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WIRELESS SENSOR NETWORK BASED LAND SLIDE DETECTION AND MONITORING SYSTEM

*Vrushali G Hadole ,V.G Puranik
*Department of Electronics& Telecommunication Engineering, Bhivarabai Sawant Institute of Technology &Research, pune, India
Department of Electronics& Telecommunication Engineering, Bhivarabai Sawant Institute of Technology &Research, pune, India

ABSTRACT
Mass failures of slope, includes movement in soil, rock which cause a considerable damage to the natural habitat, environment, economy and other resources. Detection, monitoring and control are the three major issues regarding Real-Time applications. For a large scale detection of fault and monitoring faults is one of the important applications that lead to advancement of many kind of technologies. In this paper A Land-Slide detection system is being developed in the areas with high rainfall and versatile climatic behavior most of the year. Integrating Geophysical sensors forming a heterogeneous wireless network helps in identifying the fault and this paper also includes development, deployment (analysis) and data retrieval of the sensors information using WSN that is ZIGBEE.

INTRODUCTION
Wireless sensor networks is capable of large scale sensor deployment and have the advantages of adaptability, easy maintenance, and low installation cost with scalability for different environmental scenarios. In this paper we are implementing with development hardware which contains an accelerometer sensor which means mems sensor and other environment monitoring sensors like Ultrasonic sensors. The details are monitored and send through wireless communication module Zigbee to Another node called as access point which receives the alert message from land slide detector and enables a voice for alarming civilians. Continuous monitoring enables pre detection of landslide. Also it is able to gather other details like the rate of land slide   Disaster management of various environmental activities and detecting these conditions is one of the crucial part   Real time environmental disaster detection and monitoring is one of the basic necessities of the world. Various technologies have been developed till now and wireless sensor networks are one of the technologies that can fulfil the requirement. WSN has the capability of deploying in populated areas as well as data extraction and transmission is easy with low cost and low power consumption. This paper describes basic implementation of land-slide detection and monitoring system. This paper uses ZigBee protocol and a 2.4GHZ RF module as communication medium . Sensor deployment is a basic requirement for any kind of fault detection system , monitoring can be achieved by using other techniques like remote sensing, GPS technology; automated terrestrial surveys and so on. In this paper, with the basic information gathered the deployment of heterogeneous network is being discussed. The ease of implementation, low power consumption, minimal maintenance cost paved for turning views to Wireless Sensor Network This paper includes about the electronic node designing using controller and its interface with various geophysical sensors.

REVIEW WORK
Land slide occurs due to mainly following reasons
A. **Earth quakes**: which produce shock and vibrations forms a significant factor in some hill areas.
B. **Construction**: heavy industries and building constructions Which create internal vibration
C. **Rainfall**: intense or heavy rainfall prone areas will always be in danger of land-slides especially hilly areas.
D. **Under-Ground Constructions**: human activities including Various transportation constructions like roadways and Railways leading to steam erosions, heat wave action
In this paper mainly we are using three sensors for collecting data we can use any sensors which measures the above factors but this paper is deal with the following three sensors

A: MEMS SENSOR:
The MMA7260QT low cost capacitive micro machined accelerometer features signal conditioning, a 1-pole low pass filter, temperature compensation and g-Select which allows for the selection among 4 sensitivities. This sensor converts the ground displacement or movement into some voltage which may be recorded at a ground station for monitoring. with normal operating voltage of 30V and ground activities can be collected for every 30V change in voltage variation Zero-g offset full scale span and filter cut-off are factory set and require no external devices. Includes a Sleep Mode that makes it ideal for handheld battery powered electronics

B: TEMPERATURE SENSOR :
The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1∕4°C at room temperature and ±3∕4°C over a full −55 to +150°C temperature range The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 μA from its supply, it has very low self-heating

C:MOISTURE SENSOR:
They determine the amount of moisture content by measuring the dielectric constant of the soil. The constant value for the dry soil is around 3 to 5, 80% for water and about one for air. Thus the changes in moisture content cause a substantial change in the moisture content value of the soil.

SYSTEM MODEL
To design the system of our requirement a NODE should be Fabricated with a controller as a 'master node' for collecting The sensor data and transmitting the obtained data to the 'Receiving station' with some intermediate nodes as middle Layer transmitting medium, where the entire network leading To a WSN. And microcontroller used for this is LPC 2148 Transmitter node and receiver node are shown in FIG 2.1 and FIG 2.2
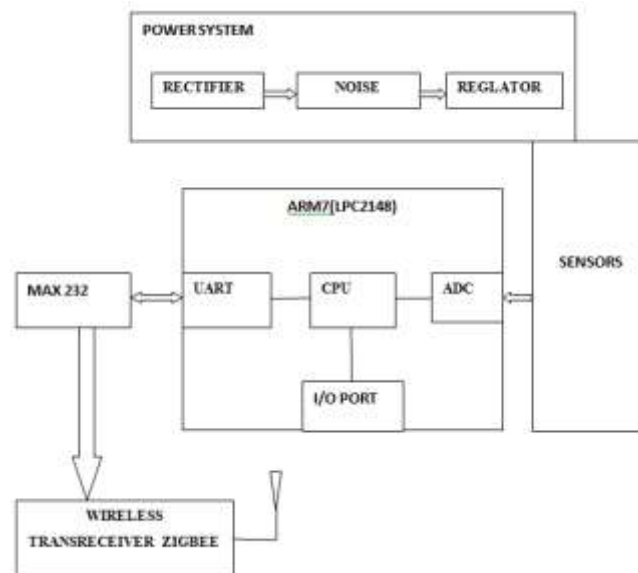
2.1 Transmitter Node
Transmitter Node is the master node that will control all the sensor information that is being gathered through various sensors and transmits to the data to the Receiver Node across two intermediate nodes that helps in efficient transmitting of the gathered data without any missing information. Transmitter node consists of controller (LPC 2148) where the 3 sensors were interfaced with controller transmit the information using

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ZIGBEE and as well compare the obtained values with stored values, that helps in stability and time with respect to rate of change.
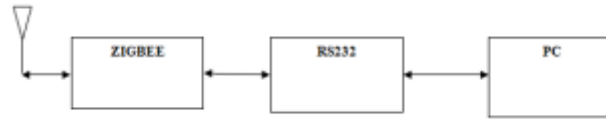
2.2Receiver Node
 communication module (zigbee) and acts as Trans/Receiver Nodes. And the output is displayed on the PC

HARDWARE DESCRIPTION
A POWER SUPPLY
Any NODE or any controller circuit requires power supply based on the requirement. For this NODE a battery can be used for fulfilling the requirement or an on-board power supply with a bridge rectifier circuit can be used for this purpose, which converts the AC supply to 12V DC supply and then 5V DC for running the controller, even for some sensors which require 5V as their operating voltage. For this purpose an on-board power supply is being developed which supply electrical signals to run the circuit. This bridge rectifier converts the AC to DC. All the controller components and sensors use 5V, 500ma DC as the source for power supply. But some sensors like pore pressure and strain gauge transducer requires12V requirement. So the bridge circuit developed in requires the fulfillment of both the power circuit at same time and a 9V-0-9V battery can be used as a source of power supply.

B CONTROLLER (LPC2148)
The LPC2148 microcontrollers are based on a 16-bit/32-bit ARM7 TDMI-S CPU with real-time emulation and embedded trace support, that combine microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty. Due to their tiny size and low power consumption, LPC2148 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I2C-bus and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers suitable for industrial control and medical systems.

C MAX232
USART (Universal Synchronous Asynchronous Receiver Transmitter) is a communication protocol for transmitting the data between the and to control station. The internal RS-232 The internal RS-232logic helps in creating the path by maintaining frequency and baud-rate.
Pin configuration of RS- 232 is shown below

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3.1 Max 232

D ZIGBEE:

There were many wireless modules available in the market, but the low cost, high transmission range capability, ease of interfacing and low power consumption with regarding to NODE turns the views of the project to use the ZIGBEE module as a medium of communication. The details are monitored and send through wireless communication module Zigbee to Another node called as access point which receives the alert message from land slide detector and enables a voice for alarming civilians. Continuous monitoring enables pre detection of landslide. Also it is able to gather other details like the rate of land slide etc.

2.4 GHZ Receiver Transmitter Stations (ZIGBEE):

Wireless transmission can be achieved by a device which can facilitate the signal trans-receiving. This 2.4GHz frequency is un-pain frequency for general purpose This can be further developed by integrating ETHERNET service along with zigbee for optimum data conversion and transmission. The size of the module is so small which can be easily portable for this application. there were many wireless modules available in the market, but the low cost, high transmission range capability, ease of interfacing and low power consumption with regarding to NODE turns the views of the project to use the ZIGBEE module as a medium of communication. ZEEGBEE module looks like as follows

3.2Zigbee Module

While designing the above model we have to follow the following steps and the steps are
START
Design power supply
Interface sensor With LPC 3148
 Initialization for the User Modules involved
Enable the UART
 Enable the UART power by setting jumper J10 to ON position
Connect RS232 serial cable to the serial port (P15) of the DVK and to the serial port of the computer
Measure the sensors value
 Display result on PC
Send values to UART

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RESULTS

When we connect hadware as per the fig. 2.1, 2.2 and give power supply then we get the result as follows. we can set the limits of our three factors which we are going to measure if the value of temperature, acceleration and moisture crosses that limit it gives alarm the buzzer gets on and this is very useful to avoid the further loss
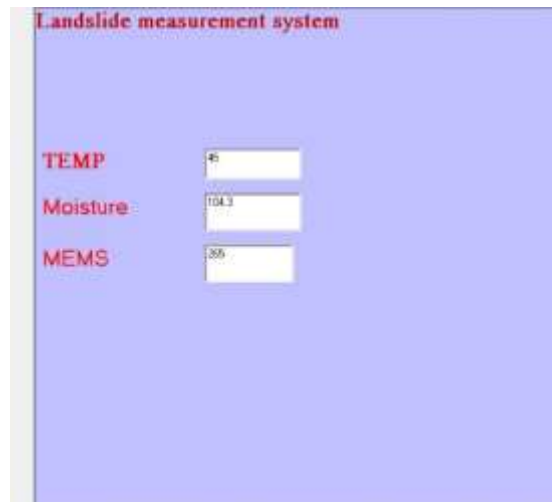
4.1 Land Slide Measurement System

In fig 4.1 shown the general Land slide measurement system if one value also crosses the limit buzzer gets on so it is very useful system we can monitor from this model and it is useful in heely area, High rain fall area, Forest areas where loss of deaths occure due to such natural disaster and this model is cost effective and easy to implement also

CONCLUSION

The project has an advantage of obtaining optimum results with minimum cost and even more compatible for expanding with other communication devices for even more fast responses. The only problem arises with the serial communication between the controllers which might decrease the processing speed. This also discussed a proto-model of NODE design for 'Land-Slide Monitoring' which of great importance especially in heavy rainfall and hilly areas.

FUTURE SCOPES

The WSN deployment leads to access many of the sensor information and by using Ethernet, Wi-Fi, Satellite or any other wireless protocol the danger intimation can be passed to the nearby villages and to the government officials. The Data Acquisition System at the control station is equipped with all the necessary protection equipment for all necessary measures which can be easy for the officials to take necessary steps for disaster protection

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