Flood Prediction and Prevention System

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ABSTRACT: Natural disaster is a common phenomenon which regularly affects both living and non-living entities that belong to the environment. Our society is increasingly dependent on embedded systems for activities of several important days today. Wireless Sensor Networks (WSN) are used widely today nearly everywhere, including both residential and undeveloped riverside areas. Human beings do not have the ability to fully eliminate the natural disaster, but the only thing that human beings can do is foresee natural disaster and take drastic measures to prevent it. There are several technologies available for forecasting natural calamity and avoiding it. In this paper use of Wireless Sensor Networking (WSN) technology to predict & avoid flooding. WSN is preferred because of its cost-effectiveness, faster data transfer & accurate calculation of the required flood prediction & prevention parameter. Another beauty of WSN technology is that could calculate the required parameter by taking very few environmental parameters into consideration. In this paper a flood prediction & prevention survey is conducted via the wireless sensor network.

KEYWORDS: Wireless Sensor Networking (WSN), Flood prediction, Flood modeling, Sensor, Computational node.

INTRODUCTION

Embedded systems are playing an increasingly important part in today's real-time response. An embedded system is one that is designed for a particular task, rather than several general tasks. These systems can be used to solve different types of problems in developing worlds. In many developing countries like Rwanda in particular, some of the citizens still live in high-risk zones without having a mechanism for real-time warning. The availability of technologies for developing villages near and a little distant from the river, without access to electricity, is only slowly spreading. Citizens are also mostly affected by recurrent river floods, flash flooding due to heavy rainfall and a lack of an early warning system in real time. This system has the primary objective of saving human life and reducing property damage. The government will be able to expand these wireless sensor networks' installation as it is cost-effective and easy to maintain. The government can save money by using such inexpensive tools like an Arduino that cost about thirty US dollars instead of expropriating hundreds of thousands of US dollars and constructing new homes for the victims[1].

The flood alert system that is used in the developed world is more costly and relies on the specialist hydrologists who track real-time data 24 hours a day and run sophisticated computational models at a central location. These services are unaffordable & impractical for both developed counties and developing countries. Floods ends with the loss of multiple lives and leaves the flooded area with huge property destruction every year, particularly the rage of flooding is most visible in poor and developing countries, where people are the victims of natural clemency. A lot of techniques have been developed that could help us mitigate the damage through predictions of early disasters. There are a number of severe resource limitations such as money , power and skilled man-power when deploying a prediction model in rural areas. This motivates us to use the information communication technology & sensor network work to resolve the networks in order to overcome several problems associated with developing and poor countries to fight the flood. This may also help in a way to balance the minimum cost requirement and limited computing capacity with high efficiency of both the system and computation.

This paper have described different research work on flood prediction and prevention through wireless sensor network (WSN)[2]. The previously worked paper on flood prediction using a WSN and other related papers reinforces the different ways of predicting flood (flood forecasting). These reference papers provide ideas on how to minimize its destructive effects of flooding on humans to save lives and property by using a newly

developed technology called the Wireless Sensor Network (WSN). WSN is taken into account in an innovative way particularly in our proposed work for the flood prediction & its effect minimization.

ALARMING FOR FLOOD

A predictive model developed using WSN (Wireless Sensor Networks).This model helps predict flooding in rivers using easy and fast calculations to produce real-time results and save the lives of people who may be affected by flood alarm. The workflow as shown in the flow Figure 1 given below[3].
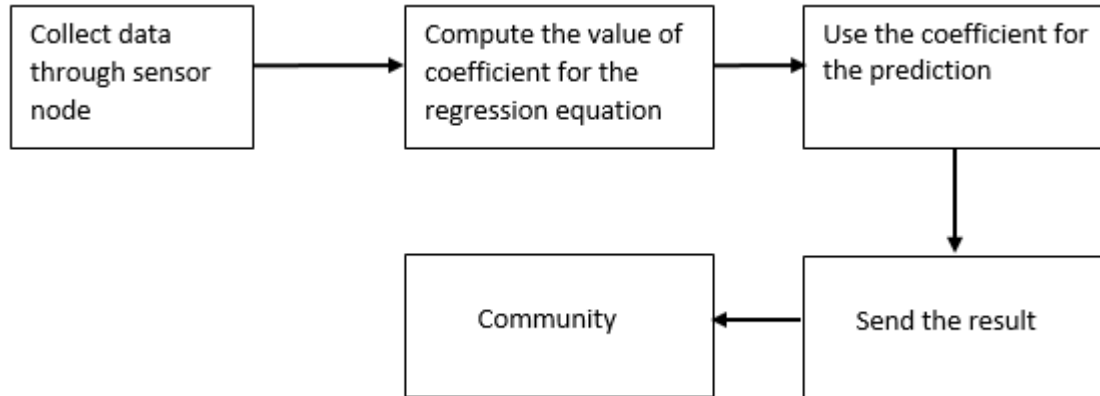

Figure 1: Flow Diagram of how Wireless Sensor Network Works.

The author used multiple robust linear variable regression here, which is simple to understand, and is powerful in speed and cost-effectiveness in implementation. It has low utilization of resources and yet provides reliable accuracy with real time predictions, thus having features that are desirable in any real world algorithm. The model is independent of the number of parameters, i.e. any type and it is possible to add or remove any number of parameters based on the on-site requirements. The rise in water level is represented by using a polynomial from which in the near future it is possible to determine the exceeding of flood line. In This paper only uses a time multiplier function to determine the time interval between the two successive readings. In this model the central node is mentioned but is not taken into consideration. The model just forecasts the flooding situation and alerts people about flooding by ringing the alarm but it has no part to play in preventing flooding. They have kept the efficient part of energy consumption in this paper for future work. A predictive model developed using WSNs (Wireless Sensor Networks).This model helps predict flooding in rivers using easy and fast calculations to produce real-time results and save the lives of people who may be affected by flood alarm.

A brief overview of how to implement the sensor network in Honduras to detect flood & alert the community early on. They analyzed the significance of flood detection on sensor networks in developing countries, sensor networks and the current flood detection operating systems available. This paper discussed the problem of warning communities flood detection in impending disasters quickly becomes complex due to its multifaceted nature. They studied the problem of flood detection in Honduras, and suggested a solution.

They split the solution into four tasks (event prediction, authority notification, community alert, and community evacuation) between CTSAR (name of NGO) and themselves using Wireless Sensor Network (WSN). They conducted various experiments to validate the proposed solution. On the communication side, the 144 MHz radios were verified in their usability. They checked it with the various ranges that the device needed to ensure contact within those ranges. The radio antennas need line-of - sight high in the air to communicate reliably at these ranges, which requires antenna towers and limits the ability to test this portion of the system in the US.

PROPOSED SYSTEM

The venture's key idea is to use sensors to gage and track water levels in streams. The miniaturized scale also illustrates measuring the water stream in rivers and sending SMS to the expert concerned using GSM engineering at whatever stage water level reaches as much as possible (Figure 2).
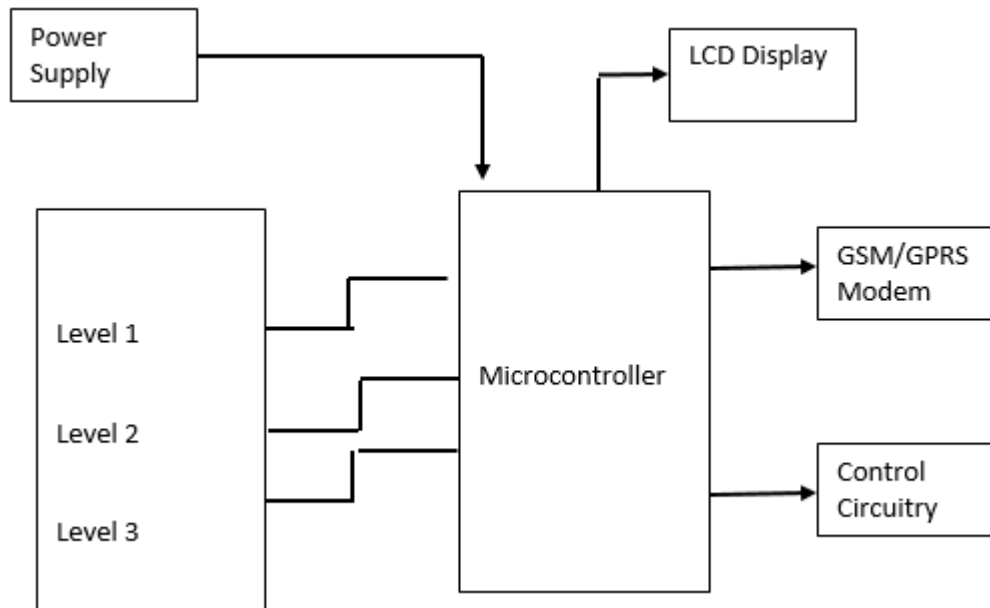

Figure 2: Block Diagram of System.

In this paper Atmel Microcontroller is used which controls each of the operations regarding the water levels in the waterways. ATMEL microcontroller, GSM modem, control circuit, transformer, supply control, copper wires, and sensors are used. These sensors are placed in different edge levels and related to the controller. Off chance that in order to assume the water level is expanding in the dam, the data will be passed to the controller at that point when the water level crossed the sensor at level-1, and then the controller will check the safety measure guideline given by the designer and forward it to the GSM modem. The modem sends the particular SMS promptly to the mobile devices for which it is allocated stating the "the water level has reached the Level-1 breakpoint." Additionally the controller performs the controlling piece of the water level via the directions provided by the designer. This incorporates the operations, for example, the amount of doors to be opened, the amount of edge levels crossed. In this method, the controller tests the quantity of edge rates crossed, and as shown by the control of the entrances.

GSM

Nowadays the GSM is the most important technology. Many people used this technology. It was developed in December 1991 by the European Institute of Telecommunications Standards in Finland. It has now become the global standard for mobile communication. It is used in over 90 percent of the world market share in over 219 countries and GSM is an open cell innovation used to transmit portable voice and information management. It works in the groupings of 900 MHZ. It Enables, for example, the transmission of basic information administrations, SMS[4].

GSM system was developed for communication purposes as a digital system using the multiple access time division (TDMA) technique[5]. A GSM digitizes and reduces data, then sends it down in its own particular time slot through a channel with two different streams of client data. The digital network has the capacity to hold data rates of 64 kbps to 120 Mbps. A GSM system has different cell sizes, like macro, micro, pico, and umbrella cells. Each cell varies according to the domain of its implementation. A GSM network macro, micro, pico, and umbrella cells have five different cell sizes. Each cell's coverage area varies depending on implementing environment[6].

Liquid Level Sensor

The sensors used to detect liquid levels or interfaces between liquids such as water and oil or solids and liquids are called liquid level sensors. You can also define these sensors as transducers or as integrated systems with instrumentation and control capabilities. This type of liquid level sensor is one of the most important sensors and plays a vitally important role in various industrial and consumer applications. A wide range of level sensor measurement systems are available to meet the different criteria, such as a wide range of applications, high-precision needs, and specifications and practices for device implementation[7].

Measurement technologies are made available in various versions to address a wide range of measurement needs, or to address a specific use. Industrial applications include liquid level sensing for transportation tanks, storage tanks and water treatment tanks, as well as for sensing liquids such as petrol, diesel and other fuels in the petrochemical industries. In household applications, liquid level measurement is important including electronic devices such as water dispensers, water evaporators, steamers, boiler monitoring systems, heating systems, washing machines, steam iron, juice squeezers, automated coffee machines, etc. Compared with general applications, level sensors are designed for specific applications.

Power Supply

A power supply is an electrical device which supplies an electrical charge with electric power. A power supply's primary function is to convert electric current from a source to the correct voltage, current, and frequency to power the charge. Therefore power supplies are sometimes referred to as converters of electric power. Some power supplies are stand-alone separate pieces of equipment, while others are built into the loading appliances they power. Examples of these include power supplies found on desktop computers and devices for consumer electronics. Other functions that power supplies can perform include restricting the current drawn by the load to safe levels, switching off the current in the event of an electrical failure, power conditioning to avoid electronic noise or voltage spikes at the input from entering the load, power factor correction and energy conservation so that the load will continue to operate in the event of a temporary interruption[8].

Microcontroller

A microcontroller is a compact, integrated circuit designed in an embedded system to govern a particular operation. A typical microcontroller includes peripherals on a single chip with a processor, memory, and input / output (I / O).

Microcontrollers can be found in vehicles, robots, office machines, medical devices , mobile radio transceivers, vending machines and home appliances, among other devices, sometimes referred to as an embedded controller or microcontroller unit (MCU) They are essentially simple miniature personal computers (PCs) designed to control a larger component's small features, without a complex front-end operating system (OS).

To monitor a singular feature in a computer, a microcontroller is inserted within a machine. It does this by using its central processor to interpret data which it receives from its I / O peripherals. The temporary information obtained by the microcontroller is stored in its data memory, where the processor accesses it, and uses instructions stored in its program memory to interpret and apply the incoming data. It then uses the peripherals of its I / O to interact and enforce the correct action[9].

Microcontrollers are used on a wide variety of devices and systems. Devices also use several microcontrollers that work together to handle their respective tasks within the system. For example, a car may have several microcontrollers that control various systems inside it, such as the anti-lock braking system, traction control, fuel injection, or control of suspensions. All microcontrollers communicate to each other in order to inform them of the correct actions. Others could communicate inside the car with a more complicated central computer

and others could only communicate with other microcontrollers. Using their I / O peripherals, they send and receive data, and process it to perform their assigned tasks[10].

Water Level Design

In order to authenticate the concept and finish a proof of origin, Author have already built a miniaturized scale demonstrating how the water level stage increases in waterways. This small scale model consists of an advanced cell phone, Atmel microcontroller, a 16x2 piece model, GSM modem,12 V transformer, three water level resistors, sensors, Netdunio board, hardware control and speaker .It must have a water level system assurance. It must have a water monitoring body protected to avoid harm if the water level is the most serious.

Architecture Design

GSM modem is an open cell invention to decide the model.it is used for remote correspondence.it is used to transmit flexible voice and information services.it operates in the 900MHZ and 1.8GHZ classes, in this paper three resistors are used to calculate water levels at three separate levels. This model is connected to a 12V transformer to change over the high voltage current. 16x2 piece LCD is used to view data. When the water level has risen from low to abnormal. In Netdunio electric board, these a wide variety of parts are inserted to cable all circuits and communicate with the Arduino board by using copper wires. Speaker caution used when the level of water increases and when the level-3 is reached. The circuit triggers the speaker alarm, and the SMS is sent to the specialist concerned by GSM modem.

RESULT

When a person insert a micro sim into the GSM modem, a message will be displayed as a message to store mobile number on the Arduino board display device. Upon sending the mobile message from the registered number, the conformation message will be sent to the registered number.

Level 0 information is given whenever the water level is at intermediate level, the level 0 is displayed as empty. Whenever the water level raises and the level 1 cap is reached. It will display a buzzer as level: Full and ring, and send a message to the mobile number of the authorities concerned. Whenever the water level raises and the level 1 cap is reached.

It will appear as level: Complete and ring a buzzer and send a message to the mobile number of the appropriate authority.

This program would help track the different threshold rates in dams as a result of the results and also give the details to the authority concerned to take the necessary decision.

CONCLUSION

According to the meaning an IOT is a component that conveys its current status and distributes the current status on the web, then our proposal is close to accomplish from the idea of IOT. It sends the instant message and rang the warning for worrying populace and it sends the instant message to the expert flexible numbers concerned about which numbers we were enlisted on that server.

This small-scale demonstration is manually tested in the water compartment this miniature-scale show was constructed in view of the programmable electrical board this electrical board consists of some electrical resistors which were associated with three distinct statures in the water holder when the water level reaches the electrical resistors which the server sensors send to the GSM module.

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