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Survey on Flood Monitoring & Alerting Systems

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Abstract - In any water system, when there is an increased quantity of water, it causes flooding, like a river or lake overflowing. Flooding is a natural disaster occurs in many countries. Many occasions are responsible for flooding such as heavy rainfall or dam fractures. In case of flooding or dam fractures, it rapidly releases a huge quantity of water and floods the river banks and surrounding areas. It causes loss of life and property also. Flood monitoring and alerting systems are helpful for monitoring and to reduce the losses faced by the society. This paper gives an overall survey on the various flood monitoring and alerting systems in the different flood prone areas around the world.

Key Words: optics, Flood monitoring, Flood detection

1. INTRODUCTION

In Recent years flooding became one of the major natural disasters occurring in India. 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. Heavy rains are also one of the major aspects for the causes of flash floods. 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. 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 [1].

2. Literature Survey

Paper [2] presented a description about implementation of the sensor network. The proposed model is as shown in Figure 1. This architecture is used for early warning of flood prediction and detection and to alert communities in events of disasters. It allows model-driven control for optimizing the prediction capability of the system. This architecture is developed in Honduras and different experiments were carried out. A statistical modeling algorithm was designed for flood prediction. The solution was carried out using wireless sensor network (WSN) and divided into four tasks- event prediction, authority notification, community alert, and community evacuation.

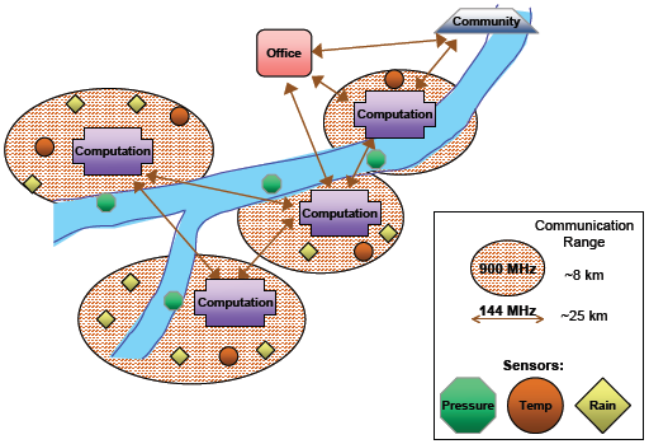

Fig -1: Flood Alert System Model [2]

In paper [3] author used Wireless sensor network for flood monitoring and detection. For developing FMDS, ZigBee radio was used and three modules (sensor field, surveillance centre and mobile phone) were developed. Sensor gathers the information of flood indicators about temperature, relative humidity, amount of rainfall and water level in the sensor field. FMDS system sends the notification SMS to the regarding flood prone zone.

In paper [4] author presented an automatic method based on an unsupervised clustering which is done in three steps. In first step Digital Elevation Model (DEM) is used as prior information to localize high probability of floods. This step allowed us to mark out the area at high risk due to topographic data. Then, in second step the separation of the wet and dry pixels is done by a non-linear k-means clustering kernel. This makes optimal separation of two classes 'water' and 'non-water' in unsupervised classification in the next step. In third step to isolate the flooded pixels from the permanent water, a non linear clustering with a log ratio image is applied in the features space. In the third step, the pixels corresponding to the flooded portion are detected by a non-linear classification on the image log ratio in feature space. It can be seen as the construction of map damaged area has been made easy and in a short time without any ground truth. The limitation of this

approach is the obtaining of images during floods time in real time.

In [5] author presented a Flood alert system with Android Application. This system uses smartphone, WSN and IoT technology. For communication it uses ZigBee protocol. This system will monitor the potential drainage usually occur flooding and share the info in real time to people nearby. The system architecture has four nodes. Sensors (node 1) for detecting water levels and send data to router nodes. Routers (node 2 and node 3) work as a backup node and it receives and send data to coordinator node. Coordinator (node 4) receives and processes data before sending to server.

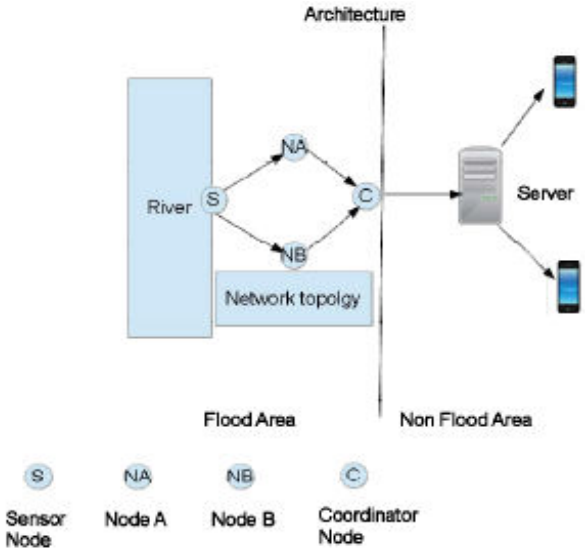

Fig -2: Flood Flood Alert System Model [5]

This paper [6] proposed an IoT based water monitoring system that measure water level in real time. The prototype is based on idea that the level of water can be very important parameter when it comes to the flood occurrences especially in disaster prone area. A water level sensor is used to detect the desired parameter and if the water level reaches the parameter the signal will be freed in real time to social network like Twitter. A cloud server was configured as data repository. The measurements of water level are displayed in remote dashboard. The proposed solution with integrated sensory system allows inner monitoring of water quality. Alerts and relevant data are transmitted over the internet to a cloud server and can be received by user terminal owned by consumer. The outcome of water measurement is displayed in web based remote dashboard.

In [7] the author proposed into three key points (i) IoT and the areas of applications (ii) rain and other sensing parameters (iii) prediction of floods. Paper [8] has the current sense of Malaysia disaster management to increase the flood prediction and maintain the low risk. In paper [9] author discussed the system to monitor the flood based object system with the surveillance system. The methods of image processing are directly utilized by the author. Author [10] has proposed a method to read the water level at time interval and send SMS to the residences to alert them regarding the flood. Paper [11], [12] and [13] has proposed the design of flood prediction with the ultrasonic sensors used to level the flood water and alert the surrounding system.

Recent Trends

Paper [14] presents Method Used by Government Organization. Government organizations use the measurement scale for indicating the water levels in rivers. For measurement scale marking system is used. From the given marking of water level technical person decides the situation of flood. From that situation they predict the area of danger zone. Then the respective government officer instructs the management people.

In the Kolhapur district for the water measurement at the Rajaram Bandhara they use the manual method. In which, one of the persons go to a particular location at particular time, that time can be in the morning or in the night. That person checks the water level manually using torch light at night. And then he conveys the water level to other person using mobile phone call or any other method. After that, the alert signal is generated to alert the people. In this method, there is lot of risk are present during the heavy rainfall. This method is not safe for the person working for it [14].

Paper [15] presented “Early flood monitoring system using IoT applications”. Here ultrasonic sensors are used to determine water level, and water flow sensor is used to determine flow rate of a river. This system is in based on Thingspeak web 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. IFTTT (if this than that) web server is used for sending SMS to alert the people. In IFTTT URL is triggered limited times there is limit to send messages.

3. CONCLUSION

This paper performs survey of environmental and flood disaster detection & monitoring systems and different communication technologies which help to improve upon the effective flood detection and flood warning problems. These systems with highly reliable sensors and effective IoT

platforms will critically be used for large scale environment monitoring and disaster prevention.

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