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Smart System to Detect Natural Disasters and Recovery

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Abstract: ***Natural disasters like Land sliding , Forest Fires and earthquakes are the great threats towards the mankind which cannot be prevented but careful planning of the emergency measures by 'alert' system can often reduce disastrous consequences. Due to recent technological advances in the communication systems has also bought many new trends in the disaster monitoring system. The system focuses on monitoring moisture level of soil , temperature level in the surrounding and earth vibrations to detect land sliding , forest fires and earthquakes respectively via sensors and generates alert signal when moisture level of soil, temperature level in the surrounding and vibrations of the earth crosses a threshold. Alert message is a Text Message and Android app notification Service is send to the concerned authorities through their mobile phones. The system also has a module which will help people to recover after the occurrence of the natural disaster. This module will act as a precautionary action to save lives and will be beneficial to the community in the case of Land sliding, Forest Fires or earthquake disaster.***

Keywords Natural disasters, alert' system, land sliding, forest fires, earthquakes, sensors

I. INTRODUCTION

Occurrences of natural disasters have been constantly increasing worldwide due to global warming and environmental destructions. The situation is much more severe in developing countries as sophisticated disaster detection technologies are either unaffordable or impractical. Researchers have been attempting to address this global challenge using wireless sensor network (WSN) technology. Disasters can be closely monitored by augmenting a variety of sensors, e.g., temperature, displacement, pressure, noises, and concentration of chemicals. WSN is a beneficial technology for disaster monitoring for its merits of low cost, quick response, i.e., capability to capture and deliver relevant data with minimum delay, and this particularly suits for monitoring natural disasters which often occurs in an unpredictable manner, and scalability and flexibility. Natural disasters like Land sliding, Forest Fires and earthquakes are the hazardous towards the mankind which cannot be prevented but careful planning of the emergency measures by 'alert' system can often reduce disastrous consequences. Land sliding Monitor Land sliding and monitoring using WSN .It is necessary to discuss whether full integration at the network level should be advisable for every application [1]. Forest fire is the problem faced by number of countries all over the world. This system is use to detect condition that result fire in forest [2]. The system focuses on moisture level in soil, rises in temperature due to fire, earth vibrations via sensors, and generates alert signal when water level or level of earth vibrations crosses a threshold. Alert message is Text Message and Android app notification Service to the registered members through their mobile phones [3]. It also includes system to broadcast the messages to the local people, nearby the disaster prone area. This module would be beneficial to the community and act as a precautionary action to save lives in various disasters. In this system, we also have a recovery system module from the disaster [4]. The system sends `ARE YOU OK `message to user. If the user's response is positive then the system reaches to its end state as the user is safe there is no need to take any further action. If the user's response is negative or there is no reply from the user then the system will fetch the current location of the user. The system will take snapshots from the user's front and rear camera and forward these GPS location and snapshots to the nearest hospital and police station.

II. WORKING

The main purpose of Smart Disaster Notification System is to alert people before the time of disaster occurring at their home region. In our system, we divide the whole application in different modules. First one is situating the sensors at such locations where the probability of occurrence of natural disasters is high. In second we are building a WSN (Wireless Sensor Network) of the sensors. The third module consists of the Arduino board which is a microcontroller which will collect the data of the sensors in WSN. In next module, we are transferring the data from the Arduino board to a database which will store this data. This database will also store the Users information such as its name, home location, mobile number, phone numbers of family members. The fifth module consist of our android application which will be installed in the user's android smart phone also the application will be installed at the nearest police stations and hospitals.

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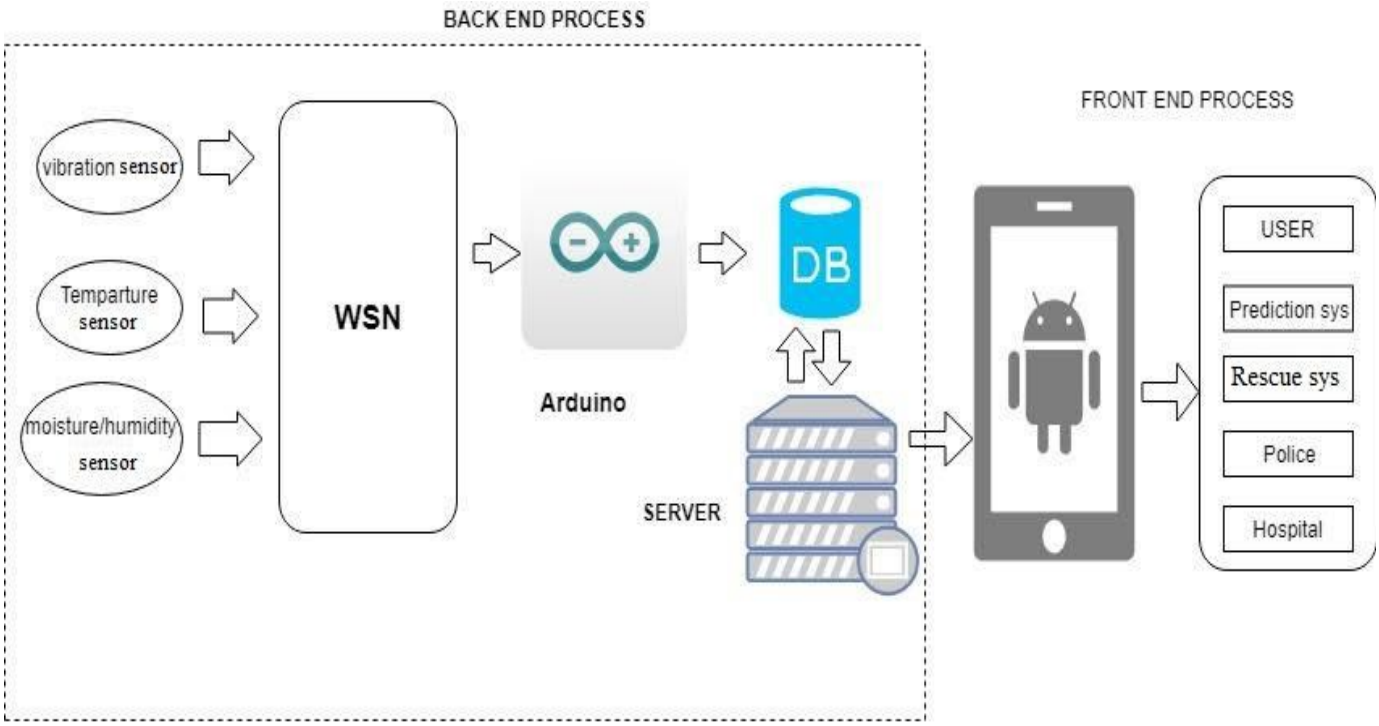


Fig 1: System architecture diagram

This system is a real time system in which continuous data will be fetched from the sensors and stored in the database. A threshold value is set for each type of disaster. Whenever the data fetched from the sensors crosses the threshold value it will be detected by the system that means a natural disaster is about to occur and an alert message in the form of SMS will be send to the user. This application also has a rescue system in which after the occurrence of the natural disaster a pop-up message will be send on the user's smart phone asking 'Are you safe?'. If the user replies 'Yes' then the system reaches to the safe end as there is no need to take any further action. If the user replies 'No' or if there is no reply in a certain amount of time then it is considered as the user is not safe and the system will automatically start the user's front and rear camera and take snapshots. The system will track the user's GPS location through the user's smart phone. The system will send these snapshots and the GPS location of the user to the nearest police station and hospital

III.HARDWARE DESCRIPTION

A. Arduino board

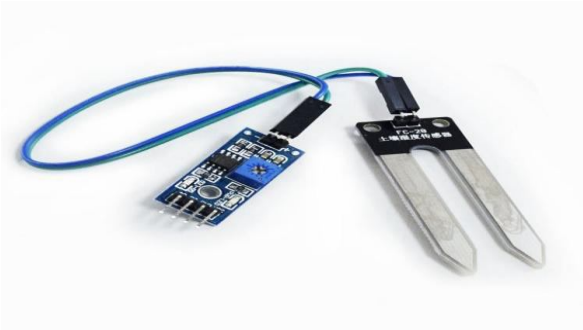


Arduino board is a mini computer having size of a credit card. It functions like a normal computer does and needs to be connected with external input output devices (mouse, keyboard (display). Arduino board uses various types of microprocessors also have feature of loading programs from personal computers through Universal Serial Bus (USB) . The microcontrollers are regularly customized utilizing a feature from the programming dialects C and C++. Arduino board is microcontroller so it is used to run one program at a time over and over again. Arduino is very simple to interface with sensors and other electronic components. We can address hardware properly using code. An Arduino board is best used for simple repetitive tasks: opening and closing a garage door, reading the outside temperature and reporting it to Twitter, driving a simple robot.

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B. Moisture sensor



The moisture sensor measure the volumetric water content present in the soil. The moisture sensor used for soil measures the volumetric water content indirectly by using some other properties of the soil, such as the electric resistance, dielectric constant or the interactions with neutrons as a proxy for the moisture content. The Moisture Sensor uses capacitance to measure dielectric permittivity of the surrounding medium. The sensor creates a voltage which is directly proportional to the dielectric permittivity.

C. Vibration sensor



Vibration sensors are used to measure displacement, proximity, linear velocity and acceleration. Here in this project we are using vibration sensor which detect the seismic vibration of earth. A vibration sensor also called as an accelerometer. It is a sensor which produces electrical signals which are directly proportional to the seismic vibration of the earth to which the sensor will be attached. These signals produced by the accelerometer are passed on to the instrument that in turn converts this signal in the form of velocity signal.

D. Temperature Sensor

Temperature sensor is used to measure the temperature. It measures the temperature through an electrical signal. The sensor requires a thermocouple or Resistance Temperature Detectors.



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The thermocouple has two dissimilar metals and it produces the electrical voltage which is indirectly proportional to the changes in the temperature. The sensor reads the voltage across the diode. As the voltage is indirectly proportional to the temperature when the temperature rises the voltage drops between the terminals of the transistor of the base and the emitter. These readings are recorded by the sensors.

IV. WSN

WSN consists of network of distributed sensors or collection of sensors that acts as nodes, that collects actual data in the environment. WSN also has routers and coordinates. Routers help transfer the collected data from the nodes to coordinators for further processing. Once this data is collected this data can further be transmitted to the Internet where coordinators act as gateway. WSN provides self-organizing and self-configurable network. And along with this the ability to provide environmental and physical condition monitoring using large number of low-powered and low- cost nodes makes WSN very useful. As WSN has large number of nodes, manual setup is very tedious task. Self-organizing capacity of WSN makes adding new nodes or removing old ones easier.

V. CONCLUSIONS

To minimize the losses of life in these natural phenomena we have proposed a system. Our system is an android mobile phone application consisting of WSN. This application gives alert before any potential disaster like Landslide, Forest fire, earthquake etc. may happen. Our disaster notification system is a real time system which will help and instruct people in the times of natural disasters and would save many lives by predicting them before their occurrences. Three commercial sensors had been integrated with the system to monitor and compute moisture level of soil , temperature level in the surrounding and earth vibrations to detect land sliding, forest fires and earthquakes respectively via sensors and generates SMS alert signal when moisture level of soil, temperature level in the surrounding and vibrations of the earth crosses a threshold. This application also has a rescue system which will help to rescue people after the occurrence of natural disaster. In future work, we will try to generate an alarm system as SMS alert system is easy but to handle SMS traffic is difficult.

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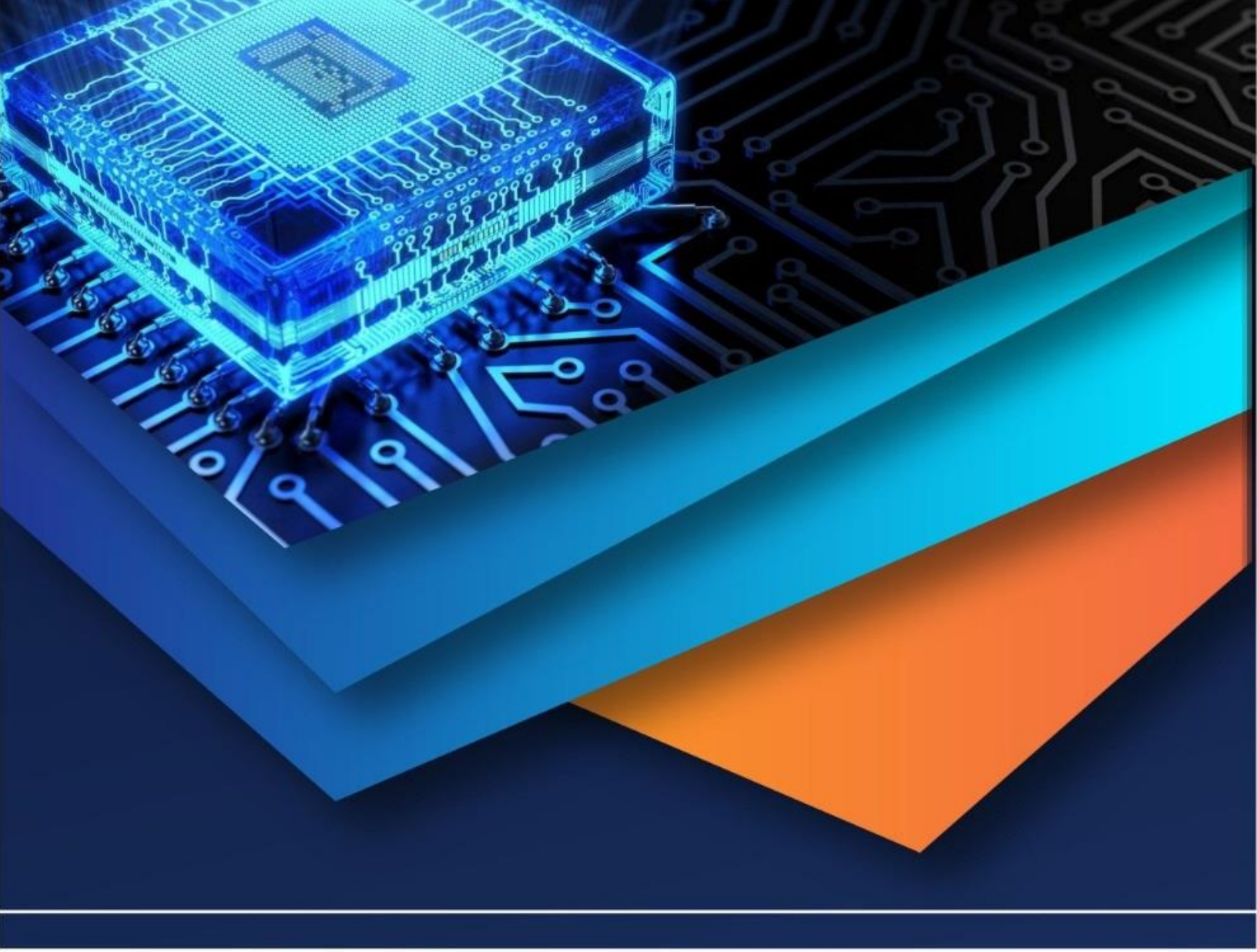
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