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# RESEARCH THE PEOBLEM STATEMENT

## 1) Problem statement understanding:

Landslide is a natural disaster damaging the social life every year. It can be defined as the movement of mass of rock, debris down a slope. It occurs due to natural or manmade activities. Asia was found to be the most affected continent where 75% of landslides occurred. India also faced the loss of humans due to landslides which occurred last year during monsoon in kerala. The main aim of the proposed system is to detect those conditions which leads to the occurrence of landslide and notify it well before time so that necessary steps can be taken to reduce 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.

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: ±1°C and ±1%.

7)SW-420 Vibration sensor

**Working:**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.

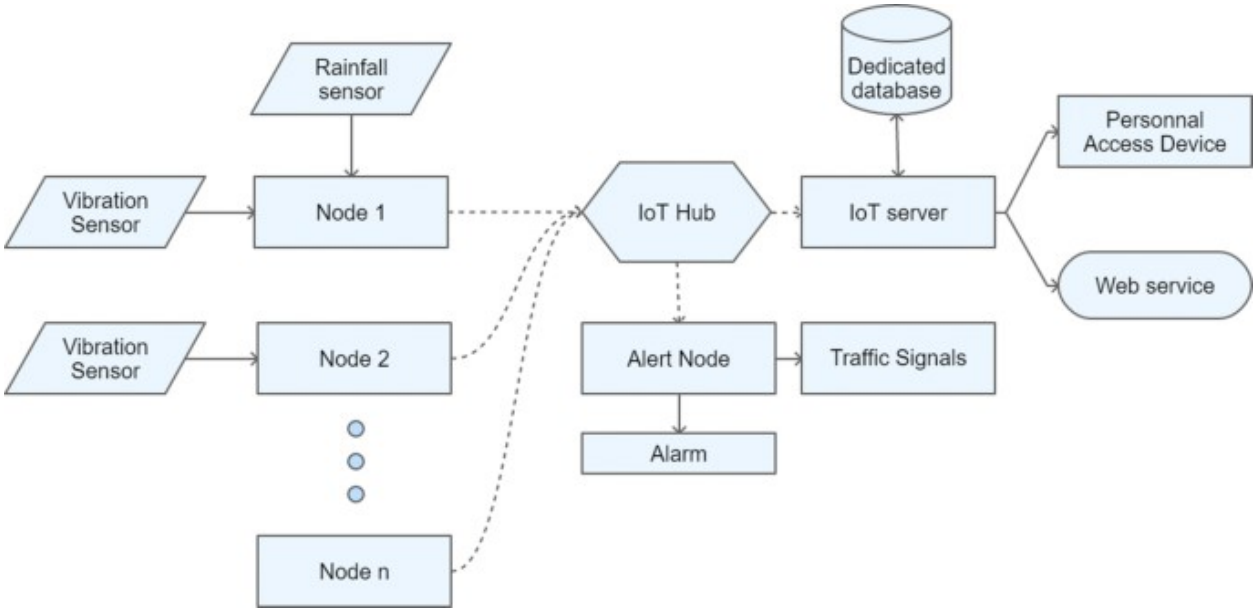
## Landslide Detection System Node 2:

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)Providing solar panels at each sensor node will allow for the seamless functioning of the sensor nodes in remote locations.This will eliminate the need for periodic charging of batteries for the nodes,which may involve human interference or need for power lines.

2)The building of weather stations, one for each cluster nodes.On sending this additional data to the sink node, analysis can be done more efficiently with the help of weather -based switching between high and low frequencies.

## 4)Applications,Advantages,challenges

## Applications:

1)If a landslide is noticed early enough, it is possible to avoid any accidents by relocating any human life to a safe location.

2) Roads can be closed to prevent vehicles from being caught in the debris.

3) Stay away from the slide area. There may be danger of additional slides. Listen to local radio or television stations for the latest emergency information. Watch for flooding, which may occur after a landslide or debris flow.

## Advantages:

1. Worldwide monitoring
2. Real-time alerts
3. Reduced wiring
4. Reduce cost

5. Easy installation
6. Easy maintenance and so on

## Challenges:

Reliably detect and estimate small displacements

1)Determine column that moved

2)Estimate new locations of dislocated columns

3)Estimate location of slip surface

4) Faulty Readings

## 5)Conclusion:

The landslide detection system is successfully implemented as a prototype. All the sensors and other stuff works as per the expectations. The sensors effectively sense the surrounding conditions and give the readings. Based on readings, the prediction of landslide is achieved successfully. The system senses data and transmits it continuously. The readings of Soil Moisture sensor are used to decide the zone. The threshold values change according to the soil type and its characteristics. The accelerometer is used to check any movement of soil due to earth's vibration. The output values of accelerometer are mapped with the reference values to use it as a Seismograph device.

## 6)References:

1)E. F. —, "Landslide detection system using wireless sensor network based on IOT," Electronic Clinic, 02-Apr-2021. [Online]. Available: https://www.electroniclinic.com/landslide-detection-system-using-wireless-sensor-network-based-on-iot/ [Accessed: 17-Jun-2021].

2) 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: 17-Jun-2021]