IoT BASED FLOOD MONITORING AND ALERTING SYSTEM

Mr. J. Rajanikanth, M.Tech(Ph.D)[1,] Bandi Saahithi[2], Dorigundla Sreelatha Reddy[3], Gangireddygari Sumanth Kumar Reddy[4], Areddula Sangeetha[5], Ravulacheruvu Suhaib Ahamad[6].

1. *J. Rajanikanth, Associate Professor, 5jrajanikanth@gmail.com.*
2. *Bandi Saahithi, Student, bandisaahithi@gmail.com*
3. *Dorigundla Sreelatha Reddy, Student, sree80502@gmail.com.*
4. *Gangireddygari Sumanth Kumar Reddy, Student, sumanthkumarreddy2002@gmail.com*
5. *Areddula Sangeetha, Student, sangeetha1423100@gmail.com*
6. *Ravulacheruvu Suhaib Ahamad, Student, jsuhaib710@gmail.com*

Department of Electronics and Communication Engineering, Siddharth Institute of Engineering & Technology, Puttur, Andhra Pradesh, India.

ABSTRACT

Nowadays natural calamities like flooding turn up drastically, and it severely affects standard of living. In this paper the development of flood monitoring system using IoT to keep track of the conditions nearby the reservoir with the help of Arduino, and the compactible sensors such as level, temperature, humidity and flow distinctly presented. Firstly, the hardware unit is placed in the flood prone areas, the GSM Module as the transmitting unit and the sensors associated with the system measures the corresponding parameters. Then the accurately measured parameters are displayed through the LCD display and passed to the IOT web application. Here the ThingSpeak web application is used to store data in private channel and the web application then alerts the authority and people while flood occurs.

Keywords- *Arduino Mega, DHT11 Sensor, GSM Module, ThingSpeak Web Application, Battery.*

I. INTRODUCTION

Flood occurs when water overflows from the river, lake or from heavy rainfall and it can happen at any time of the year. Flooding can be very dangerous, when floods happen in an area that people live, the water carries along objects like houses, cars, furniture and even people. It can wipe away property, trees and many more heavy items. For years, flooded roads have been a problem in Metro Mumbai. It causes heavy flow of traffic. Both motorists and commuters are getting stuck in a flooded areas and getting lost in finding possible routes just to go to their destinations.

When traffic happened, people's money, time and effort are wasted. Through the local government unit flood control has been extending their efforts to inform the commuters regarding the situation in flooded areas during rainy season, still the dissemination of information to the locals are not enough. For this reason, the "Arduino Flood Detector System" is been develop, to help the road user to avoid this problem happened.

It was invented based on problem faced by motorists and commuters when flood occurred. This will avoid the traffic jam because the users have a time to find a possible routes before they are going to be stuck at the flood area. The system will function when the admin activates the system and when water along the road detected by distance over ultrasonic sensor. When the flood occurs, the ultrasonic sensor will sent signal to the microprocessor circuit and the sense water level will be display in the user interface and it will automatically send a Short Message Service (SMS) to those recognized residents and it will continue update until the water level detected returns to normal.

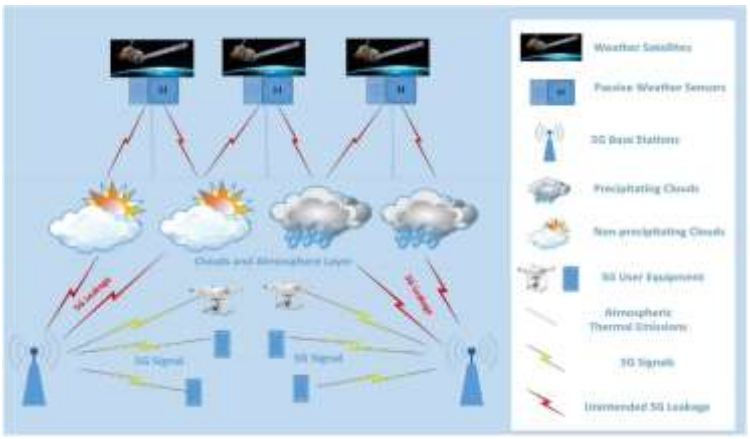


Fig.1: IoT System for Weather Monitoring

The process repeats as the water level continuous to rise. The idea of an SMS based warning system was proposed because mobile phones have become a popular communication device among people all over the world. All mobile phone are able to communicate because it comprises of a GSM. This system used to detect the current water level of flood around the road and will give real-time information to the motorists or commuters that has still not passing through the flooded areas to avoid problem.

II. RELATED WORKS

[1] A novel architecture for the transceiver is proposed in order to increase the service range of IEEE802.11ah, which is necessary for the long-range IoT communication of emergency messages in emergency situations. Experimental results show that the presented architecture is suitable for the long-range IoT communication of emergency alert messages.

[2] Wireless sensor network system could remotely monitor the real time data of water condition in the identified areas. To monitor the water conditions such as water level, flow and precipitation level, wireless sensor network system is developed.

[3] GRAB, designed for robust data delivery in face of unreliable nodes and failable wireless link. GRAB forwards data along band of interleaved mesh.

[4] In Wireless Sensor Networks (WSN) the user requirements are often desired to be evolvable, whether driven by changes of the monitored parameters or WSN properties of configuration, structure, communication capacities, node density and energy among many others.

[5] The Functionality is supported by the reflective and component-based Grid Kit middleware, which provides support for both WSN and Grid application domains.

[6] A Distributed system is proposed using water level monitoring sensors named Shonabondhu. The sensing nodes are distributed all across the country and the servers that collect data from sensors are spread around various regions. The servers use a function of rainfall and current water level that indicate a particular gradient to that sensors.

[7] Proposed cooperative monitoring algorithm based on node location information. Basically, IoT is a part from WSN but sometimes there are have a problem on connectivity end to end device because there are varieties of devices used in the network architecture. A consistent design system is needed to implement, where the main application requirements for low cost, fast deployment of large numbers of sensors, and reliable and long unattended service are considered at all level.

[8] The system must be able to handle the variety of data types, providing interoperability among all the components. This is because of the various environment of the IoT device give a different perspective in term of information processing, communication capabilities, and data transferring that coming from the devices. The communication device is important in the system example using of ZigBee network protocol. The protocol had

free communication frequency and used low power consumption for communication that saves the hardware cost of instead of using GPRS and reduce the cost of the whole system. The advantages of the ZigBee network is it can achieve mutual communication sensor nodes. It helps the system discovers sensor nodes within the range of monitoring stations in short time, reduce the scanning time to collect data, improve the reliability of the information collection and transmission.

III. METHODOLOGY

An IoT early flood detection and alert system using the Arduino is thus, a proposed solution to this problem. The system consists of various sensors which are temperature, humidity, water level, flow and ultrasonic sensors and also includes an Arduino controller, a GSM Module , an LCD, an IoT remote server-based platform and an android application with constructed user friendly GUI relaying all the vital information involved in the picture in a visual format.

This model set up the GSM board near the dam and DHT sensor and ultrasonic sensor, float sensor are connected to it.DHT sensor gives the Humidity and Temperature in the air and Ultrasonic sensor gives the water level. Based on this and some other parameters we may decide if the flood is going to occur or not. We connect them to the cloud from where we connect this to the mobile application and we can see the output in our application too.

The systems have given connections in breadboard as follows, are will fix DHT11 and Buzzer on Breadboard and we will give connections, We will give connection DHT11, Buzzer and Ultrasonic Sensor to GSM Module.

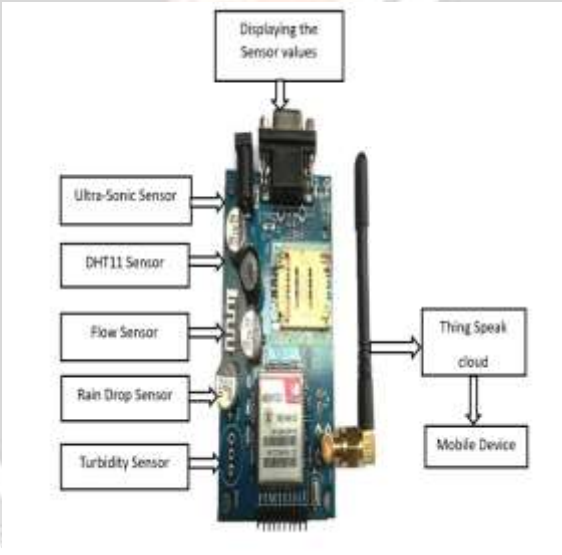


Fig .2: System Architecture

IV. BLOCK DIAGRAM

In this project we are using Ultrasonic Sensor, DHT11 Sensor, Flow Sensor, Raindrop Sensor, Turbidity Sensor to measure the parameters like water environmental temperature and humidity, Flow rate, level of water, rain intensity of the environment, how much amount of water is been contaminated in rivers.

If any of the value exceeded message on the values will be uploaded using GSM Module and the exceeded values will be displayed in LCD screen and also it gives indication using LED's and alert will be given using voice sensor and also through SMS notification.

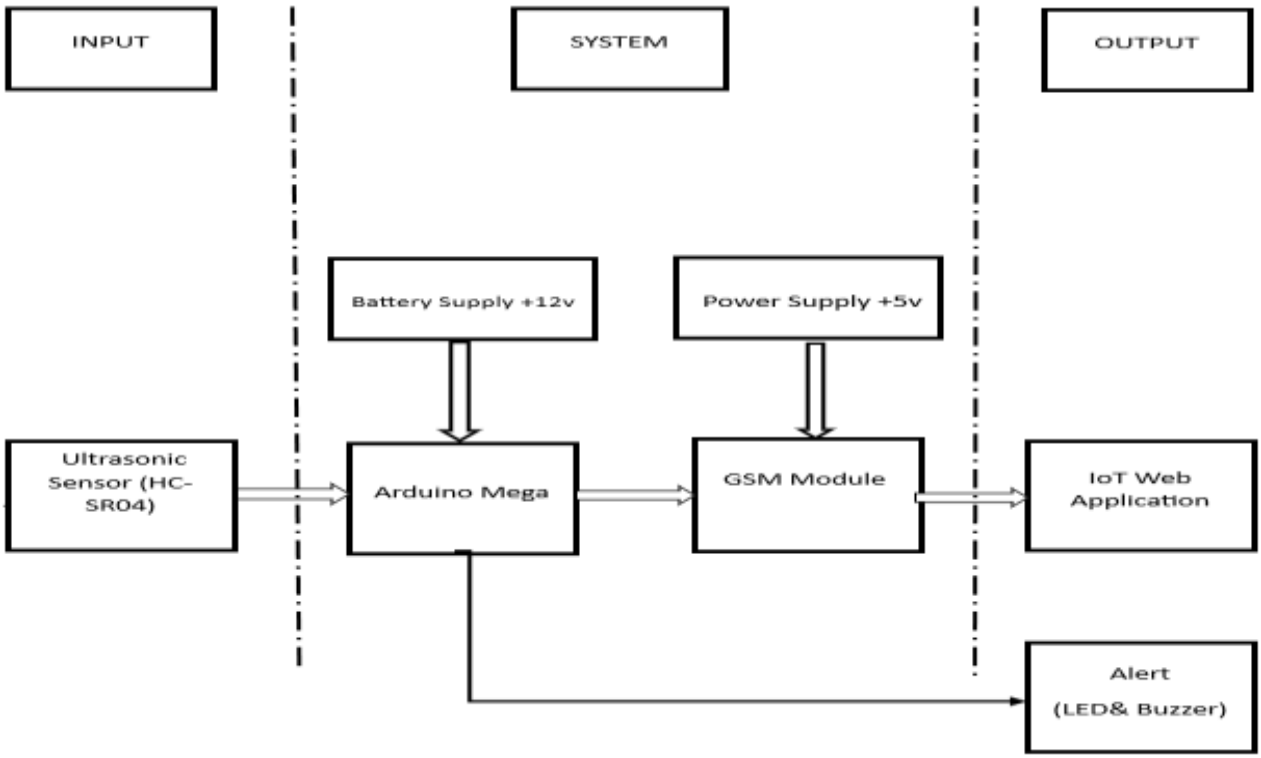


Fig. 3: Block Diagram

V. HARDWARE DETAILS

- Battery
  Voltage: 5V
  current :1.3Ah
- Arduino Mega
- Ultrasonic sensor
- Flow sensor
- DHT11 Sensor
- Raindrop sensor
- Turbidity sensor
- GSM Module
- Adapter 12v
- Buzzer
- LED's (Red, Green , Orange)
- Voice module
- Speaker
- 16X2 LCD Display
- Connecting wires

Arduino Mega: The Arduino Mega 2560 is a Microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega 2560 board is compatible with most shields designed for the Uno and the former boards Duemilanove or Diecimila.

Ultrasonic sensor: As the name indicates ultrasonic sensor measure distance by using ultrasonic waves. The sensor head emits an ultrasonic waves and receives the wave reflected back from the target ultrasonic sensors measured the distance- to the target by measuring the time between immision reception. An optical sensor has a transmitter and receiver. Whereas ultrasonic sensor uses a single ultrasonic element for both immision and reception. In a reflective model ultrasonic sensor, a single oscillator emits and receives ultrasonic waves alternately. This enables miniaturization of sensor head.

DHT11 sensor: DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability.

Float Sensor: It acts like a switch, when the water level hits the float sensor it sends an alarming signal.

Rain Sensor: The rain sensor module is used for detecting the presence of rainfall, acting as a switch when raindrop touches its board. The module measures moistness through analog output pins and provides digital results.

Turbidity Sensor: A turbidity probe works by sending a light beam into the water to be tested. This light will then be scattered by any suspended particles. A light detector is placed at (usually) a 90 Degree angle to the light source, and detects the amount of light that is reflected back at it.

GSM Module: The GSM module is used to transmit the data from sensors to the PC system through wireless transmission. In this project , GSM sim900 modem is used which is usually mounted to the Arduino. It comes with the features to send and receive SMS and voice calls, and establish communication over the broadly spread GPRS network. To upload sketches to the board, connect it to computer with a USB cable and upload sketch with the Arduino IDE. Once the sketch has been uploaded, you can disconnect the board from your computer and power it with an external power supply. Then, the GSM library handles communication between Arduino and the GSM shield.

LCD: It is used to display the values in LCD Screen**.**

LED (Red,Orange, Green) : A Light-Emitting Diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the Semiconductor recombine with electron holes, releasing energy in the form of photons. It is used to indicate , if it reaches beyond the limit then red LED will glows and if it is in normal condition then green LED will glows.

Voice module sensor : It is used to alert the people by voice message, if it is red then it gives Danger and if its green the it give safe message.

Power Supply (5V Battery): Arduino boards can operate satisfactorily on power that is available from the USB port. It provides 5V DC Voltage and can be sourced from the port from a PC, wall socket adapter or portable power bank. Using of 5 Volts because that provides the best combination of noise immunity, power consumption and speed with the existing technology. Naturally, connecting circuits such as Sensors and other devices tried to use the same voltage to avoid the need for extra power supplies.

In this project we use Embedded C for executing program for operation of the proposed system. Embedded C is generally used to develop microcontroller-based applications. Embedded C is a well defined and standardised general purpose programming language. A platform specific application known as compiler is used for the conversion of programs written in C to the target processor specific binary files. We use Arduino IDE for executing the programs for the operation of proposed system. The Arduino Software(IDE) contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions. It connects to the Arduino hardware to upload programs and communicate with them. In Arduino we use the two main functions for the execution of the code i.e.-setup() and loop() function. Arduino IDE is easier to reuse the code for the execution of Program.

VI. SOFTWARE DETAILS

The software requirements used in the system design are Arduino IDE and the language is done on Embedded C. The Arduino IDE is an integrated development environment designed to program the Arduino microcontroller. It is an open platform for some addition add-on boards such as GSM Module etc.The embedded C is used for supporting the embedded device. In this system the sensors relate to the device are connected to observe the state of flood detection in the system and programmed to warn the surrounding environment immediately.

Step 1: Sign up for ThingSpeak

First, go to https://thingspeak.com/ and create a new free Mathworks account if you don't have a Mathworks account before.

Step 2: Sign in to ThingSpeak

Sign in to ThingSpeak using your credentials and click on "New Channel**"**. Now fill up the details of the project like Name, Field names, etc. Here we have to create four field names such as Humidity, Temperature, pressure & Rain. Then click on "Save channel".

Step 3: Record the Credentials

. Select the created channel and record the following credentials.

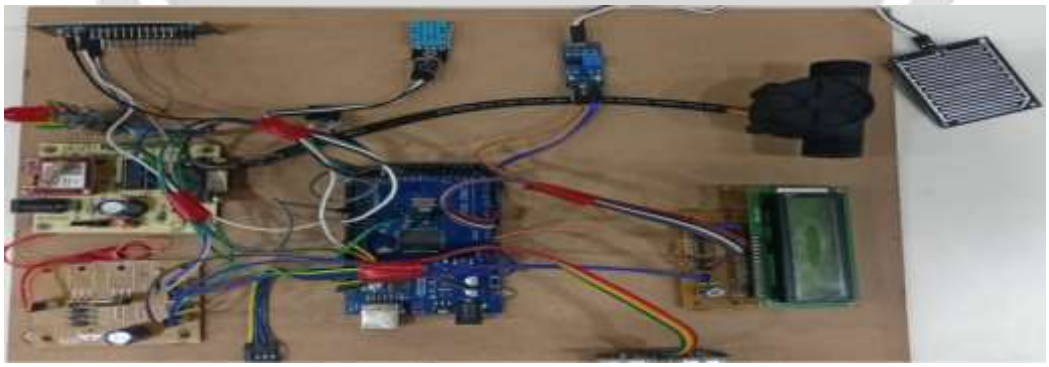
- Channel ID, which is at the top of the channel view.
- Write an API key, which can be found on the API Keys tab of your channel view

Step 4: Add widgets to your GUI

Click on "Add Widgets" and add four appropriate widgets like gauges, numeric displays, and indicators. In my case, I have taken an Indicator for the flood. Select appropriate field names for each widget.

VI. RESULT & CONCLUSION

This project highlights the possibility to provide an alert system that will overcome the risk of flood. As the project is enabled with IOT technology and hence the sensor data can be monitored from anywhere in the world. More sensors can be integrated into the system in order to create more accurate and efficient flood detection system. It can also contribute to multiple government agencies or authority that ultimately help the society and mankind about the flood like hazardous natural disaster. It will monitor each and every aspect that can lead to flood. If the water level rises along with the speed, it will send an alert immediately. It also ensures increased accessibility in dealing and reverting to this catastrophic incident. In summary, it will help the community in taking quick decisions and planning against this disaster mankind about the flood like hazardous natural disaster.



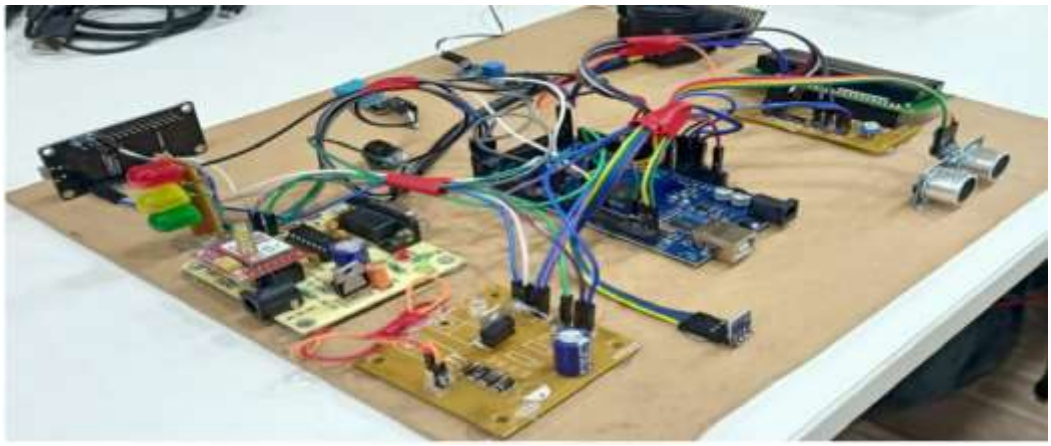


Fig 4: IoT Based Flood Monitoring and Alerting System

VII. FUTURE SCOPE

This study is conducted to solve the problems brought about by floods. The device shall contain with the following features: It has ultrasonic sensor to sense the distance of water level of flood on the road. The system provided a camera that will display the real-time image of the flood that can view via livestream. It includes Serial Communication to send warning text message with the content of date, time, water level and road accessibility. The system has three (3) modules which are Users, Logs, and Contact Numbers. It can be modify by the admin. The unit containing the sensor is suggested to be place in front of Our system. The position of the sensor must be placed perpendicular to the flood water; otherwise, there will be an imperfect reflection of ultrasonic waves and cause measurement errors. The sensor is suggested to be placed on a pole with a height of about 3 to 3.5 meters. The flood sensors and microcontrollers will be powered by a Solar Power Bank with 80, 000 Ampere Ampere-Hour (mAh) for the benefit of continuous operation of water flood height detection and network data transmission.

VIII. REFERENCES

[1]. Internet of Things Based Real Time Flood Monitoring and Alert Management System Author: Tibin Mathew Thekkil ; Dr.N.Prabakaran Year: 2021
[2]. Development of Flood Monitoring System using WSN and IoT based on Cloud Author: Pallavi C B1; Chandrakala; Year:2019
[3]. Flood Detection using Sensor Network and Notification via SMS and Public Network Author: Mohamed Ibrahim Khalaf alfahadiwy ;Azizah suliman ; Year:2018
[4]. Flood Detection System Using Wireless Sensor Network Author: Abhijeet A Pasi;Uday Bhave Year: 2017
[5]. A New WSN Paradigm for Environmental Monitoring and Data Collection Author:Eric Dines, Hassanain Al-Majeed, Asanka Fernando, Mutaz Abdalla, Year: 2016
[6]. Internet of Things Based Real Time Flood Monitoring and Alert Management System Author: Jagadeesh Babu Mallisetty and Chandrasekhar V; Year :2015
[7]. An Intelligent Flood Monitoring System for Bangladesh Using Wireless Sensor Network Author: Z.M.Taib, N.S.Jaharuddin and Z.D. Mansor ;Year : 2014
[8]. Development of a low cost Community Based Real Time Flood Monitoring And Early Warning System – Abimbola Atijosan, Ayodeji Olalekan Salau, Rahmon Ariyo Badru, Taofeek Alaga ; Year: 2013
[9].SMS Based Flood Monitoring and Early Warning Author: Sheikh Azid, Bibhya Sharma, Krishna Raghuwaiya, Abinendra Chand Year Year: 2012
[10] D. Mysar, M.Jagadeesh Babu, Real Time Monitoring of Water Level Variation in Rivers and Flood Alerting System using ARM7 on International Journal of Advanced Research in Computer and Communication Engineering , 2016
[11] L.S.C. Johnson, and S.N Hidayah M., A Review of Flood Catastrophic Management in Malaysia, ARPN Journal of Engineering and Applied Sciences, Vol.11, No. 14, Jul 2015.
[12] Z.M.Taib, N.S.Jaharuddin and Z.D. Mansor, "A Review of Flood Disaster and Disaster in Malaysia" International Journal of Accounting and Business Management, Vol. 4, No.3,2014.

[13] Dr. E N Ganesh, "IOT Based Environment Monitoring Using Wireless Sensor Network", International Journal of Advanced Research (IJAR) ISSN 2320-5407,2013.
[14] Jagadeesh Babu Mallisetty and Chandrasekhar V2, "Internet of Things Based Real Time Flood Monitoring and Alert Management system"- International Journal of Pure and Applied Mathematics Volume 118 No. 17 2019, 859-868.
[15] Sebin Sabu1 and Nora Elizabeth, Kerela Floods- A Model of Rescue and Rehabilitation using Information Technology and Socialmedia based Crowd Sourcing, IEEE India Info. Vol. 13 No. 3 Jul-Sep 2015.
[16] Sheikh Azid, Bibhya Sharma, Krishna Raghuwaiya, Abinendra Chand, Sumeet Prasad, SMS based flood monitoring and early warning system, ARPN Journal of Engineering and Applied Science, 10(15) 2015.
[17] Abubaker Rahmtalla, Abdalla Mohamed, Wang Guang Wei, Real Time Wireless Flood Monitoring System using Ultrasonic waves, International Journal of Science and Research (IJSR) ,3(8) 2014.
[18] Manish M. Patil and Prof. Chhaya S. Khandelwal, Implementation of Patient Monitoring System Using GSM Technology. International Journal of Electronics and Communication Engineering & Technology (IJECET).4(1), 2013, pp. 18–24
[19] S. J. Priya, S. Akshaya, E. Aruna, J. A. M. Julie, and V. Ranjani, "Flood monitoring and alerting system," International Journal of Computer Engineering & Technology (IJCET), vol. 8, no. 2, p. 15, Mar 2012.
[20] Azlina, N., Aziz, A., &Aziz, K.A. (2011). Managing Disaster with Wireless Sensor Networks, (December 2008), 202–207