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LANDSLIDE DETECTION USING ANDROID

Zohra A. Shaikh[1], Abhijeet S. Ratnparkhe[2] , Roshani N. Bhamare[3], Sidharth S.Lokhande[4] , Sunita Nandgave[5]

Student, G. H. Raisoni College of Engineering and Management, Pune[1,2,3,4]

Assistance Professor G. H. Raisoni College of Engineering and Management, Pune[5]

zohra.rahman8@gmail.com[1],abhijeetratnparkhe@gmail.com[2],rbhamare506@gmail.com[3],lokhandesidharth051@gmail.com[4], sunita.nandgave@raisoni.net[5]

Abstract: **The power of wireless sensor network technology has provided the capability of developing large scale systems for real time monitoring. The recent years, people were unknown for all kind of natural disaster and calamities, natural calamities like earth moves(earthquake),rainfall, flood, Tsunami. Nowadays, everyone wants to prefer safety in life and the prevention from catastrophic events. planet earth may get hit at any time, any place by any natural perilous, where billions of peoples died as well as economic loss takes place. These incident cannot be stopped, but using some modified innovative techniques these losses may be avoided. Among these one of major natural hazard is landslide. There are different techniques used for landslide detection, this paper used wireless sensor network technique .WSN is used in interim and emergency region for development of real-time monitoring system.**

Keywords *– Landslide, WSN, Geographical Sensor, Accelerometer Sensor, Humidity Sensor, Moisture Sensor.*

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I INTRODUCTION

Environmental disasters are unpredictable and occur due to heavy rainfall. Landslide causes loss of life, human settlement, agriculture and lead to damage of communication routes. The term landslide describes many types of downhill earth movements ranging from rapidly moving catastrophic rock descend rapidly down a mountainside (Avalanches) and debris of something wrecked which flows in mountainous regions to more slowly moving earth slides [5]. Therefore different technologies has to be developed to capture relevant signals with minimum monitoring delay. Wireless sensors are one of the cutting edge technology that can quickly respond to rapid changes of data and send the sensed data to a data analysis centre in areas where cabling is inappropriate.

Wireless sensor network (WSN) technology has the capability of quick capturing, processing, and transmission of critical data with high resolution in real time. However, it has its own limitations such as relatively low amounts of battery power and low memory availability compared to many existing technologies. It does, though, have the advantage of deploying sensors in antagonistic environments with a inadequate minimum of maintenance. This fulfills a very important need for any real time monitoring, especially in hazardous or remote scenarios. Another important is an android, as we know that today, Android plays a vital role in human's life because of its features like mobility, availability etc.

In proposed system, the user will register & then login by an android application. soil moisture sensor, Accelerometer sensor, Load cell will be placed on proposed geographical location to monitor the real time data. Based on sensor values prediction of the landslide will be shown on the android application. If landslide detected, the application will notify the user about it & LEDs will be glow as an indicator. Also, the application will track Landslide location & will suggest an alternate path. For that user need to give input of Source & Destination.

II MOTIVATION

The main motive is early detection of landslide saves lives, economics damages. with the help of Accelerometer, Soil Moisture, Load Cell (Hardware Requirement) we can predict landslide based on sensor value. And notify a user about landslide and suggest alternative path based on source and destination.

III OBJECTIVE

The main Objectives of Landslide Detection is detecting the early signals preceding catastrophic events. Landslides claim thousands of lives and cause considerable

economic damage to buildings, roads, and other infrastructure around the world. As natural hazards, landslides are largely unpredictable. We provide Improvements in the monitoring, detection, and investigation of landslides will help raise the understanding of the process that cause these disasters and helps to identify their early warning signs with the help real time landslide detection sensor Arduino, Load Cell, Soil Moisture sensor, Accelerometer Sensor

IV ARCHITECTURAL DIAGRAM

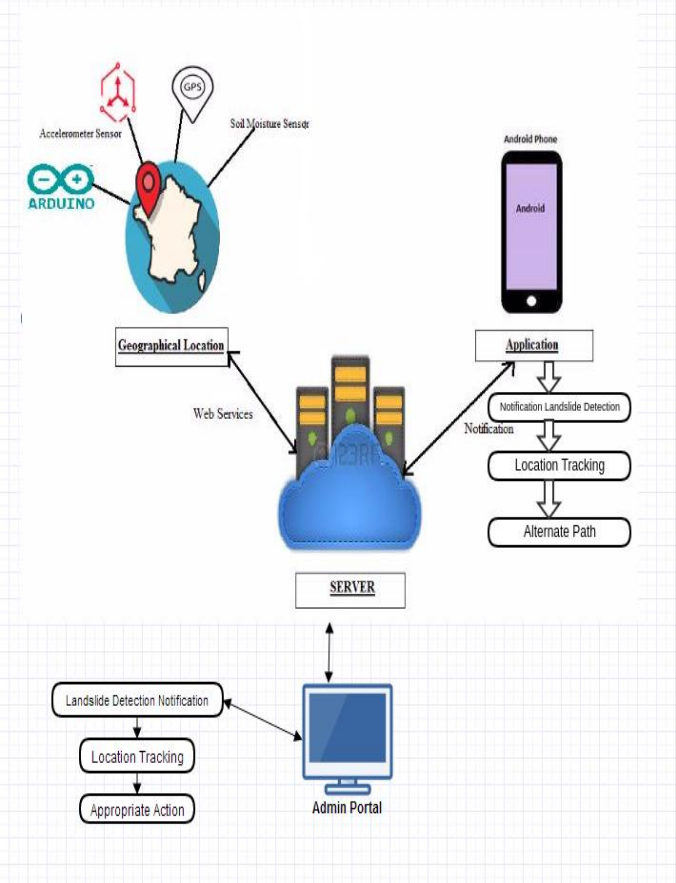

Figure 1. ARCHITECTURE DIAGRAM

V LITERATURE SURVEY

Various authors have proposed and discussed much advancement in educational field using technology that has helped in improving educational field.

1) "Effective and Efficient Landslide Detection System to Monitor Kokan Railway Tracks" by Satishkumar Chavan, Shobha Pangotra, Sneha Nair, Vinayak More, Vineeth Nair in the Year: 2015, Publication: International Conference on Technologies for Sustainable Development (ICTSD-2015), Feb. 04 – 06, 2015, Mumbai, India, Reviews stated that, the proposed railway track monitoring technique using image processing provides a robust, efficient and effective solution to detect landslides along the highly landslide-prone Konkan region. The proposed block processing with mean variance distance technique is most suitable compared to other image comparison techniques like Entropy, Hamming distance, Euclidean distance, correlation etc. The system also used motion detection, time lag, and median filtering to reject unwanted events caused by birds, animals, human beings, rain and abrupt changes in lighting conditions. The various algorithms proposed in the paper are able to effectively filter out unwanted events and generated warning signals only on detection of concerned events.[8]

2) "Smart Geophone Sensor Network for Effective Detection of Landslide Induced Geophone Signals" by Deekshit V N, Maneesha Vinodoni Ramesh, Indukala P.K, and G. Jayachandran Nair, Year: 2016, Publication: International Conference on Communication and Signal Processing, April 6-8, 2016, India, This research introduced a new smart geophone sensor network with enhanced signal processing capability. A simple and cost effective Arduino based data acquisition system using geophones is developed thus reducing the energy consumption of the system. The smart geophones have the on-site processing capability, which avoids the unwanted data transmission. The interference of different types of noise leads to fault detection. The experimental setup is developed by using the smart geophone sensor network in real- time environment and various ground vibration signals such as footstep signals, vehicular signals and weight drop signals are identified. The features of various ground vibration are extracted and can be used for the effective removal of noises from the landslide signal. In this paper an efficient algorithm for the detection of landslide events is proposed. The proposed correlation technique improves the accuracy of the signal by eliminating different noises. Therefore, the multilevel processing will help to improve the efficiency of the overall system.[5]

3) "A SURVEY ON LANDSLIDE DETECTION" by Zohra A. Shaikh, Abhijeet S.Ratnparkhe, Roshani N. Bhamare, Sidharth S.Lokhande, Sunita Nandgave, Nowadays, everyone wants to prefer safety in life and the prevention from catastrophic events. planet earth may get hit at any time, any place by any natural perilous, where billions of peoples died as well as economic loss takes place. These events cannot be stopped, but using some innovative techniques these losses may be avoided. Among these one of major natural hazard is landslide. There are different techniques used for landslide detection, this paper used wireless sensor network technique. WSN is used in interim and emergency region for development of real-time monitoring system. This this proposed system also explains geophysical sensors for detecting the change in pore pressure and moisture content with warning system developed for landslide detection.

4) Maneesha V.Ramesh." Real-time Wireless Sensor Network for Landslid Detection." International Conference on Sensor Technologies and Applications,2009,Kerala,

India.Landslides are mostly unpredictable and occur within a short period of time. To save human life and avoid losses, efficient Technology has to be developed and implemented in high geologically hazardous Areas with low cost. Wireless Sensor Networks Plays a major role in Environment monitoring system. This paper is concerned with the development and implementation of Low cost Autonomous Wireless Sensor Networks based Landslide detection integrated with self-energy harvesting Powered early warning systems.

VI TECHNOLOGIES TO BE USED

•JAVA:

Java has been tested, refined, extended, and proven by a dedicated community of Java developers, architects and enthusiasts. Java is designed to enable development of portable, high-performance applications for the widest range of computing platforms possible.

Eclipse:

Eclipse is an integrated development environment which is mostly written in java. The operating systems that support eclipse are Linux, Mac Operating System, Solaris, and Windows. It works on both 32 and 64-bit variant Windows.

•MySQL:

It is the Open Source Relational SQL Database Management System. It is used for developing different web based software applications. It is organized by MySQL AB, I.e. Swedish Company. It is the mostly usable Open Source Relational SQL Database Management System.

Landslide: Landslide: A landslide is a event where a block of earthen mass slides downhill. It affects to the human life and the surrounding physical environment.

WSN: The wireless sensor network technology is used in accidental and emergency region to developing large scale system for real-time monitoring.

Accelerometer Sensor: The wireless sensor network technology is used for reducing or without wasting time will take actions, fast processing purpose. The fast transmission of data the WSN is used.

Moisture Sensor:: Soil moisture sensor is used for the calculating the volume of water content in soil.

Humidity Sensor: Humidity is the presence of water vapor in air.

•ARDUINO:

Arduino is the combination of hardware & software. It is a small microcontroller chip or kit i.e. used for the connecting to the hardware & software components to eachother.Using arduino can passes the digital signals from the sensors to the server i.e. software component. It is the open source hardware & software board.It is licenced by the GPL under GPU.The hardware code will be uploaded on the specific Arduino board.This code will be used for the fetching sensors values from the sensors in the analog signals & transferred in the digital form i.e.human readable form.

•BLUETOOTH:

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs). Invented by telecom vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables.

•SOIL MOISTURE SENSOR:

Soil moisture sensors measure the volumetric water content in the soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighing of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

•LOAD CELL:

A **load cell** is a transducer that is used to create an electrical signal whose magnitude is directly proportional to the force being measured. The various types of load cells include hydraulic load cells, pneumatic load cells and strain gauge load cells.

•ACCELEROMETER SENSOR:

An is a device that measures proper acceleration. Proper acceleration, being the acceleration (or rate of change of velocity) of a body in its own instantaneous rest frame, is not the same as coordinate acceleration, being the acceleration in a fixed coordinate system. For example, an accelerometer at rest on the surface of the Earth will measure an acceleration due to Earth's gravity, straight upwards (by definition) of $g \approx 9.81$ m/s2. By contrast, accelerometers in free fall (falling toward the center of the Earth at a rate of about 9.81 m/s2) will measure zero.

VII OVERALL DESCRIPTION

7.1 PRODUCT PERSPECTIVE:

In proposed system, User & Admin will be two modules where hardware setup will be placed on proposed geographical location. By taking input via sensors system will predict or detect landslide. Notification will be sent to admin & user. Another facility is user can able to get the

alternate path where admin side able to take some appropriate action.

7.2 PRODUCT FUNCTION:

A) Web Application-

1. Registration and Login.
2. Real time landslide detection using sensors Accelerometer, Soil Moisture, Load Cell (Hardware Requirements).
3. Prediction of a landslide (Based on sensor values).
4. Notify Super Admin about landslide through Web Application.
5. Admin will take action according to received information from sensors.

B) User (Android App)-

1. Registration and Login.
2. Real time landslide detection using sensors Accelerometer, Soil Moisture, Load Cell (Hardware Requirements).
3. Prediction of a landslide (Based on sensor values).
4. Notify user about landslide through Web Application.
5. The user should enter Source and Destination for a system to provide with alternate paths.

VIII MATHEMATICAL MODEL

$S=\{s,e,X,Y,T,F_{main},NDD,DD, Success, Failure\}$

- **S(System)** :- Is our proposed system which includes following tuple.
- **s (initial state at time T)** :- GUI of search engine. The GUI provides space to enter a query/input for user.
- **X (input to system)** :- Input Query. The user has to first enter the query. The query may be ambiguous or not. The query also represents what user wants to search.
- **Y (output of system)** :- User has to enter a query into search engine then search engine generates a result which contains relevant and irrelevant URL's and their snippets.
- **T (No. of steps to be performed)** :- **4**. These are the total number of steps required to process a query and generates results.
- **DD (deterministic data)**:- It contains Database data. Here we have considered MySQL and SQLite which contains number of queries. Such queries are user for showing results. Hence, MYSQL and SQLite is our DD.
- **NDD (non-deterministic data)**:- No. of input queries. In our system, user can enter numbers of queries so that we cannot judge how many queries user enters into single session. Hence, Number of Input queries are our NDD.
- **CPU_{count}**: - 1. In our system, we require 1 CPU for server.
- **Success** :- successfully recommended best application as per user's interest
- **Failure** :- Failed to be recommended.

Subordinate functions:

Where

s=Start State

e=End State

X={Set Of Inputs}

= {x1,x2}

Where

x1= Registration Detail

x2 = Source and Destination

Y={Set of Outputs}

= {y1,y2,y3}

Where y1= Show Prediction

y2= Show Cause (Which sensor value has crossed the threshold) of Landslide Detection

y3= Show Alternate Paths

F_{main} = {Set of procedure}

= {f1,f2,f3,f4}

Where

f1= Take x1 input

f2= Give y1 output

f3= Take x2 input

f4= Give y2 & y3 output

IX RESULT OF SENSOR

Table No 1

Sno	Load Cell	Accelerometer	Moisture
01	loadcell val:100(19%) Eg:val>1 i.e:3.32kg	accval:120(23%) Eg:3851023317	moistureVal:300(58%) Eg:80.00%

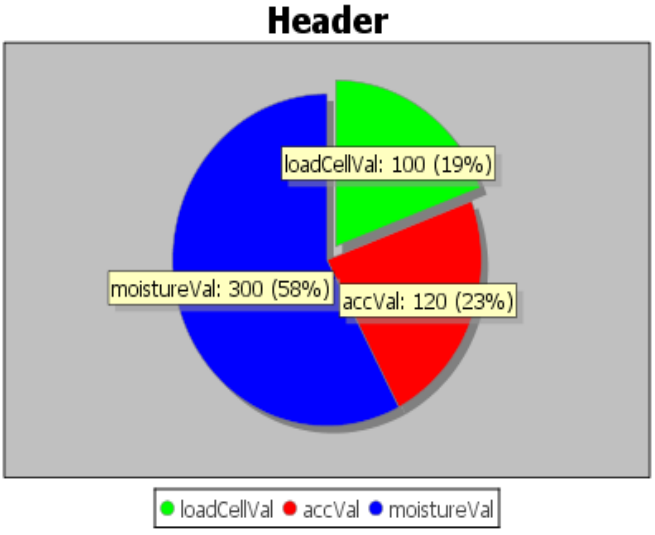

Figure No 2 Result of Sensor

X CONCLUSION

The proposed work is for monitoring the hazard of landslides and by measuring the parameters related to landslides. In proposed system hazard was pre warned before it occurs. The proposed system based on sensors which collect data and transfers it to the server for further analysis in order to give a quick response. If any possibility of occurrence of hazard was noticed to given users through the android application with an alternate route by taking the input of source & destination.

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