

## Landsliding Pre-Warning System

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**Abstract**— In this project we have to study of landslide, it occurs naturally we can't stop natural cause but we can alert the people. Due to landslide there will losses of human life and properties. This project present landslide alert system by using wireless sensors that transmitted by zigbee module from this we can alert the people.

In this we used three sensors accelerometer sensor, water level sensor, temperature sensor. Accelerometer sensor is used to measure the slop of angle if there is any movement in landslide and we used water level sensor to collect the depth of water in land. Temperature sensor is used to check the change in temperature. This data is given to microcontroller it is used to read the measurement and display on LCD. GPS is used to give latitude and longitude all reading is given to transmitter zigbee.

This information is transmitting to receiver zigbee which is display on LCD and buzzer will activate due to this we can alert people and save human life and properties. This is real time project to save the human life.

**Keywords**- GPS,Landslide,Wireless Sensors, Zigbee.

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### I. INTRODUCTION

In order to reduce and prevent the damage of landslides, Landslide monitoring is an important topic related at the hill slides. Wireless sensors are one of the technologies that can respond to rapid changes of data and send the sensed data to the receiver section in areas where cabling is not available. Wireless sensor network (WSN) technology have capability of quick capturing, processing, and transmission of data in real-time with high resolution. Because WSN itself has some better characteristics such as redundancy, wireless, the self-adaptive network and strong anti-destruction capability. WSN can communities even though all communications facilities are damaged. GPS is being increasingly used also for automated continuous monitoring of landslides. For such GPS-based deformation monitoring systems, the accuracy, availability, reliability and integrity of the positioning solutions heavily depend on the number and geometric distribution of satellites being tracked. It is composed of a series of sensors, of easy and rapid installation, which can be positioned directly upon the landslide body, or in the immediate surroundings, to provide continuous data on the landslide activity. They cause considerable damage to highways, railways, waterways and pipelines.

### II. RELATED WORK

In this we used three sensors and zigbee and GPS module. There we used three sensors Accelerometer sensor, Water Level sensor, Temperature sensor. Accelerometer sensor is used to measured static (earth gravity) or dynamic acceleration in all three axis. This sensor will fix in land at +65 degree which will measure the slope of angle if there is any change than it will transmit the information to microcontroller.

Water level sensor will convert water depth, hillsides displacement and temperature level to electrical signals, then electrical Signals from the sensors will be voltage converted, and amplified in signal at last signals are sent to processor. If there is any The LM35 does not require any external calibration or trimming to provide typical accuracies of  $\pm 1/4^{\circ}\text{C}$

at room temperature and  $\pm 3/4^{\circ}\text{C}$  over a full  $-55$  to  $+150^{\circ}\text{C}$  temperature range. If the landslides along the direction of arrow on the chips have acceleration, the output value increases. Here we used zigbee and GPS module that is connected to microcontroller 89c51 using serial communication. This information is transmitting by transmitter zigbee to receiver zigbee. Here we used to LCD at transmitted side and receiver side. This information display on LCD on receiver side and buzzer will activated. This is overall information of block diagram.

TABLE 1-List of Casualties

DATE	PLACE	CASUALTIES
16 JUNE 2013	KEDHARNATH, UTTARAKHAND,INDIA	5500
31 OTC 2014	KOLANDA, SRI LANKA	250
31July 2014	MALIN, PUNE DISTRICT ,INDIA	60
20-Aug-14	HIROSHIMA,SRI LANKA	110

### III. BLOCK DIAGRAM

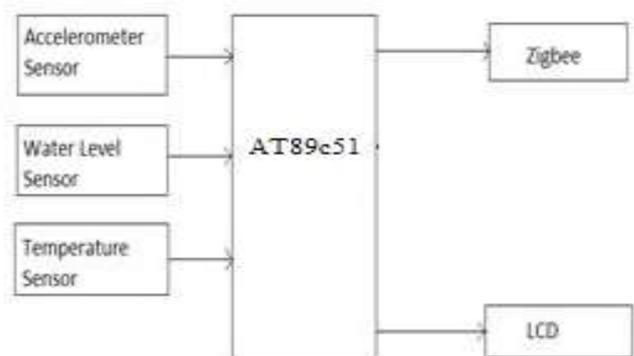


Figure 1. Transmitter Section.

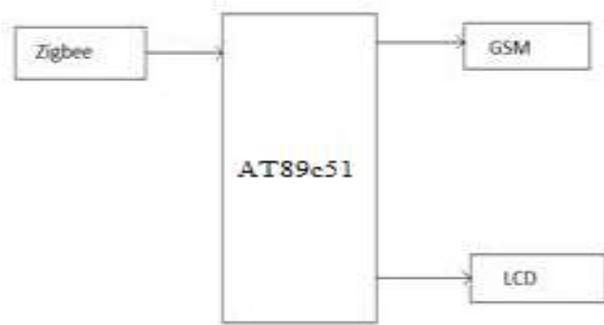


Figure 2.Receiver Section.

IV. SENSOR USED

Here we have used three sensors for efficient and effective working of our landslide pre- warning system. They are Accelerometer sensor, Water Level sensor, Temperature sensor.

Accelerometer sensor senses if there is any movement in the angle of sensor it sends the data of movement of angle to receiver side. It is used to measured static (earth gravity) or dynamic acceleration in all three axis. Acceleration is a vector force which has direction and measured in meters per second. It is placed on the land if any movement occurs then sensor senses it and sends information so that we can be alert at that area.

Water Level sensor senses is used to measure the water level in hill stations under water level increases if any disturbance in hills. So we use water level sensor to measure water level it is connected using transistor, a wire of 5v power supply is immersed in water then a scale with levels 1,2,3 are immersed in water as water level increases it shows at which level water is, so that we can be alert.

Temperature sensor is used to measure temperature level at the hill stations as hill slides may occur due to volcanic eruptions also so as temperature increases the sensor senses and gives information to processor. We used IC called LM35 as a temperature sensor. LM35 senses temperature and converted to digital form using ADC and given to processor.

TABLE 2: Sensors used

Sensors	Task
Accelerometer Sensor	Calculate Angle for Slope of Land
Rain Sensor	In case Heavy Rainfall, So for Measurement of Changes in Water Table Height
Temperature	LM35 senses temperature and converted to digital from using ADC and given to processor

V. ZIGBEE

Zigbee is main part of this project for communication. By using this zigbee we can communicate data of high speed and more data can be sent without any delay. Here we used two zigbee at

transmitted side and receiver side. One zigbee transmit the information to any other zigbee present in that area by peer to peer communication. Microcontroller will send the data from transmitter zigbee to receiver zigbee without any delay. Then data is automatically transmitted to receiver there is no use of any human intervention. Here we used reliability technology such as IEEE 802.15.4 and zigbee gives a standard, low-power communication which provides mesh routing.

VI. GPS

The Global Positioning System (GPS) is most important module in this project. This is used to give accurate location of landslide where it occurs. GPS is connected to transmitter side through microcontroller. Many time in hill area we don't know where is transmitter is placed due to GPS we can get accurate location of transmitter. This GPS module calculates its position by measuring its distance from itself. If any disturbance occurs in sensors attached then microcontroller automatically send the information of location of module to receiver side this helps us to locate the hazardous areas. Due to this we can alert the people in those areas.

VII. RESULT

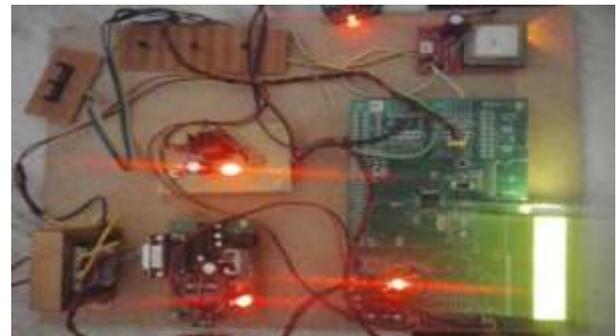


Figure 3.Transmitter section.



Figure 4.Receiver Section.



Figure 5. Accelerometer Output



Figure 6. Water Level Sensor at level 1



Figure 7. Water Level Sensor at level 2



Figure 8. Temperature Sensor at 37° c



Figure 9. Temperature Sensor at 42° c

### VIII. CONCLUSION

This is real time system for landslide detection. In this paper we use Microcontroller 89c51 and main module Zigbee and GPS. We connected three sensors Accelerometer sensor, Water Level sensor, Temperature sensor. This sensor are connected to microcontroller at transmitter side. If any

detection is occur in sensor then it transmit through zigbee module and display on LCD. Due to this we can alert the people and save the human life and properties.

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