IoT BASED AUTONOMOUS LANDSLIDE MONITORING SYSTEM

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***Abstract*—** Landslide causes significant damages to civil infrastructure. This paper provides an autonomous landslide monitoring system based on wireless sensor networks. It gives us the accurate location of the landslide, the temperature of the soil and humidity. If movements are observed the collected data sets re automatically transmitted t a connected server system for further diagnoses . The System consists of a set of autonomous sensor devices equipped with a special manner used for monitoring landslides. The devices take measurements through the sensors at frequent time intervals while operating at a very low duty cycle and transfer them over the SigFox network to a data server operated by ELK stack for circulation and visualization.

***Keywords* –** UNO board; GSM/GPS; Vibration Sensor; Humidity Sensor and Soil Moisture Sensor.

I. INTRODUCTION

The wireless sensor networks is a technique which has many applications such as environmental monitoring, habitat monitoring , structural monitoring, structural health monitoring etc. The main task of the system is the power constraints in the field. As the size of the system is smaller high capacity batteries cannot be used. We should design a power aware algorithm for long lifetime of the system. In this work, we discuss a autonomous sensing device that monitors the landslides with accurate location and temperature.This system works under the source of solar power. In the rainy season the solar panel cannot be recharged so soon or sometimes of zero level of this period. To operate the system the basic domin knowledge and the current climate condition knowledge must be known or the reliability of data will be affected. In the existing method only locations were known but in the proposed method we can know the accurate location , the temperature of the soil and the humidity ; so that we can predict the landslide before the occurrence. The system consists of two different displays in that one of it gives the results of the humidity value and the soil moisture value. The other display gives the GPS location in the form of longitude and the latitude. The GPS is connected to external battery through a probe. The system that we propose is cost-efficient , highly-reliable and it gives us a scalable solution which helps us to collect data and report sensory data of very high accuracy and in a continuous way. In this system we have used various types of sensors in order to collect the data accurately.

II. SOIL MOISTURE MONITORING:

In this monitor we use to measure the water content (moisture) of the soil. If the soil has low water level, the module level is high , if the soil has high water level ,the module level is low. The working voltage of the sensor is 5V .The interface type is Analog. And the working temperature is 10°C -30°C.The soil moisture sensor uses capacitances to measure dielectric permittivity of the surrounding medium. The soil moisture sensor is used to measure the loss of moisture due to evaporation. The moisture sensor is connected to the arduino UNO.

Hardware And Software Required ;

- Moisture sensor module.
- Arduino Uno.
- Arduino IDE(1.0.6 version).

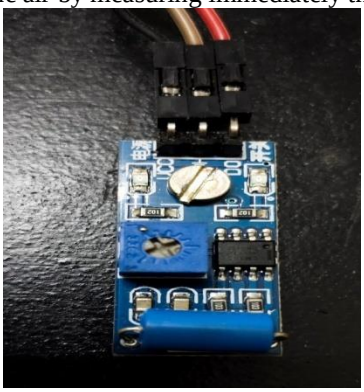
Hardware Connections ;

- Vcc to 5v.
- GND to GND.
- A0 to Analog 0 of Arduino.

After the connections are made the program for the soil moisture sensor should be uploaded to it to give the value of the moisture in the soil. As a result we will obtain the moisture value present in the soil in the display.

VIBRATION SENSOR:

The vibration sensor is also called as piezoelectric sensor. It is used for measuring various processes. This sensors are also used for deciding the smell or the fragrances within the air by measuring immediately the capacitance and quality as well.



III. THE PROPOSED MECHANISM

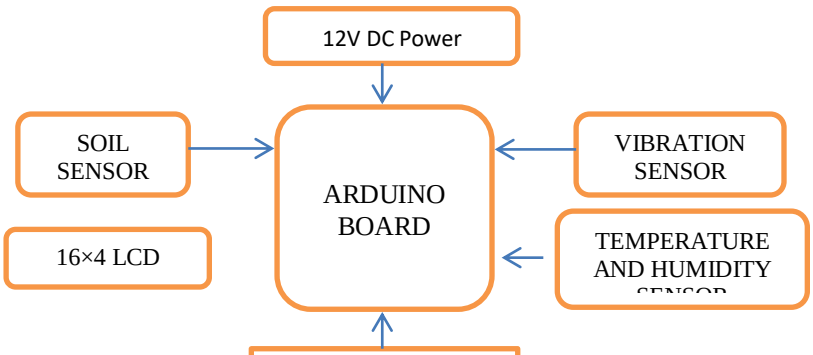
The proposed model landslide monitoring system used to give us the accurate values and the state of the soil. Through this method of monitoring we can predict the landslide before it occur. Because of this landslide the human life in some sort of areas such as the hill areas where there is more possibilities of the occurrence of the landslide. This system consists of various sensors and display modules for monitoring the values and to know the location of the landslide occurred or going to be. The GPS/GSM module is used to know the perfect location through the display connected in the module which shows the longitude and latitude by which we can know the perfect location.

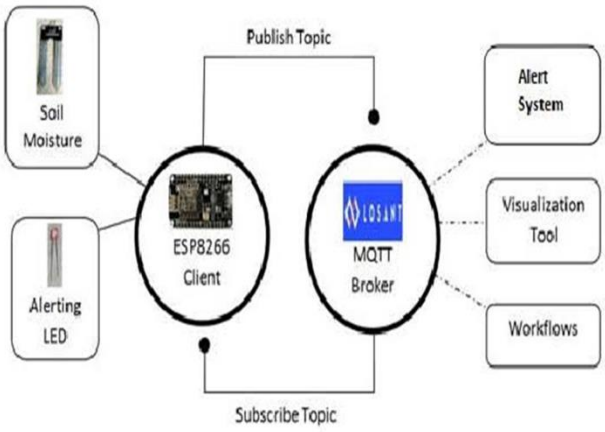
This system is operated by providing 12V DC power supply . An adapter is used to give the power supply to the arduino board. The arduino is connected with a vibration sensor, soil moisture sensor, temperature and humidity sensor. Through this sensors the values can be collect in the form data and it can be monitored. The GPS gives us the location. It is connected to the board but it doesn't get power through the board. An external supply of 9V battery should be given. The probe is given for the connection of the battery to the location providing module display.

SYSTEM ARCHITECTURE:

The proposed system block diagram is stated below. As the system should not be more complicating to understand it been made very simple. It can be used as a portable device and it can be easily adaptable in any condition in the covered form or a type of sealed form. This reason behind is the sensors and the board we use are not resistant to water.

BLOCK DIAGRAM:





Through this architecture we can know the structure of the device.

IV. Performance Evaluation

The System consists of database and an analysis station using the software called proteus which is used to determine the factor of real streaming of data. It also has the capability to compare and analyse the value of different sensors for the comparison.

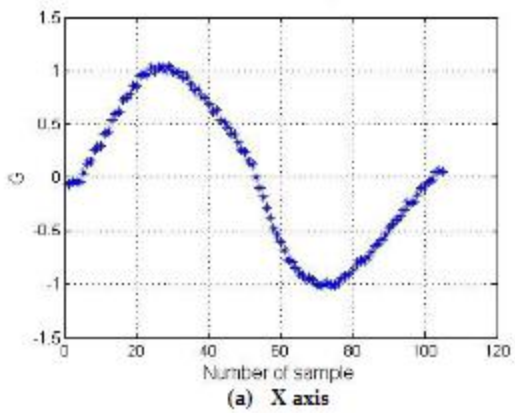


Figure 1. Model

V. Conclusion

Landslide Monitoring With Location Temperature And Humidity has more improvements in the proposed system than the existing system. The accuracy of the values are made more perfectly than the existing system. Thus the location and the humidity values in the proposed system , the accuracy rate is increased to 98.6%.

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