

Secure and Warning System in Hill Station Using WSN

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Abstract- Wireless Sensor Network is one of the most promising field and has innumerable applications in the real time systems. Implementation of WSN in real-time system for landslide detection and warning system is discussed in this paper. Sliding of rocks and soil is called landslide. It is triggered mostly because of heavy rainfall or melting of snow and can cause loss of lives and property. Using real-time monitoring the landslide can be detected and with the help of suitable warning system people can be warned. For this system we proposed the use of LPC2148 ARM microcontroller and zigbee for warning system

Index Terms- Zigbee, Microcontroller, Accelerometer and Sensor.

1. INTRODUCTION

Landslides mostly occur during monsoons in India, causing great loss of life and property. They cause considerable damage to highways, railways, and pipelines. They generally occur with other major natural disasters such as earthquakes, volcanic activity and floods are caused by heavy rainfall. In many cases, expanded development and human activities, such as modified slopes of land and deforestation, can increase the incidents of landslide. An early warning system for landslide prediction can reduce these losses to a great extent. We intend to use the wireless sensor networks in the landslide prone areas for estimating the chance occurrence of landslides.

Wireless sensors are one of the technologies with great advancements that can quickly respond to rapid changes of data and send the sensed data to a data monitoring center via zigbee. Sensors are easy for rapid installation, which can be positioned directly upon the landslide body, or in the surroundings, to provide real time data on the landslide activity. Along with the landslide, the hairpin bend, flame and motion detection also included which prevent the accidents in the hilly regions of the nation. The

accelerometer used is for reducing the speed of the vehicles when the hairpin bend is detected.

2. PROPOSED SYSTEM

In the proposed system we have the modules of Zigbee for remote correspondence and three sensors for information retrieval. The sensors utilized are flame sensor, PIR sensor and MEMS sensor. There will be warning system at the remote place which will be activated when the sensor values cross threshold value.

The information gathering and monitoring unit gathers the information through different sensors and control utilizing ATMEGA328 microcontroller. The information is transmitted from the gathering and control segment, consequently it goes as transmitting unit. In this unit we have the diverse sensor, for example, PIR sensor, Flame sensor and MEMS sensor.

The diverse parameters, for example, temperature in air, soil moisture and animals movement are identified utilizing these sensors. These sensors are combined to a frame which is controlled by controller.

Monitoring, forecasting and warning of landslides are the important features for saving the lives and assets from catastrophic devastation. There are mainly three fundamental ways for monitoring the landslide such as visual, surveying and instrumentation. Each monitoring technique has its own pros and cons and application range. Ground based visual inspection and sampling of this data on continuous basis may be one of the effective ways of monitoring the landslides. Surveying includes all type of physical measurements such as levels, theodolites, electronic distance measurement (EDM), and total station provide some of the prominent landslide features [5, 6]

The real-time monitoring networks are restricted by energy consumption, due to the remote location of the implementation site and the unavailability of constant power. Considering these factors, the wireless sensor network at the implementation site implements a totally innovative concept for distributed detection and estimation to arrive. The concept of wsn is really amazing for the project of the landslide

The wireless sensor networks are more accurate than that of each single sensor and capability to achieve universally optimal decisions. In landslide scenario, the implementation of this algorithm imposes a constraint of handling various sensors in each sensor node. The techniques that can be used for implementing this algorithm are referred from [7], [8] and [9].

3. WORKING

The transmitter circuit consists of power supply, flame sensor, pir sensor, and mems sensor and zigbee module blocks. The sensors are connected to the ADC 0 and ADC 1 of microcontroller. The signal conditioning circuit is used for sensors to get



Fig. 3.1 Transmitter

appropriate output. The data collected from the sensors is in voltage form thus we convert it in suitable format to display the results. The power supply is designed for 3.3V for microcontroller and 5V for peripheral modules. The transmitting of data is done using zigbee. Zigbee has range of 500m approximately.

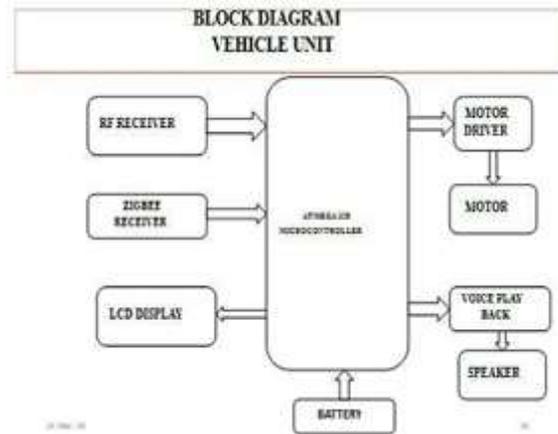


Fig:Receiver

4. COMPONENTS

Here we used ATMEGA 328 microcontroller. The Atmega328 microcontroller is based on a 32 bit ARM7TDMI-S CPU with real-time emulation and trace support, that combines the microcontroller with embedded high speed flash memory up to 512 kb. A 128-bit wide memory interface and a unique accelerator. To this microcontroller Zigbee and sensors are attached. Microcontroller performs the tasks of collecting data and transferring data from sensors to Zigbee and display the output on LCD screen.

4.2 Flame sensor

A flame sensor module that consists of a flame sensor (IR receiver), resistor, capacitor, potentiometer, and comparator

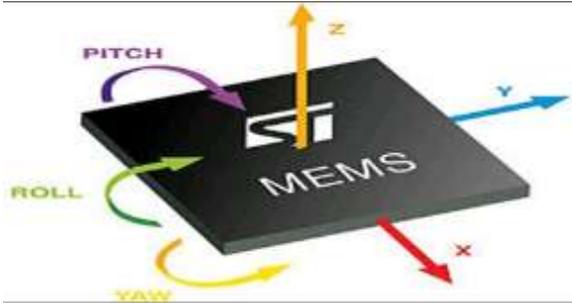


FIG:FLAME SENSOR

LM393 in an integrated circuit. It can detect infrared light with a wavelength ranging from 700nm to 1000nm. The far-infrared flame probe converts the light detected in the form of infrared light into current

changes. Sensitivity is adjusted through the on board variable resistor with a detection angle of 60 degrees.

4.3 MEMS sensor



4.4 PIRMotion sensor

Zigbee is the main hardware module used in this project for communication purpose. We have two zigbee modules one at transmitter side, another at the receiver side. Using zigbee we can communicate at high data rates. External signal is not needed for this communication, so we can use this zigbee modules anywhere even in forests, mountains etc. using peer to peer communication. One zigbee can communicate with any the data obtained from transmitter side processor it transmits without any delay. Then receiver side zigbee receives the data transmitted from transmitter.



Fig:PIR motion sensor

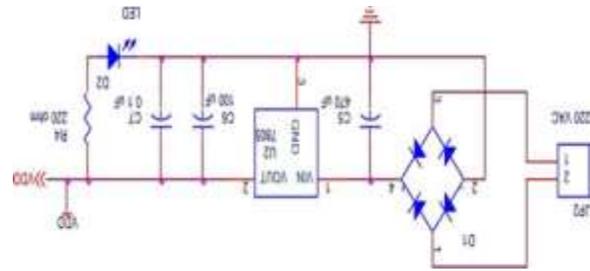
4.5 ZIGBEE



5. POWER SUPPLY

The power supply circuits are constructed using rectifiers, filters, and then voltage regulators. Starting with an AC voltage, a varying DC voltage is obtained by rectifying the AC voltage, then filtering to a DC level, and finally, regulating to get a desired fixed DC voltage.

The regulation is usually obtained from a voltage regulator unit, which receives a DC voltage and supplies a lower DC voltage as required, which remains the same even if the input DC voltage varies, or the output load connected to the DC voltage varies.



6. EXPERIMENTAL RESULTS

Flame sensor and mems sensor collect data in analog form and they are connected to ADC through signal conditioning circuit. We use signal conditioning because both side impedance is high.

It convert this data in digital form and convert it into percentage and display this value in percentages on LCD.

Sensor readings are sent to base station through wireless connection using Zigbee. Zigbee transfers all data to base station and it can be observed on terminal.

7. CONCLUSION



In this paper, wireless sensor network based landslide detection system is discussed. This system uses a zigbee wireless technology and ARM7 microcontroller composed of wireless sensors. This network Will be used for understanding the capability and utility of wireless sensor network for critical and emergency applications.

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