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INTERNET OF THINGS BASED REAL TIME FLOOD MONITORING AND ALERT MANAGEMENT SYSTEM

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ABSTRACT
Flooding is one of the major disasters occurring in various parts of the world. Recently, severe floods affected the south Indian state of Kerala, due to unusually high rainfall during the monsoon season. Flood has large social consequences for communities and individuals. The model is very much useful for the real time monitoring of the water level variation in the rivers, dams, reservoirs and the monitored values are regularly stored in the web server. The two main objective of the system is to serve 1) as information channel for flooding between the involved authorities and experts to enhance their responsibilities and collaboration and 2) as a web based information source for the public, responding to their need for information on water condition and flooding. The use of wireless sensor network (WSN) for monitoring of river and flood conditions. The wireless sensor network system can also be used for real time monitoring of water condition like water flow level and precipitation levels. The model was developed and engaged in monitoring flood.

KEYWORDS: Arduino, wireless sensor nodes.

1. INTRODUCTION
Natural disasters happen everywhere in the world, and they can be completely disturbing the human life and economy .Economy and growth of any country depend upon the agriculture, proper alert forecasting makes the farmer to protect the crop from flooding. It also affect power generation, tourism, Although we are to forecast rainfall or to track cyclone path very precisely from satellite images, the need of real time monitored data such as flow, water level, intensity of rainfall   are essential in order to make 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 minimize the cost of flood damage. The system is much advantaged for protecting the lives of people and animals. The proposed model is very much utilized for monitoring of the water level, flow variations in rivers and the same can be used for measuring of the water level, flow rate and condition of soil. The measured values are regularly updated on the web server which is very much useful to send flood alerts to consistent authority and people for faster action.

The project mainly constitute a Wireless sensor nodes (WSN). WSNs is a developing class of to a great degree dynamic condition on the top of which a wide range of uses. It comprises of a possibly extensive arrangement of individual sensor hubs. These WSNs are placed along the river beds to monitor water condition. Each Node is connected with a GSM module. The measured parameters are processed by the Arduino. The processed information transmitted from corresponding node to alert management system using GPRS and also the collected data are fed to the cloud storage using IoT . The alert management System can be used to observe, record and send a message to the people before disaster knockouts.

 The Internet of Things builds on three major technology layers: Hardware (including chips and sensors), Communication (including mostly some form of wireless network), and Software (including data storage, analytics, and front end applications). IoT describes a system where items in the physical world, and sensors within or attached to these items, are connected to the Internet via wireless and wired Internet connections. The physical objects that are being connected will possess one or more sensors. Each sensor will monitor a specific

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condition such as location, vibration, motion and temperature. In IoT, these sensors will connect to each other and to systems that can understand or present information from the sensor's data feeds. These sensors will provide new information to the authority and to people.

2. BACKGROUND

In developed country like US, Japan etc. the flooding problem is minimized significantly and do not affect much due to availability of emergency system. But the developing countries like India, Brazil etc. is suffering a lot during flood. The number of deaths due to flooding keeps increasing in different part of our country. Two years ago the flood occurred inkerela and in Chennai, the capital of Tamilnadu resulted insignificant loss of life and property. Whenever, flooding happens living area near the riverbank and downstream area are affected severely than others. They need to be alerted much earlier to have extra time to evacuate immediately. During Chennai flood in 2015, fake news were spread for instance, A false message which said two lakes had breached and Chennai had been cut off from rest of the districts, spread panic among commuters, especially those that were stranded for hours together on the arterial Mount Road on Monday night. To avoid this situation we need authorized warning system. Our system provides such information so that people can avoid false news .And the system makes use of voice call as it is helpful for people who do not know how to read the text message.

3. PROPOSED SYSTEM

The existing system in terms of efficiency, a test was conducted by recording the time delay of the detection of the water level to be transmitted updated in the current system .Through this system, the information could be available to anyone who could access the internet once the website will be given a domain and can be broadcasted live in the internet. Aside from the people near the river who would be alarmed once the water level will be of critical level, those who are away will also be informed of the current situation. With that, necessary preparations and safety measures can be done. It could be a help to prevent or lessen the damages that flood may bring. The flood warning system should be carried a step further in notifying the public. Since social networking is at the moment one of the popular medium of communication, sending an alert through it would hence reach a larger audience. A prototype of the proposed system is discussed in this paper and the result of the testing phase is also elaborated. The architecture of the system can be expanded further to a fully functioning system in alerting the public of an impending disaster caused by flood

4. METHODOLOGY

The project mainly constitute a wireless sensor nodes (WSN) which are placed along the river beds to monitor water condition .The design of a WSN involves of a set of nodes for sensing and a base station that link with each other , collect the confined data to make the actual results about the environment. Sensing unit senses the condition of the soil, flow of water and its level. The sensor nodes are connected to GPIO pins of Arduino and programmed server.The measured parameters are processed by the Arduino .The processed information transmitted from corresponding node to alert management system using GPRS. The main hardware components are Arduino, Landslide sensor, flow sensor,level sensor, rainfall sensor and GSM ,GPRS .Each node will update its information in regular intervals and data stored in the google web server.The device will be placed above the river beds.

5. BLOCK DIAGRAM
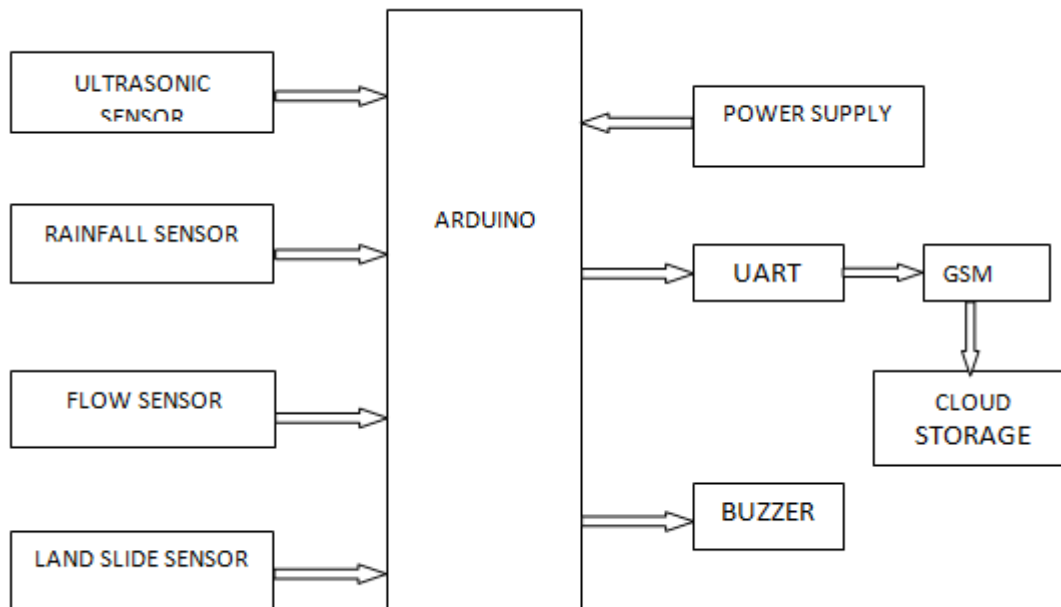
ARDUINO UNO

The Arduino UNO is an open source microcontroller board based on the microchip ATmega328p microcontroller developed by Arduino.cc. The board is equipped with sets of analog and digital input/output-(I/O) pins that may be interfaced to various expansion boards and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts.

Ultrasonic sensor

The ultrasonic sensors are proximity sensors that work free of mechanical friction and that detect objects at distances ranging from a few centimeters to several meters. The sensor emits a sound and measures the time it takes for the signal to return. These reflect in an object, the sensor receives the produced echo and converts it into electrical signals, which are elaborated in the evaluation apparatus. The materials can be solid, liquid or dusty, however they must be sound reflectors. The sensors work according to the elapsed time of the echo. The HC-SR04 sensor is used here . Its stable performance and high ranging accuracy make it a popular module in electronic market .Compared to the Shap IR ranging module , HC-SR04 is more inexpensive than it . But it has the same ranging accuracy and longer ranging distance.

Raindrop sensor

The Raindrops Detection sensor module is used for rain detection. It is also for measuring rainfall intensity. Rain sensor can be used for all kinds of weather monitoring and translated into output signals and AO. Raindrops Detection Sensor Module Rain Weather Module for Arduino, etc. Rain sensor can be used to monitor a variety of weather conditions and turned into several fixed output signal and Analog output.

It includes a printed circuit board (control board) that "collects" the raindrops. As raindrops are collected on the circuit board, they create paths of parallel resistance that are measured via the op-amp. The lower the resistance (or the more water), the lower the voltage output. Conversely, the less water, the greater the output voltage on the analog pin. A completely dry board, for example, will cause the module to output 5V.

The module includes a rain board and a control board that is separate for more convenience. It has a power indicator LED and an adjustable sensitivity through a potentiometer. The module is based on the LM393 op-amp.

TILT sensor

Tilt sensors are devices that produce an electrical signal that varies with an angular movement. These sensors are used to measure slope and tilt within a limited range of motion. Sometimes, the tilt sensors are referred to as inclinometers because the sensors just generate a signal but inclinometers generate both readout and a signal.

Water flow sensor

Water flow sensor consists of a plastic valve body, a water rotor, and a hall-effect sensor. When water flows through the rotor, rotor rolls. Its speed changes with different rate of flow. The hall-effect sensor outputs the corresponding pulse signal. This one is suitable to detect flow in river.

The circuit diagram of the system is shown below. It consists of wireless sensors and Arduino .
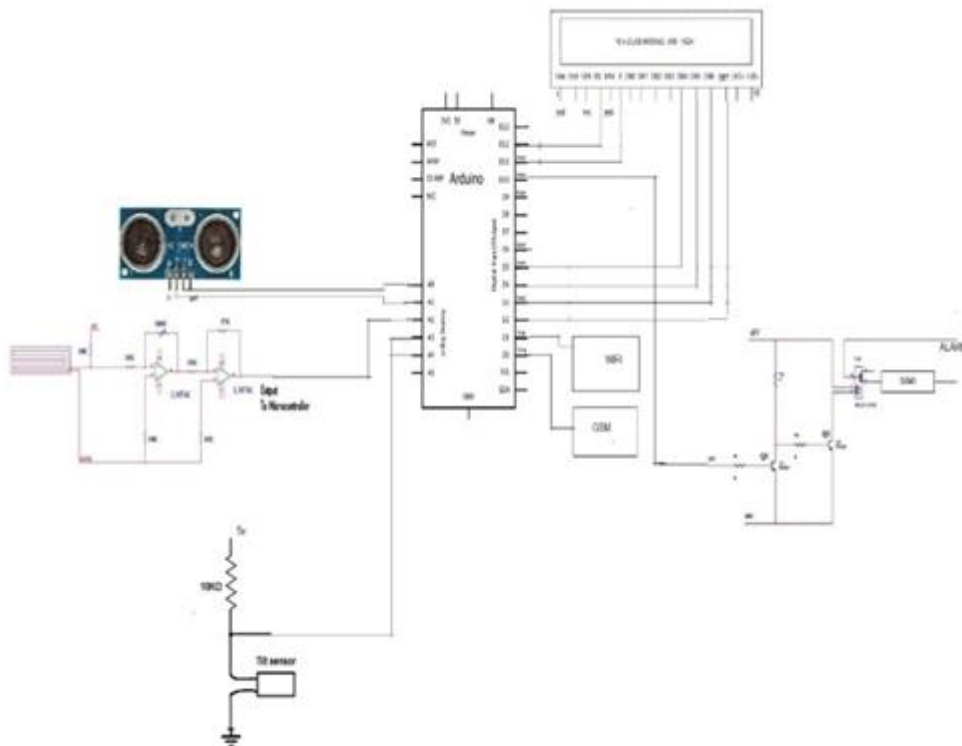

Figure 1

6.   RESULT& DISCUSSIONS

The project is mainly consist of Wireless Sensor Nodes that are deployed at the river site. These sensors will detects the realtime water level, flow rate and rate of rainfall. The tilt sensor along with the system will detects the soil erosion. Each of these sensors will communicates with the microcontroller individually, and it stores the data as per the predefined sequence that is given flow, water level, soil erosion and rain fall occurrence simultaneously. These data will be stored in the cloud storage. The measured values are compared with the threshold values by interfacing it with the microcontroller. If the measured values exceeds threshold value condition of flooding will occur,. To check the status of current situation it will be displayed on the webserver it can be see the real time values. When the condition of flood arises the system will sendSMS notifications to the authority to make necessary actions and also send SMS notification to people to do the necessary precaution.

The picture shows the hardware part that consist all wireless sensor nods and processor Arduino.

Figure 2

7. ADVANTAGES

Flood warnings are a highly important adaptive measure where protection through large scale, hard defense, is not desirable or possible. The purpose of the flood warning services is to detect and forecast threating flood events in advance so that the public can be alerted in advance and can undertake appropriate responses to minimize the impact of the event. This is particularly important in developing countries, where flooding results in massive loss of life and property. It protects the life of people and animals. The constant monitoring and forecasting allows the detection and assessment of danger to take place before it hits a community. Forecasts may also be made to help decision-makers model how an event is likely to develop, how significant it will be upon arrival, and what sections of the population are likely to be at risk. This is necessary because simple detection of an event will not provide enough time to undertake appropriate responses. Alerts and monitoring before disaster allows people to protect their life as well as pet animals too. Warningsthat give time for peoples to move the upstairs or other safely places.

8. FUTURESCOPE

This system is the real world application of IoT. Further studies on wireless sensor technology will be best to replace current sensors. The flood alert informations can be displayed on LED display boards for road users and for safety reasons could be placed at strategic location. The flood observatory system will be easy to install and maintained if it is powered by solar cells. The use of solar energy will also provide cheaper source of power to the entire system.

9. CONCLUSION

Floods have large social consequences for communities and individuals. As most of the people are not well aware of the impact of flooding that includes loss of human life, damage of crop, property, deterioration of health conditions. It also affect the economy of the country. The effect of flood disaster is found to be unique for the entire people in the society. Anyhow flood cannot be avoid or completely prevent. But, by some proper measures of alert and warning the impact of flood can be reduced to some extent. The system provides a real world application of internet of things and offer services like accurate level monitoring indirectly benefited by the system. So we hope this system will reduce the effects of flood disaster by offering services like accurate level monitoring. This system ensures faster flood alert and monitoring.

10. ACKNOWLEDGEMENTS

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