

RESEARCH THE PROBLEM

STATEMENT

1) Problem statement understanding:

Avalanche is a cataclysmic event harming the public activity consistently. It very well may be characterized as the development of mass of rock, garbage down an incline. It occurs due to natural or manmade activities. Asia was discovered to be the most influenced landmass where 75% of avalanches happened. India likewise confronted the loss of people because of avalanches which happened last year during storm in Kerala. The principle point of the proposed framework is to identify those conditions which prompts the event of avalanche and inform it a long time before time with the goal that important advances can be taken to lessen or save the human loss.

Effects: Destroys the slope/hill, Eliminates all vegetation, Buries houses and sometimes entire villages, Weakens the slope and makes it more susceptible to further landslides.

Types of Landslides

- Rock falls
- Rock slope failures
- Rotational landslides
- Landslides in regolith

- Debris flows
- Creep
- Solifluction

- Translational slides

A 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.

Landslides can occur in offshore, coastal and onshore environments.

Although the action of gravity is the primary driving force for a landslide to occur, there are other contributing factors affecting the original slope stability.

Causes: Heavy rains, Earthquakes, Volcano eruptions, Floods, Ground water changes

Damage: Destroys the slope/hill, Eliminates all vegetation, Buries houses and sometimes entire villages, Weakens the slope and makes it more susceptible to further landslides

Landslide detection system- how to make an advanced level **early warning Landslide detection system** using the **Wireless Sensor Network** based on the **IoT “Internet of things”**. This is quite an advanced level project capable of monitoring the **earth vibration**, Temperature, Humidity, and the Soil moisture. All these sensors are connected with different **IoT Nodes** which make the complete network. The number of nodes can be increased and decreased as per the requirement. All the **Landslide detection nodes** are monitored using website.

2) Hardware & Software Requirement:

List of Hardware components:

- 1)Nodemcu ESP8266 WIFI module
- 2)LM7805 Voltage Regulator
- 3)470 micro farad capacitor

4)DC female power jack

5)female headers and male headers

6)DHT11 Temperature and humidity module

Range:Temperature Range: 0°C to 50°C. Humidity Range: 20% to 90%

Resolution: Temperature and Humidity both are 16-bit. Accuracy: $\pm 1^\circ\text{C}$ and $\pm 1\%$.

7)SW-420 Vibration sensor

This Vibration sensor can be used in places where you need to monitor the vibration

Range: In a standard application (50g range), the sensitivity of a typical vibration sensor is 100mV/g, while in low vibration applications (10g) the sensitivity is 500mV/G.

Other Hardware tools: Digital oscilloscopes,variable supply,DMM,soldering iron kit,PCB small portable drill machines.

Software Requirements:

- 1) Proteus Software
- 2) Arduino IDE.
- 3) Python

Breif Working:

Landslide Detection System Node 1:

In node 1 a vibration Sensor “SW-420” is connected with the Nodemcu ESP8266 Wifi module. This Node is responsible for monitoring the vibrations. The vibration data is sent after every 1 second to the web application. When the vibration exceeds a predefined value an alert is also generated.

Landslide Detection System Node 2:

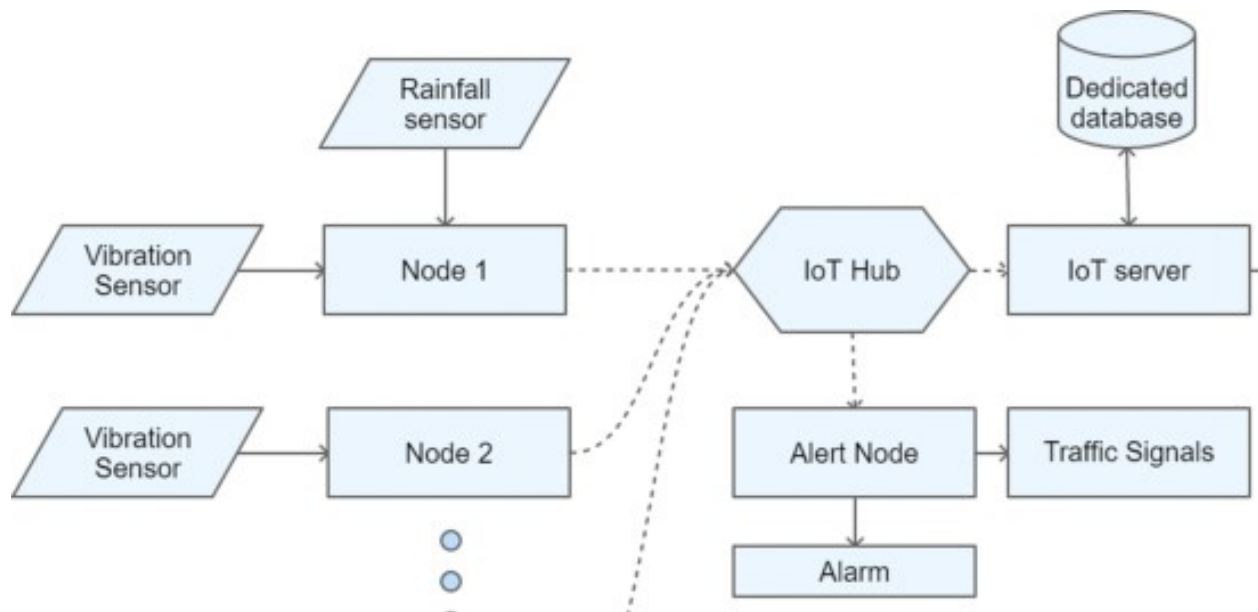
In node 2 the DHT11 temperature and humidity sensor is connected with the Nodemcu ESP8266 Wifi module. This Node is responsible for monitoring the

temperature and humidity. The temperature and humidity data is sent after every 1 second to the web application where the data is displayed on the gauges. When the temperature and humidity values exceed the predefined values an alert is generated.

Landslide Detection System Node 3:

In node 3 a soil moisture sensor is connected with the Nodemcu ESP8266 Wifi module. This Node is responsible for monitoring the soil moisture. The soil moisture data is sent after every 1 second to the web application. When the soil moisture exceeds a predefined value an alert is generated. The soil moisture is also monitored in real-time, this way precaution steps can be taken in advance.

GSM module: This module connects all the nodes and sends data to the web application.



3) Additions and updates.

1) The construction of weather stations, one for each node in the cluster. Analysis can be done more efficiently with the help of weather-based switching between high and low frequencies when providing this additional data to the sink node.

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4)Applications,Advantages,challenges

Applications:

- 1) Keep your distance from the sliding area. There's a chance that more slides will appear. For the most up-to-date emergency information, tune in to local radio or television stations. Flooding may occur as a result of a landslide or debris flow.
- 2) Roads can be blocked to save vehicles which can get stucked under the debris.
- 3) If a landslide is detected early enough, it would be easy to avoid any accidents because any human life can be migrated to a safe area.

Advantages:

1. Global surveillance
2. Notifications in real time
3. Simplified wiring
4. Save money
5. Installation is simple.
6. Simple to maintain

Challenges:

- Small displacements can be reliably detected and estimated.
- Find out which column has moved
- Estimate new locations for dislocated columns
- Find out where the slip surface is.
- There is a possibility of detecting wrong readings

5)Conclusion:

As a prototype, the landslide detection system has been successfully implemented. All of the sensors and other equipment function as expected. The sensors successfully sense and provide readings based on the surrounding conditions. Based on readings, the prediction of landslide is achieved successfully. The system senses data and transmits it continuously. The zone is determined by the results of the soil moisture sensor. The threshold values vary depending on the kind of soil and its properties. The accelerometer is used to monitor any soil movement caused by the vibrations of the earth. To use the accelerometer as a seismograph, the output values are transferred to reference values.

6)References:

- 1) R. Dhanagopal and B. Muthukumar, “A Model for Low Power, High Speed and Energy Efficient Early Landslide Detection System Using IoT,” Wireless Personal Communications, 20-Nov-2019. [Online]. Available: <https://link.springer.com/article/10.1007/s11277-019-06933-7>. [Accessed: 16-Jun-2021]
- 2) E. F. —, “Landslide detection system using wireless sensor network based on IOT,” Electronic Clinic, 02-Apr-2021. [Online]. Available: <https://www.electronicclinic.com/landslide-detection-system-using-wireless-sensor-network-based-on-iot/> [Accessed: 16-Jun-2021].