International Journal of Innovative Research in Computerand Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.194 |

||Volume 8, Issue 4, April 2020||

Landslide Prediction, Detection and Alert using IOT

Sushant Sampat Wagh[1], Mayur Vilas Pathare[2], Yogesh Ravindra Jarkad[3], Mrs.Vaishali Lele[4]

U.G. Students, Dept. of Electronics Telecommunication Engineering, K K Wagh Institute of Engineering Education &Research, Nashik, Maharashtra, India[1,2,3]

Assistant Professor, Dept. of Electronics and Telecommunication Engineering, K K Wagh Institute of Engineering Education & Research, Nashik, Maharashtra, India[4]

ABSTRACT: A landslide means movement of mass of rock, debris or earth in down slope. Landslides are form of mass wasting. Landslide includes wide range of ground movements i.e. Movement of soil or rock under the direct influence of gravity. The term "Landslide" is also known as "Landslip". It also includes five types of slope movement such as falls, topples, slides, spreads, flows. Rock falls, deep-seated slope failures, mudflows and debris flows are most common type of landslides.

Landslide are one of the very serious geological hazard that happens in almost every country around the world. Globally landslide causes hundreds of thousands of deaths and injuries in each year and also causes financial losses. Landslides are mostly unpredictable and occurs within short period of time. To save human life and losses, Efficient technology has to be developed and implemented in high geological hazardous areas with low cost. This project proposes the development and implementation of low cost autonomous wireless sensor network based landslide prediction and detection with early warning system. Wireless sensor network plays major role in environment monitoring system.

KEYWORDS: Mass wasting; low cost autonomous wireless sensor network; environment monitoring system.

I. INTRODUCTION

Landside caused by rain, earthquake, volcanoes or other factors that make the slopeunstable. Landslide have three main causes geology, morphology and human activity. Geology refers to characteristics of material itself .Morphology relates to the structure of land. Human activity, such as agriculture and construction can also cause major risk of landslide. Near populated areas, landslide presents major hazards to people and property. To avoid such destructive damages and losses we develop a small solution on it.

In this paper our main goal is development of low cost autonomous sensor network that is suitable for detection and observation of mass movement. In order to get information about movement rate, acceleration and movement direction of landslide-area, appropriate real-time observation system is developed and tested.

Here we develop a reasonable and effective sensor combination and alignment for early warning. also results of experiment with different sensors are analyzed and evaluated. Our main focus will be on sensor and network fusion with respect to the false alarm rates, malfunction detection and information enhancement. The sensor will be integrated on so called nodes, providing energy supply, information processing capabilities and wireless network connection. These nodes will be planted across area where landslide happens. One central system is develop with wireless network capability that will be placed on safe place near to the landslide prone area .This system monitors all these nodes. Nodes will collect all the information and send it to the central system. Here wireless sensor network makes perfectly sense as they provide good coverage of a wide area. So it is easy to get relevant information about early warning of landslide. The system developed here is robust and redundant.

II. WORKING

In this paper we built a system which is capable to withstand in heavy rain, stone fall, debris flow. Here we implement two types of circuit, one is called nodes and other is called as base station or central system.

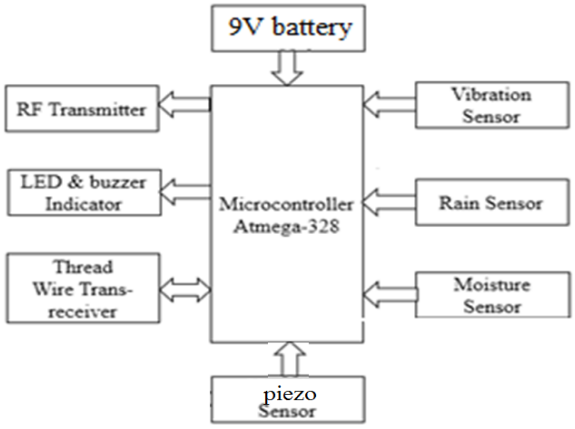

Fig 1. Block Diagram of Node

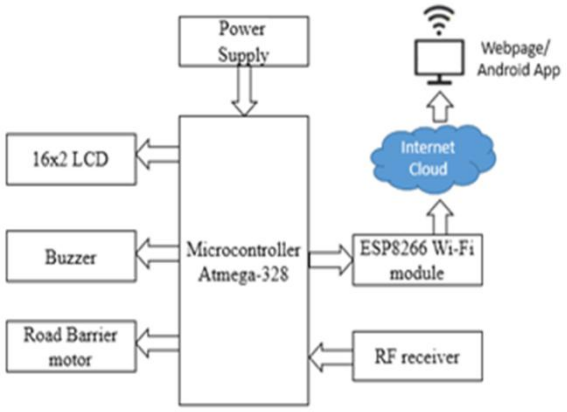

Fig 2. Block Diagram of Base Station

At node different sensors are integrated. Sensors used here are rain sensor, moisture sensor, vibration sensor, piezo sensor. We create a multiple nodes and these nodes planted across whole area where landslide happens. Rain sensor, moisture sensor, vibration sensor collect the information about rain, moisture and vibration. These information is used to create early warning of landslide. Piezo sensor arrangement is made at ground level to detect the landslide. When landslide occurs, soil and stones fall down on piezo sensor arrangement which will detect the landslide. Another module connected to microcontroller at node is thread wire transreceiver. These thread wire spread across area. It has two pins that are transmitter and receiver. Both are connected to controller. Here we transmit analog voltage from transmitter pin of controller through thread wire and receive it at receiver pin of controller. When landslide occurs this wire breaks and receiver did not get any voltage. This will detect landslide occurs. RF transmitter used here for wireless communication purpose. It transmits all information about rain, moisture and vibration, occurrence of landslide to the base station. In short at node early warning and detection of landslide will be done.

The main controlling action will be taken at base station. Based on information received by RF receiver controlling action will be perform. On detecting high moisture and vibration in land area, alert will be send to the base station by using encoded RF signal. Whereas on detection of alert signal, base station upload the data on IOT webpage with the location of corresponding node. Danger situation is displays on the roads passing through area using electronic displays. When landslide occurrs, with the help of electronically control barriers road is block. So any vehicle and human being are unable to go through that road.

III. MAJOR COMPONENTS

1.Rain sensor:- Rain sensor has metal strip on it. When rain drops falls on rain sensor, these metal strips are shorted. Thus conductivity increases and we get some analog output voltage.

2. Moisture sensor:- Working principal of rain and moisture sensor is same.

3. Vibration sensor:- In vibration sensor mercury ball and two wire arrangement is used .One wire is connected to VCC and other is connected to ground. When there are vibrations, mercury ball touches to the wires and wires get shorted and we get some analog output voltage.

4.Piezoelectric sensor:- Piezo sensor is used as a pressure sensor. Output of piezoelectric sensor is weak analog signal. We can amplify it by using OP-AMP 741.

5.Electronic road barrier:- Servo motor is used for electronic barrier. Servo motor works on PWM principle therefore its angular rotation is controlled by duration of applied pulse to its control pin.

6.nRFtransreceiver:- It is capable for wireless communication up to 2Mbps with range from 40 to 100 meter. 125 nodes will be connected to one transmitter. It uses SPI protocol.

IV. DESIGN OBJECTIVES

- On detection of high moisture and vibrations, early warning of landslide will be generated.
- Landslide detection using thread wire system and piezo electric arrangement on ground level.
- On detection of landslide immediate alert will be generated on webpage.
- Danger situation will be displayed on road ends with electronic displays and alarm.
- 24 * 7 monitoring and alert.

V. SIMULATION AND RESULT

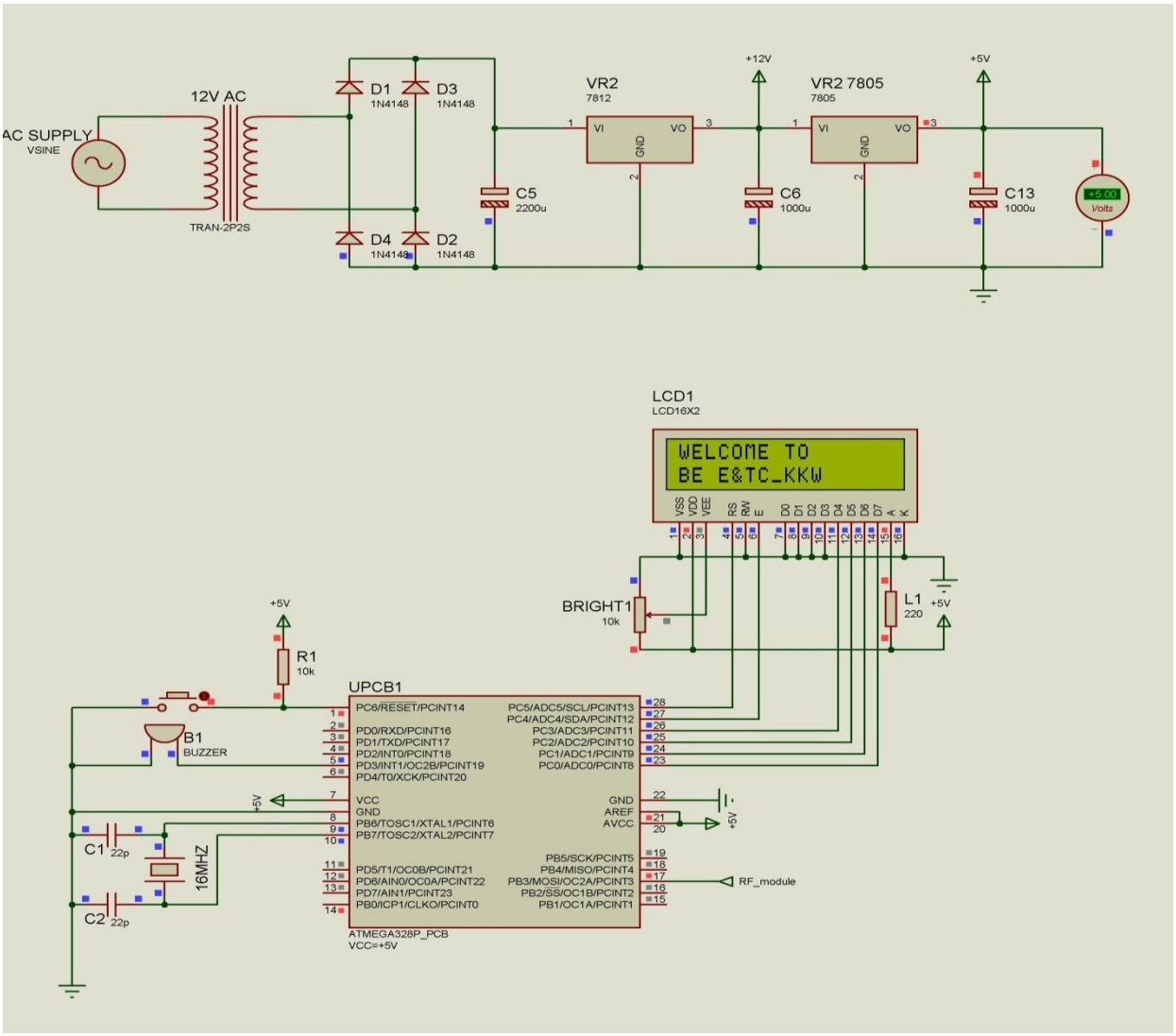

Fig 3. Simulation of Base Station

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.194 |

||Volume 8, Issue 4, April 2020||

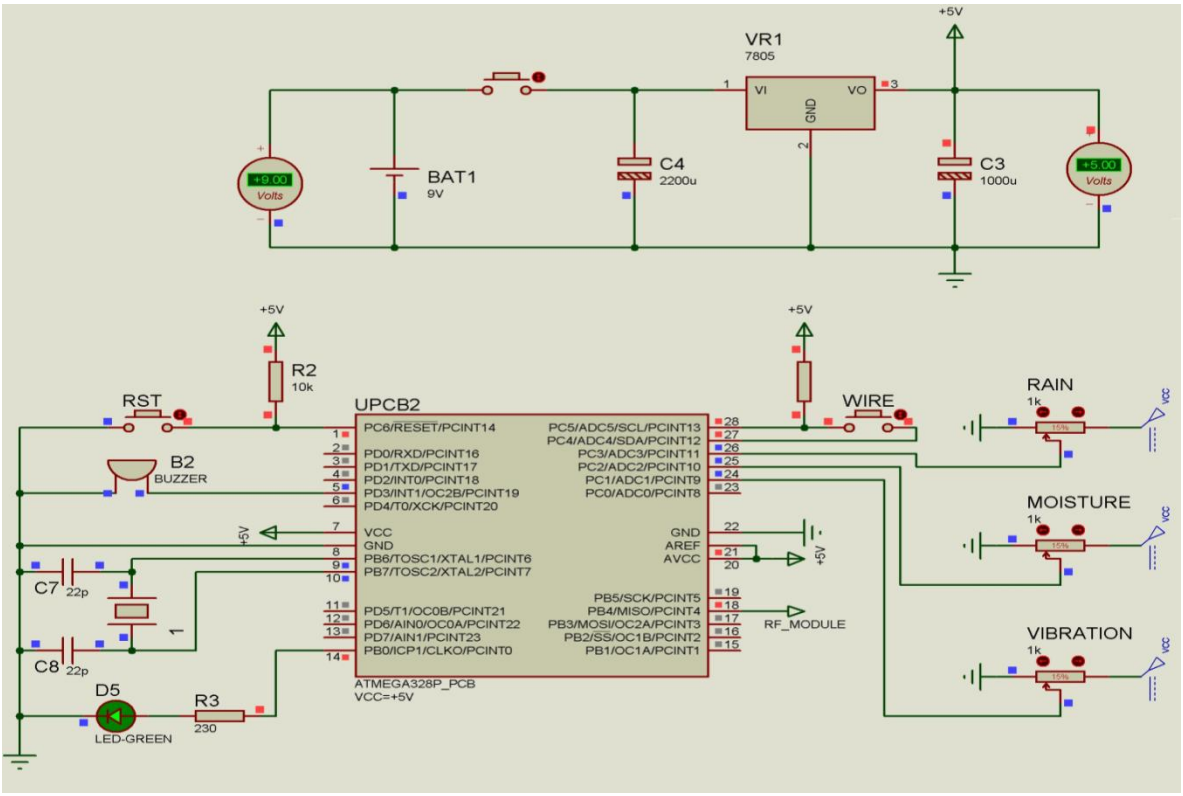

Fig 4. Simulation of Node

System detects all the parameters and calculate possibility of landslide.

Soil Moisture	Raining	Vibrations	Thread break	Landslide possibility	Action to be taken
Low	No	Average	No	No	Normal
Low	Yes	No	No	No	Normal
Moderate	Yes	No	No	Be careful	Buzzer & display
High	High	XX	XX	High	Buzzer & display & Barriers
XX	XX	High	XX	High	Buzzer & display & Barriers
XX	XX	XX	Detected	Detected	Buzzer & display & Barriers

Fig 5. Table of Parameters

Here we take different cases and predict the possibility of landslide. When soil moisture is low, average vibration, no rain and thread is not break , then there is zero possibility of landslide. When there is low soil moisture, light raining is there and no vibration then also there is no possibility of landslide. When there is high soil moisture, high rain and irrespective of vibration and thread break, it gives high possibility of landslide. In that case road is

blocked by using barriers and danger situationdisplayed on displays. This is mostly happens in rainy season. When vibrations is high and irrespective
of other parameters , it gives high possibility of landslide. It is similar to earthquake like situation. Then also road is blocked and danger situation displays. Once the thread wire is break then landslide is detected.
Since system is digital so all data is uploaded on webpage. Through webpage we get percentage of rain , soil moisture , vibration, status of road barriers. It gives location of landslide.

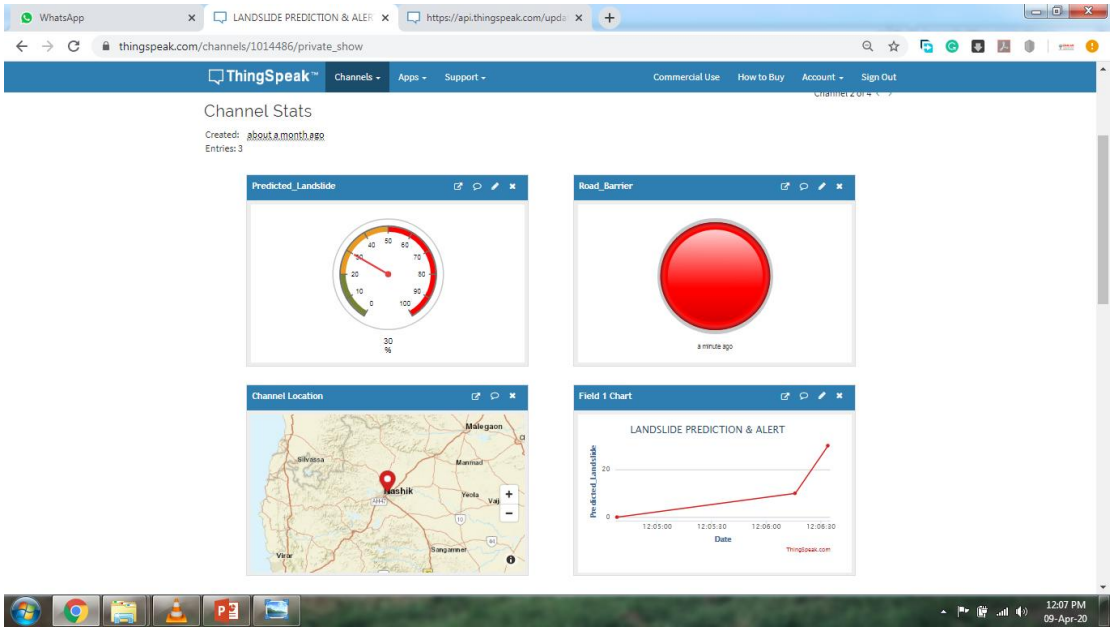

Fig 6. IOT Webpage

VI. CONCLUSION AND APPLICATIONS

In this project we have successfully built the prototype of our project . All sensors are properly functioned and we got nearly accurately correct output. We found that it is very cheap and efficient method to predict and detect the landslide. This system can be implemented on roadside mountains called as “Ghats”, Ice mountains, Tunnels. In case of any danger situation immediate all types of help will be provided as data is continuously uploaded on webpage. By using this system many lives can be saved. and it minimizes the losses as low as possible.

ACKNOWLEDGEMENT

We would like to take this opportunity to express our respect and deep gratitude to our guide **Prof. Vaishali Lele ,** for giving us all necessary guidance required for this project, apart from being constant source of inspiration and motivation. It was our privilege to work under her guidance.
We are thankful to **H.O.D Prof. Dr. D. M. Chandwadkar** for regular guidance, Co-operation, encouragement and kind help.

REFERENCES

[1] Arjun D. S, “Integrating cloud-WSN to analyze weather data and notify SaaS user alerts during weather disasters”, IEEE International Advance Computing Conference (IACC) 2015.

[2] Ashish Rauniyar, “Croudsourcing-Based Disaster Management Using fog computing in Internet of Things Paradigm”, IEEE 2nd International Conference on Collaboration and Internet Computing (CIC) 2016.

[3] Rajesh Singh, “Land sliding and monitoring using WSN” IEEE International Advance Computing Conference (IACC) 2014.

[4] Yiying Zhang ,"Internet of Things(IoT) foe Effective Disaster Managment" Published By IEEE Access, Digital Object Identifier 10.1109/ACCESS.2017.2752174.

[5] Garcia, A., Hördt, A. and Fabian, M. (2010). "Landslide monitoring with high resolution tilt measurements at the Dollendorfer Hardt landslide, Germany", Published by Semantic Scolar-2009.

[6] S. S. Vishnu "Disaster Alert and Notification System via android mobile phone by using google map",International Research Journal of Engineering and Technology (IRJET) 2014.

[7] Sagar D. Kharade, "Natural Disasters Alert System using Wireless Sensor Network" International Journal of Engineering Development and Research 2015