

GSM Based Real-Time Wireless Sensor Network For Landslide Detection

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ABSTRACT

In this paper we have presented study about the landslide warning system, as the occurrences of land slide is a big loss for human life. We use this technique in order to alert the people from landslides. This design contains one sensor Accelerometer Sensor as Vibration sensor senses the vibrations in mountains. The sensor is connected to the Arduino Uno Processor for collection of data. This information is displayed on LCD display at receiver station or by SMS it can alert the people. This paper is very important as we can use it in our real time scenarios to save lives.

Keywords: Detection, GPS, SMS Alert, Save Lives

I INTRODUCTION

Landslide also known as a landslip, is a geological phenomenon that includes a wide range of ground movements such as rock falls, deep failure of slopes and shallow debris flows. History depicts that, it has happened mostly in Himalayan regions, Hill ranges of Northeast, Western and Eastern Ghats of India. The North East region of India is badly affected by bewildering varieties of landslides. This makes the landslide monitoring as an important aspects in India. Most of the landslides are caused due to heavy rainfall. Rainfall events can cause slope failures in areas of limited extent or in large regions. Developing an early warning system for the monitoring of landslides requires its domain expertise. We are using Arduino, which is an open source electronics platform based on easy to use hardware and software. Arduino software is easy to use for beginners, yet flexible enough for advanced users. This use to build low cost scientific instruments, to chemistry and physics principles, or to get started with programming and robotics. Arduino also simplifies the process of working with microcontrollers. Arduino software (IDE) runs on windows, Macintosh OSX, Linux operating system.

II METHODOLOGY

In this work, firstly when Landslide creates the vibrations and reaches to the set point of accelerometer it send the message through GSM module to the control room officer with location with the help of GPS system. Then control room aware the peoples about the Landslide.

A. COMPONENT

A. Accelerometer sensor: Accelerometer Sensor use as Vibration sensor senses the vibrations in mountains. The ADXL335 is a small, low power and complete 3-axis accelerometer with signal conditioned voltage outputs. The accelerometer measures acceleration with a minimum full-scale range of 3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. Wiring of Accelerometer with Arduino shows in Fig.1

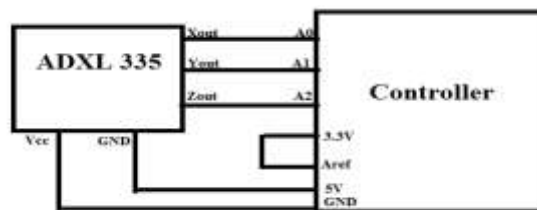


Fig.1 wiring of accelerometer with controller

B. GSM:

The GSM (worldwide gadget for cellular communication) is a well known developed by way of Telecommunication standards Institute to explain protocols for 2nd technology virtual cellular networks utilized by cellular phones. in this gadget GSM is used for acquiring data from the controller if landslide will occur. The system is used for sending facts received from the controller to the associated number. This module is used broadly inside the international. This GSM modem is a notably bendy plug and play quad band GSM modem for direct and smooth. Supports functions like Voice, facts/Fax, SMS, GPRS and incorporated TCP/IP stack. Wiring of GSM module with Arduino Uno shows in Fig.2

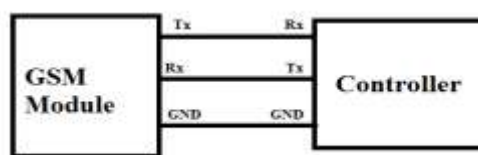


Fig.2 wiring of GSM module with controller

C. GPS

The global Positioning gadget (GPS) is a space-primarily based navigation system that provides region and time data in all weather conditions, anywhere on or near the Earth in which there may be an unobstructed line of sight to 4 or more GPS satellites. The device presents crucial competencies to army, civil, and commercial users around the sector. The us government created the machine, maintains it, and makes it freely accessible to everybody with a GPS receiver. The USA started the GPS assignment in 1973 to triumph over the restrictions of previous navigation structures integrating thoughts from numerous predecessors, which include a number of

categorized engineering layout studies from the Nineteen Sixties. This GPS module is used; if any disturbance happens in sensors attached to the microcontroller then controller automatically ships the records about the place of module to find the unsafe regions. As in hill stations we don't recognise where the landslide happens or earthquake occurs correctly, we use this GPS to understand area correctly so that we will alert human beings at that location and save them. Wiring diagram of GPS with Arduino Shows in Fig.3

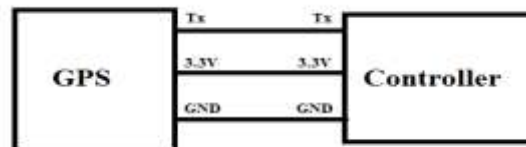


Fig.3 wiring of GPS with controller

D. Arduino

Arduino is an open source computer hardware and software company, project, and user community that designs and manufactures single_board_ microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards or Breadboards (*shields*) and other circuits. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler tool chains, the Arduino project provides integrated development environment (IDE) based on the Processing language project.

In this paper, Arduino is used for

1. Testing the input.
2. Execution of the program.
3. Updating the output.

III EXPERIMENTATION

In rainy season, Landslide happens several times. To detect that situation we are using this system. In this system we use only Accelerometer sensor to detect the vibrations at a set point when vibrations reach to the set point it will give the signal to the control room to aware the humans & save them. Block diagram of work shows in Fig.4

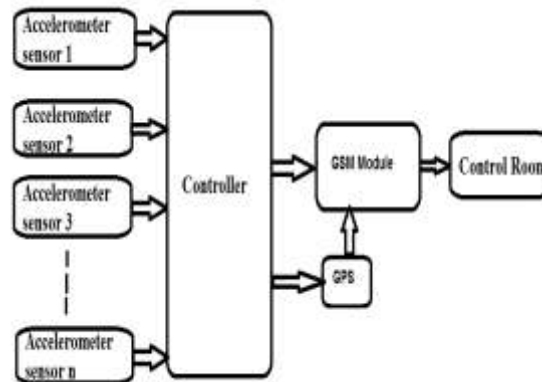


Fig.4 Block diagram of complete setup

IV RESULT ANALYSIS

Landslide detection is one of the challenging research areas available today in the field of geophysical research. This landslide detection system is cost effective. By this system we can save more lives. The complete system setup is shown in fig. 5. The system is also easy to operate.

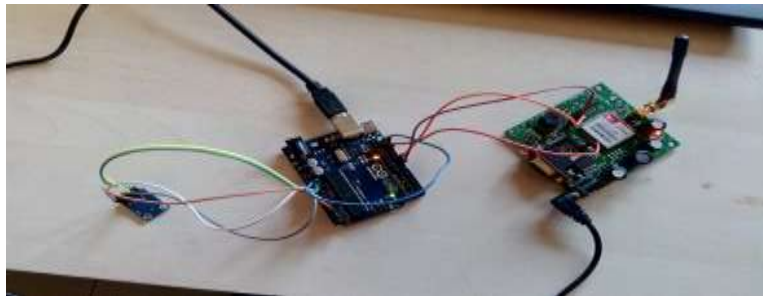


Fig.5 Photograph of complete system.

V CONCLUSION

We have designed the real time gadget for landslide and earthquake detection. This system is advanced the usage of Arduino Uno processor. The principle additives used in this gadget are GPS, GSM. We have connected one sensors like vibration sensor within the enter facet we've got sensors connected to Arduino processor.

If sensor detected any disturbance then it presentations by means of GSM we were given the message. In future, this system may be designed for protection of our livelihood in addition to nations wealth. In future we will cover large location for detection of landslide, road-slide, and earthquake through the use of GSM module.

REFERENCES

- [1] He Yueshun, Zhang Wei, the reseach on *wireless sensor network for landslide monitoring*, *international journal on smart sensing and intelligent systems* vol. 6, no. 3, june 2013

- [2] Michael J. Olsen, Shawn Butcher, and Evon P. Silvia, Oregon State University “*Real time change and damage detection of landslide and other earth movements threatening public infrastructure*”, March 2012.
- [3] P. D. Savvaidis, “*Existing Landslide Monitoring Systems and Techniques*” School of Rural and Surveying Engineering, The Aristotle University of Thessaloniki.
- [4] Ohbayashi, Riki, Nakajima and Yasutaka, “*Monitoring system for landslide disaster by wireless sensing node network*”, SICE 2008, pp. 1704-1710, August 2008.
- [5] A.Dinagar, P.Karthick, K.Karthi, P.Tamilvanan, S.Premkumar “*Landslide Monitoring System with GSM Modul*”, 2015, IJIRCCE
- [6] Maneesh V. Ramesh, “*Real-time Wireless Sensor Network for Landslide Detection*”, 2009 Third International Conference on Sensor Technologies and Applications.
- [7] Ramesh, M. V., “*Real-time Wireless Sensor Network for Landslide Detection*”, Proceedings of The Third International Conference on Sensor Technologies and Applications, SENSORCOMM 2009, IEEE, Greece, June 18 - 23, 2009
- [8] Sayali Wavhal, Anuradha Ghodake, Pratiksha Gholap, Rajashri Korde Research on “*Automatic Detection and Notification of Landslide and Earthquake*”. IOSR Journal of Computer Engineering (IOSR-JCE).
- [9] P. K. Mishra, S. K. Shukla, S. Dutta, S. K. Chaulya and G. M. Prasad, “*Detection of Landslide Using Wireless Sensor Networks*”, Central Institute of Mining and Fuel Research, Barwa Road, Dhanbad – 826015, Jharkhand, India
- [10] Maneesha V. Ramesh, Sangeeth Kumar, and P. Venkat Rangan, “*Wireless Sensor Network for Landslide Detection*”, Amrita School of Engineering, Amrita Vishwa Vidyapeetham (Amrita University) Clappan P. O, Kerala, India.