IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 6, Issue 9, September 2017

Landslide Detection

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Abstract: Landslide monitoring is based on geotechnical instrumentations using, for examples ultrasonic sensors, water level sensors, vibration sensors, accelerometer, inclinometer, rainfall sensor, or. However, cable based monitoring systems are costly, require continuous maintenance, and are limited in their communication flexibility. To overcome these limitations, wireless sensor networks and Internet of things are a viable alternative technology. State-of the-art wireless landslide monitoring systems collect environmental data from the slope and transfer it to connected computer systems for persistent storage. It monitors and detects the landslide and alert people from landslide hazards through android app.

Keywords: Landslide, Arduino, IOT, Rainfall, Sensors.

I. INTRODUCTION

Due to progressive development of urban areas and infrastructure, more and more people settle in the environments such as hilly sides that have become dangerous due to different types of natural hazards. The occurrence of landslides is a huge loss for human life and economic property and such events are fast. For such rapid events the wireless sensor techniques are best suitable as it can respond quickly to rapid changes like unfortunate weather conditions of data and send the sensed data wirelessly to the receiver station in areas where cabling is not possible. Signal from sensors and detection equipment's are translated into central server by using cable or GPRS communication. Cable has obvious drawbacks such as difficulties on wiring and construction at the danger zone, man-made destroying and devastation from natural disasters. In addition, GPRS communication also has technical limitations. It cannot be used in remote mountainous areas where signal is weak even hard to be received so that qualified GPRS network is hard to be established. There are projects developed which uses 302 satellite images it consist of combination of digital classification and textual analysis to identify landslide features. Thus using the satellite image includes huge processing which will conclude large calculation and complexity of the system which will make the project harder to analyze. These methods, however are known to be labor-intensive as well as costly. To overcome these limitations, wireless sensor networks and Internet of things are a viable alternative technology.

II. FEATURES

- Ultrasonic sensor
- Android app
- IOT- intranet
- Rainfall sensor
- Arduino
- Android app notification

III. RELATED WORK

Landslides may damage to properties like highways, railways, waterways and pipelines. Landslides may also occur with the other natural events like earthquake, volcanic activity, and floods induced by heavy rainfall. As also the mountainous region have their slopes modified for development purpose and deforestation, increases the chances of landslide to occur.

TABLE I

Date	Place	Casualties
16 JUNE 2013	KEDHARNATH, UTTARAKHAND,INDIA	5700
31 JULY 2014	MALIN, PUNE DISTRICT (M.S.),INDIA	50
30 OCT 2014	KOLANDA, SRI LANKA	200
20 AUG 2014	HIROSHIMA,SRILANKA	100

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By use of wireless sensor networks the environmental or physical condition are checked automatically and such autonomous instruments or nodes, combine with routers which make a standard WSN system. As such the sensors are buried at different places to obtain values for different places for same region and all these nodes form communicate wirelessly to central entrance where user gathers information, process it, examine it and present the evaluated data. Hence for an extra communication for increasing the length of the network within the region the routers may be use.WSN greater advantage towards low power consumption using just simple 4 AA batteries capable of functioning for around 2-3 years. [6]To elaborate network distance and reliability technology such as IEEE 802.15.4 and ZigBee gives a standard, low-power communication which provides mesh routing. Hence, WSN fulfills the need for real time monitoring, especially in the harsh environment too. WSN are composed of series of sensors, where the sensors are buried into the holes of earth, to provide continuous data on the landslide activity.

IV. BLOCK DIAGRAM

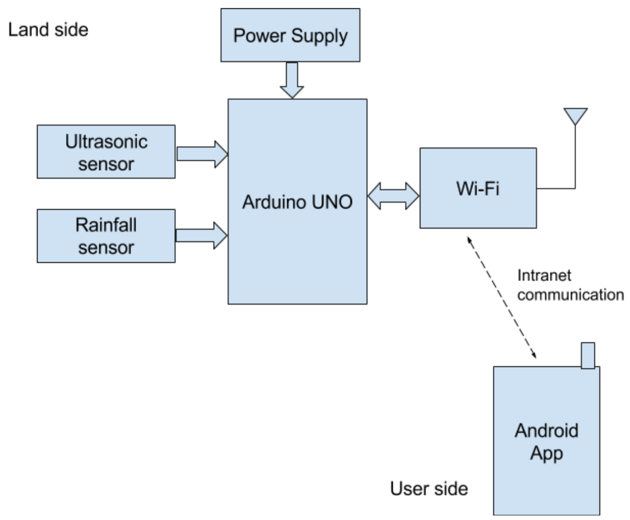

Fig. 1 Block Diagram of sensor

V. FLOW OF PROJECT

- The proposed work considers issue of landsliding in a region with disasters or heavy rainfall.
- Ultrasonic sensor is used to detect if any landsliding is happening and rainfall sensor is used to detect the heavy rainfall in that area.
- Both the sensors will give the data to arduino controller board , and arduino will transmit these data through wifi module to android app present at user side.
- Arduino will send a notification on android app, if any landslide is detected or heavy rainfall is detected.

VI. HARDWARE AND SOFTWARE REQUIREMENTS

Hardware:
- Arduino UNO
- Ultrasonic sensor- HC-SR04
- Rainfall sensor
- Wi-fi module - ESP8266

Software:
- Arduino IDE - Arduino programming
- B4A - Basics 4 Android - Android app

VII. COMPONENTS DETAILS

1. Arduino UNO

Arduino is a device used for making computers that can help in sensing and controlling the physical world. Arduino consists of both a piece of software, or IDE (Integrated Development Environment) and a physical programmable circuit board (often referred to as a microcontroller).

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Fig. 2. Ardunio UNO

Codes can be written and uploaded to the physical board. Interactive objects can be developed b by taking inputs from sensors, and a variety of lights, motors, and other outputs can be controlled by it. These projects can be stand-alone, or can communicate with software running on your computer. Arduino boards can be had-altered or can be assembled prior to purchase; the open-source IDE can be downloaded for free. ATmega328 is the microcontroller board on which Arduino Uno is based. Out of the 14 digital input/output pins, there are 6 pins which can be used as PWM outputs, a 16MHz ceramic resonator, 6 analog input, a USB connection, a reset button, a power jack and an ICSP header. Everything needed to support a microcontroller is present in it. To start it we just need to connect it to a USB and an AC-DC adapter.

Features:
1. Microcontroller: ATmega328
2. Operating Voltage: 5V Input
3. Voltage (recommended): 7-12V
4. Input Voltage (limits): 6-20V
5. Digital I/O Pins : 14 (of which 6 provide PWM output)
6. Analog Input Pins : 6
7. DC Current per I/O Pin: 40 mA
8. DC Current for 3.3V Pin: 50 mA
9. Flash Memory : 32 KB (ATmega328) of which 0.5 KB used by bootloader
10. SRAM: 2 KB (ATmega328)
11. EEPROM: 1 KB (ATmega328)
12. Clock Speed : 16 MHz

2. Ultrasonic sensor

Ultrasonic sensors evaluate the distance of a target by interpreting the echoes from ultrasonic sound waves which is similar to the working of sonar. A 2cm - 400cm non-contact measurement function and the ranging accuracy can reach to 3mm is provided by the HC-SR04 module. Ultrasonic transmitters, receiver and control circuit are included in the modules.

The basic principle of work:
(1) Using IO trigger for at least 10us high level signal,
(2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.
(3) If it signals back, through high level, time of high output IO duration is the time from sending ultrasonic to its returning. Test distance = (high level time × velocity of sound (340M/S) / 2

Fig. 3. Ultrasonic sensor

DOI10.17148/IJARCCE.2017.6945

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3. Rainfall sensor

A rain sensor or rain switch is a switching device activated by rainfall. The rain sensor detects water that completes the circuits on its sensor boards' printed leads. The sensor board acts as a variable resistor that will change from 100k ohms when wet to 2M ohms when dry. In short, more current that will be conducted as the board gets wet.

4. Wifi-module:

A set of high performance, high integration wireless SOCs, designed for space and power constrained mobile platform designers is called as Express if Systems' Smart Connectivity Platform (ESCP). It function as a standalone application, with the lowest cost, and minimal space requirement or it provides unsurpassed ability to embed Wi-Fi capabilities within other systems. ESP8266EX can be used to host the application or to offload Wi-Fi networking functions from another application processor and also offers a complete and self-contained Wi-Fi networking solution. When ESP8266EX hosts the application, it boots up directly from an external flash. In has integrated cache to improve the performance of the system in such applications. In microcontroller based design with simple connectivity (SPI/SDIO or I2C/UART interface) a Wi-Fi adapter, wireless internet access can be added. ESP8266EX is among the most integrated Wi-Fi chip in the industry; it integrates the antenna switches, RF balun, power amplifier, low noise receive amplifier, filters, power management modules, it requires minimal external circuitry, the PCB area is occupied by, including front-end module. ESP8266EX also integrates an enhanced version of Tensilica L106 Diamond series 32-bit processor, with on-chip SRAM, besides the Wi-Fi functionalities. External sensors and other application specific devices through its GPIOs are integrated with ESP8266EX

Key Features

· 802.11 b/g/n
· Integrated low power 32-bit MCU
· Integrated 10-bit ADC
· Integrated TCP/IP protocol stack
· Integrated TR switch, balun, LNA, power amplifier and matching network
· Integrated PLL, regulators, and power management units
· Supports antenna diversity
· Wi-Fi 2.4 GHz, support WPA/WPA2
· Support STA/AP/STA+AP operation modes
· Support Smart Link Function for both Android and iOS devices
· SDIO 2.0, (H) SPI, UART, I2C, I2S, IR Remote Control, PWM, GPIO
· STBC, 1x1 MIMO, 2x1 MIMO
· A-MPDU & A-MSDU aggregation & 0.4s guard interval
· Deep sleep power <10uA, Power down leakage current < 5uA
· Wake up and transmit packets in < 2ms
· Standby power consumption of < 1.0mW (DTIM3)
· +20 dBm output power in 802.11b mode
· Operating temperature range -40C ~ 125C

VIII. ADVANTAGE

- Seismic Hazard landslide and Heavy rainfall monitoring.
- Safety and security for the humans and vehicles.
- User friendly app
- Real time monitoring
- Low power consumption.

IX. APPLICATION

- Landslide detection
- Heavy rainfall detection
- Any infrastructure sliding can be detected.

X. CONCLUSION

The proposed work is for monitoring the hazard of landslides and by measuring the parameters related to landslides the hazard is forewarned before it occurs. The proposed system is with IOT which collects data and transfers it wirelessly

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using wifi module for further analysis in order to give quick response. If any possibility of occurrence of hazard is noticed the alerts are given through IOT. By use of WSN any mechanical or geo-physical sensor can be interfaced easily for protection of human losses as well as economic losses.

REFERENCES

[1] Pengfei Zhang, Ido Nevat, Gareth Peters, Gaoxi Xiao and Hwee-Pink Tan, Event Detection in Wireless Sensor Networks in Random Spatial Sensors Deployments, IEEE Transactions on Signal Processing (DOI 10.1109/TSP. 2015.2452218).
[2] Thomas Blaschke, Bakhtiar Feizizadeh, and Daniel Hoelbling, Object-Based Image Analysis and Digital Terrain Analysis for Locating Landslides in the Urmia Lake Basin, Iran, IEEE Journal Of Selected Topics In Applied Earth Observations And Remote Sensing, Vol. 7, No. 12, December 2014.
[3] Sijing Ye, Dehai Zhu, Xiao Chuang Yao, Nan Zhang, Shuai Fang, and Lin Li, Development of a Highly Flexible Mobile GIS-Based System for Collecting Arable Land Quality Data, IEEE Journal Of Selected Topics In Applied Earth Observations And Remote Sensing, Vol. 7, No. 11, November 2014.
[4] Linda Moser, Stefan Voigt, Elisabeth Schoepfer, and Stephanie Palmer, Multitemporal Wetland Monitoring in Sub-Saharan West-Africa Using Medium Resolution Optical Satellite Data, IEEE Journal Of Selected Topics In Applied Earth Observations And Remote Sensing, Vol. 7, No. 8, August 2014.
[5] Ping Lu, André Stumpf, Norman Kerle, and Nicola Casagli, Object-Oriented Change Detection for Landslide Rapid Mapping, IEEE geoscience and remote sensing letters, vol. 8, no. 4, July 2011.
[6] Maneesha V. Ramesh, Real-time Wireless Sensor Network for Landslide Detection, Third International Conference on Sensor Technologies and Applications 2009.
[7] He Yue Shun and Zhang Wei, The Research on wireless sensor network for landslide monitoring, International journal on smart sensing and intelligent systems vol. 6, no. 3, June 2013.