Hamidon, "Flood level indicator and risk warning system for remote location monitoring using flood observatory system," WSEAS Trans. Syst. Control, vol. 5, no. 3, pp. 153–163, 2010.
7. "Flood Detection using Sensor Network and Notification via SMS and Public Network." [Online]. Available: https://www.researchgate.net/publication/263088726_Flood
8. _Detection_using_Sensor_Network_and_Notification_via_S M S_and_Public_Network. [Accessed: 24-Nov-2016].
9. K. K. Khedo, "Real-Time Flood Monitoring Using Wireless Sensor Networks," pp. 59–69, 2013.
10. J. Patil and A. Kulkarni, "Flood Monitoring," vol. 2, pp. 297– 302, 2013.
11. "Democratizing the Internet of Things — Blynk." [Online]. Available: http://www.blynk.io/home/. [Accessed: 24-Nov-2016].
12. "Blynk Board Bridge Widget Demo - learn.sparkfun.com." [Online]. Available: https://learn.sparkfun.com/tutorials/blynk-board-bridge- widge t-demo. [Accessed: 24-Nov-2016].

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication (BEIESP)