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"IOT Based Flood Monitoring System Using GPS"

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Abstract: *— The impact towards mankind Flooding is the most common natural disaster. Floods have been known to do significant damage. There are many sophisticated system widely in practice by organizations and responsible authorities in monitoring flood level in flood prone regions. Most of these devices are very costly to be used and maintained. The proposed system using N-mote and N-gateway, sensor data such as temperature, humidity, rainfall rate and water level can be sent to cloud and if threshold values of the environmental conditions increases, the warning message can be sent to responsible authorities and people lives in a flood prone region. Such a system enables both private and government organizations to work on their emergency evacuation and mitigation plans for a safer move before the flood situation get worse.*

KeyWords: *N-Mote, N-Gateway, Ultrasonic Sensors, Arduino Uno.*

1. Introduction

Flooding is one of the major disasters occurring in various parts of the world. Although, we are to forecast rainfall or to track cyclone path very precisely from the satellite images, the need to have real-time monitored data such as flow, precipitation level, or water level is essential in order to make a reasonable decision on the actions necessary to be performed to prevent flooding. The cost of damage caused by flooding correlates closely with the warning time given before a flood event, making flood monitoring and prediction critical to minimizing the cost of flood damage. Although Mauritius has a surface area of only 1865 km2, there is a high variation in rainfall over very short distances throughout the island owing to its topography. Annual mean rainfall varies 1400 mm on the eastern coast to 4000 mm on the Central Plateau and 600 accompanied by flash floods has increased in Mauritius.

Wireless sensor networks(WSNs) is a developing class of to a great degree dynamic condition on top of which a wide range of uses, for example, military frameworks, living space checking, accuracy horticulture and building observing are fabricated. A Wireless Sensor Network (WSN) comprises of a possibly extensive arrangement of individual sensor hubs . Each of these hubs has extremely restricted assets, both as far as preparing velocity and memory. With the appearance of little, battery-controlled, remote figuring and detecting innovation, it is presently conceivable to screen and watch the world at phenomenal levels of granularity. Systems of such gadgets normally comprise of terms or many little, control compelled hubs sent in remote areas which they are relied upon to screen for quite a long time or years on end. The scaling down and the accessibility of various sorts of sensor hubs have permitted new organization for progressively complex applications. As of late, there has been developing enthusiasm for utilizing WSNs to perform continuous surge expectation and observing.

The main cause of flood is the hydrological condition of discharge of heavy rain fall and the enormous water.

2. Literature Review

A reliable computational model which could fight with the flood in developing and poor countries is the main concern. There are different models, the different energy efficiency models, different networking arrangement of wireless sensor networks. These motivate us in preparing a most efficient model for predicting and preventing flood.

[1] Presents a forecasting model designed using WSNs (Wireless Sensor Networks). This model helps to predict flood in rivers using simple and fast calculations to provide real-time results and save the lives of people who may be affected by the flood by ringing a alarm.
[2] Described a method to calculate the amount of energy consumption by sensor in a network, according to the data flow rate, the number of nodes and the distance between them.
[3] Presented a comprehensive study of the flood analysis and prediction using Geographical Information system (GIS) i.e. they are using an Arc GIS simulation tool to identify pre and post disaster flood risk analysis and an Ad hoc wireless Sensor Network Architecture.
[4] Presented a least cost framework of irrigation control system based on sensor network for efficient water management in Pakistan. As that there exists a direct relationship between irrigation and growth per yield of agriculture which implies the high demand of water in the country is directly proportional to scares water resources so an efficient management and maintenance of water resources and controlling the water wastage is required for agriculture.
[5] Described a Pipe Net, a system based on wireless sensor networks which detect, localize and quantify bursts and leaks and other anomalies in water transmission pipelines such as blockages or malfunctioning control values.
[6]They investigate with machine learning (ML) classification techniques to assist in the problem of flash flood now casting. They also evaluated forecasting.
[7] presented a brief description about implementation of the sensor network in Honduras for an early detection of flood & alert the community. They have analyzed on the significance on sensor networks in developing countries, sensor networks for flood detection and the available current operational systems for flood detection.

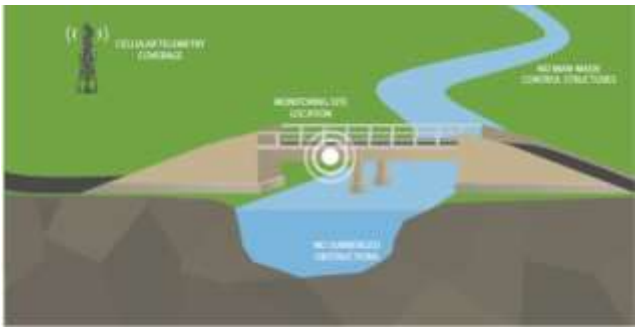

Figure 1: Flood Flow Monitoring

3. Objectives

Following are the objectives:-

- To develop the front panel by flood monitoring system
- To develop the system that the information flash flood will be linked to user.
- To interface water level detector and warming lamp with PC-based system by using arduino.
- To develop the water level detector and warming lamp hardware.
- To ease the user (Arduino) in monitoring water level by using the PC instead of physical or conventional monitoring. In other word, to create a user friendly interface of virtual instrument this can be used to monitor the water level.
- To interface between hardware prototype and front panel water level..

4. Scope of work

The scope of the "IOT Based Flood Monitoring System using GPS are as follows:-

This project focuses on the nearby area that is affected by flood. Water level data was collected and updated from time to time to monitor the changes in the water level. The project utilizes the mobile GSM (global system for mobile) network to trigger the flood incidents to the user.

The geographical condition i.e. flows of water from neighboring states, flow of river across the states & the topographical condition up to some extent are the factor of flooding condition. To develop the communication, computation, sensing has led to the emergence of wireless sensor networks (WSN) that allows distributed computation and monitoring over large area.

5. Existing System

N-Mote: in the n-mote operation, sensors for different physical environment condition are interfaced with n-mote. N-mate has a module, through which the monitored data from the sensors can send to the mote and followed by n-gateway. Initially the monitored data is received by the n-mote through its beneficiary port and transmit it to gate way by a transmitter port.
N-Gateway: The flow diagram for operation of n-gateway.as mentioned before gateway also has a Zigbee to Zigbee communication with mote because it is necessary to communicate between n-mote and n-gateway. After receiving the monitored data from the mote ,it display the monitored value on terminal display of the computer then the data will be send to the cloud through Ethernet of wifi and it will be in the form of python script.

6. Problem Definition

Most of the floods monitoring techniques are based on the telemetry system which required transmitters and repeaters to relay the information to a central terminal. This approach is expensive and is not reliable when there is malfunction of equipment in some section of the sensed area. Some other techniques are dependent on the communication infrastructure of some third party providers making them unreliable. Therefore, there is a need to build a low cost and reliable system using a wireless sensor network.

The sensor will be connected to the arduino Uno and the arduino Uno is connected to the mobile broadband so that it can send an alert message to the user.

7. Proposed System

There are many sophisticated system widely in practice by some organizations and responsible authorities in monitoring flood level in a certain location. Most of these devices are very high in costly to be used and maintained. Apart from that, these devices are usually used only for monitoring purposes between the flood prone location and the monitoring station. With real time detection and alert system all the responsible organization can be on their toes when there is an urge for a certain task related to their core job during flood. Such a system enables both private and government organizations to work on their emergency evacuation and mitigation plans for a saver move before the flood situation gets worse. Within a limited time and available man power the rescue team and fire fighting department has to plan for the best possible evacuation and rescue activities during flood.

7. Architecture

- **A Mobile Station:** It is the mobile phone which consists of the transceiver, the display and the processor and is controlled by a SIM card operating over the network.
- **Base Station Subsystem:** It acts as an interface between the mobile station and the network subsystem. It consists of the Base Transceiver Station which contains the radio transceivers and handles the protocols for communication with mobiles. It also consists of the Base Station Controller which controls the Base Transceiver station and acts as a interface between the mobile station and mobile switching centre.
- **Network Subsystem:** It provides the basic network connection to the mobile stations. The basic part of the Network Subsystem is the Mobile Service Switching Centre which provides access to different networks like ISDN, PSTN etc. It also consists of the Home Location Register and the Visitor Location Register which provides the call routing and roaming capabilities of GSM. It also contains the Equipment Identity Register which maintains an account of all the mobile equipments wherein each mobile is identified by its own IMEI number. IMEI stands for International Mobile Equipment Identity.

8 Methodology

This project uses GSM technology and ultrasonic sensor to detect the water level and sends data to a rescue team to serve as a warning. Rescue team can get data processing based on the results of point prediction model to trigger timely warnings (Short Message System) and give the information to the stakeholder that are exposed to floods. For the warning system using ultrasonic sensor to be used as a marker or detector water level in the river and this system will send SMS alert via GSM system. GSM also serves as a modem for transmission to the satellite so that the rescuer can know information about the water level in a river vulnerable to flooding.

In this project , will be used as an ultrasonic sensor network to detect the level of water in major rivers prone to flooding. At the level of danger, residents should be prepared to move to higher ground or safe place as over the hill and schools. The authorities also should act more quickly to help or rescue flood victims. usually normal level is labeled as a safe level , while for the middle level ,it indicates an impending flood or overflow of the river and the authorities or residents should be vigilant on possibility of flooding to occur. Prepared to move to higher ground or safe place as over the hills and schools.

This project uses the solar system to turn on the system. The system uses GSM shield. Ultrasonic sensor will send a signal to GSM shield and GSM shield will process the data to send short message to the authorities or communities affected by floods. When Ultrasonic Sensor act as input. This system combines ultrasonic sensors and GSM shield in a microcontroller.

9. Flowchart

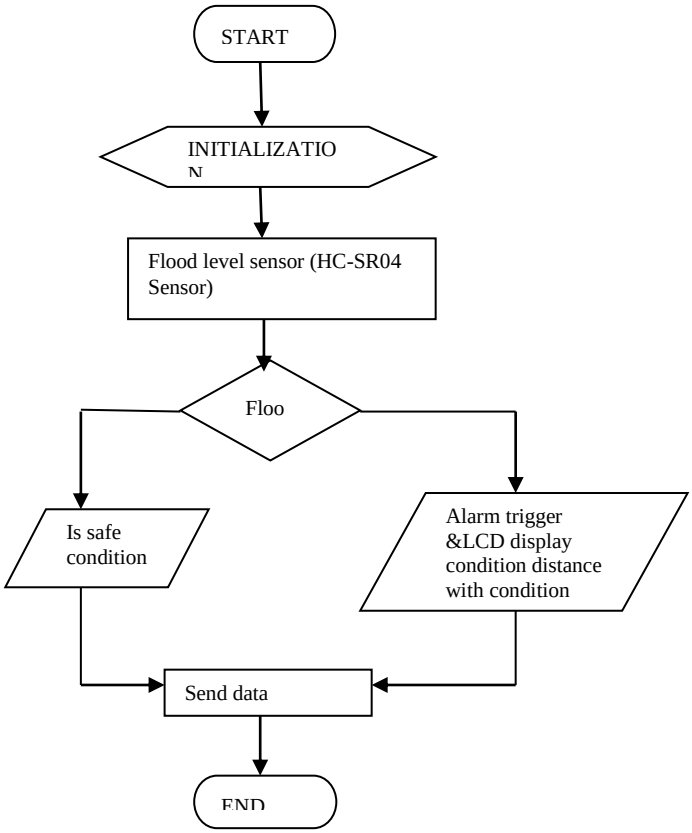

Fig. 1- Flowchart of IOT Based Flood Monitoring System using GPS

10. Results and Discussion

Nowadays mobile communication is a necessity as one of the ways of acquiring information. All level of users, including higher education students have a mobile phone as one of their communication device choice. This paper explores the adoption of web based SMS system to measure the usability and effectiveness of this broadcast communication option in disseminating information among students and lecturers. Prototype was developed by adopting iterative software development process- RUP. Use of Short Message services (SMS) for various applications have increased significantly. There is still one area where these services have not been utilized to the right potential is in the field of academics. Although it has the widest reach of all the technologies in the college campus, it is still very much underutilized in the student services administration. In this paper, assessment of SMS based applications for student services administration is explored and an approach for implementing these applications is proposed.

11. Conclusion

It is based on the design and implementation of WSN-based Flood Monitoring and Detection System (FMDS) using relative humidity, temperature, water level and rate of rainfall as flood indicators, whose values are detected by sensors in the sensor field. The flood monitoring and detection system monitors the probability of occurrence of floods and then send flood notification SMS to the inhabitant of such zones for necessary action. WSN nodes are used for flood measurements due to tiny size and low power consumption. This project is providing a solution to enhance the safety of the trains, automobiles at the bridges against flood water and avoid the lost to life and property.

This work proposed the development of the technology for disaster control in Malaysia mainly for flooding disaster to minimize the loss of property and life. This project can help authorities to control the flood situation throughout Malaysia through the use of robust sensor network system compared to the existing systems. The prototype of the proposed design was successfully built and tested in-house and in the field of Sungai Perak. It was able to record the water level and transmit the data to the base station using the GSM technology.

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