

EARTHQUAKE EARLY WARNING SYSTEM FOR ANDROID

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Abstract - Earthquake often inflicts severe casualties and property losses. Building information data play an important role in earthquake damage evaluation and emergency counter measures. Landslides and earthquakes are natural disasters that often occur in tamilnadu is a state of India. The objective of the research is to develop landslide and earthquake early warning system applications for smart phone devices with Android operating system .To enhance current earthquake warning systems, rising technologies, including social and mobile computing, have been the focus of much attention. As smart phones have benefitted from significant development over the last few years, it is now possible to capture various kinds of motion using a smart phone's sensors, (e.g., accelerometer, vibration, etc.) including earthquake motion. To that end, we developed smart phone software to capture and backend analytics to determine whether the motion captured by a smart phone is caused by an earthquake or by human motion. In so doing, our goal is to establish a new type of seismic network using smart phones which enhance traditional seismic networks. In this paper, we evaluated the use of smart phones as detection devices; collected both human and simulated earthquake data using the smart phones, and developed an algorithm to distinguish earthquakes from human activities. Our results show that using our algorithms, a smart phone or computer can not only be used as a recording instrument, but also a highly accurate earthquake detection tool. As a result, creating networks of axis sensors based on smart phones will enhance the safety of communities vulnerable to earthquakes, worldwide. The gateway which has the sensor node receiver and acts as an IOT transfers the warning to smart phones. Finally, many of the human lives can be saved.

Key Words: Node MCU, Axis Sensor, Internet of Things

1. INTRODUCTION

This development is being fixed with many applications and continued with development changes compared with traditional attitude of data acquisition. Traditional scheme based on simple ADC interface have been replaced in many situations where there is the need to collect information faster than a human, data loggers can possibly collect the information and in cases where correctness is essential. The environmental variations in physical parameters such as temperature condition, relative humidity, conductivity of Ionosphere, earth's magnetic field, gravitational field etc. either natural has led to calamity such as earthquakes generating Tsunamis or volcano. Numerous types of pressured process continuously occur in the earth's environment results sudden change in energy and associated action, leads to earthquakes. Earthquakes occur along the weak plate limits of two surfaces . The seismic waves energy travel away from the epicenter of the earthquake. The axis sensor is measure earthquakes in the form of angle of the arrival of the waves, will generate different types of waves that travel through the earth and along its surface . Geophone is an instrument for measuring ground motion. It is designed for earthquakes and landslides, machine vibrations, oil exploration, mining etc. A signal conditioner can vary in complexity from a simple resistive network or impedance matching network to a Complex multistage high gain amplifier with or without detectors, demodulators and filters . Alternately they are termed assigned processors. The output is analog but can be converted into digital using the (ADC) analog to digital converter for processing in digital world. The output of signal conditioning circuit with high gain and amplitude is interfaced as input to the microcontroller AVR having inbuilt ADC of 10 bit. The microcontroller on the other hand monitors and sends warring message when the parameter exceeds the predefined critical value.

1.1 Literature survey

Kaushik et al. mentioned in future Internet of things is going to become a reality. It will change our lifestyle. But there are many challenges to face related to the deployment, growth, realization, and use of this technology. The Internet Of Things (IOT) includes a multipart and evolving set of technological, social, and policy considerations across a diverse set of stakeholders.

Article about the module to connect Arduino uno with the external world. GSM Module SIM800A is basically used to connect Arduino Uno board with GPRS. It is connected with Rx and Tx pin of the Arduino uno. This is a small chip in which SIM card is inserted and AT commands are used to perform actions like calling, sending a text message or to send data to a website using HTTP connection. It acts as an interface between electrical devices and the internet.

The NEC Group has developed a piezoelectric vibration sensor that features sensitivity at about 30 times that of previous models. A vibration sensor is a device that corresponds to the aural and tactile organs of the human body. The real world is snowed under with vibration information generated by humans, goods, and environments. Our newly developed vibration sensor can collect tiny waveform data that has been hitherto undetectable and has therefore not been utilized. The vibration sensor waveform data together from the sensors is analyzed in real time by the hub terminals, and the extracted significant information is transmitted to the cloud system.

Kevin Ashton, co-founder and executive director of the Auto-ID Center at MIT, first mentioned the Internet of Things . Here’s how Ashton explains the potential of the Internet of Things: The problem is, people have limited time, attention and correctness all of which means they are not very good at capture data about things in the real world. If we had computers that know all there was to know about things- using data they gathered without any help from us we would be able to track and count everything and deeply reduce waste, loss, and cost. We would know when things needed replace, repairing or recall and whether they were fresh or past their best.”

2. SYSTEM ARCHITECTURE

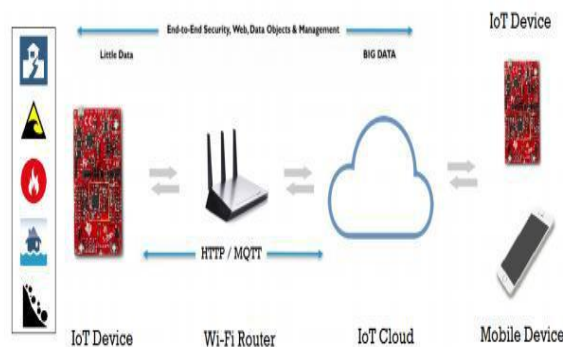


Fig. 1: System Architecture Operation

In this system is combination of both software and hardware components.

In this hardware consists of AVR microcontroller is used to connect the different types of sensor to collect the information’s. An rechargeable battery to save the power source.MC also detect the direction level monitor as well as conductivity monitor also measures the s indicates in liquid crystal display(LCD). It’s the fastest remote monitoring system. ESP8266 NODE MCU its an wi fi access board it act as on router and coordinator its send collection of sensor data to cloud storage based on API KEY. Every node haven saperate MAC address so they are secured network MAC address.

a) Software used

1) KEIL software

KEIL C software is used for microcontroller programming. C is efficient when compared to assembly language because, minimizes the lines of code - In assembly language, program which takes 100 lines will take 10 lines in Keil C. Easy to code and debug - C is easy to learn so it easy to code and since no of lines is less it will reduce complexity in debugging. Compatible with any microcontrollers - Just changing the header files we can make the program to work for different microcontrollers.

2) Thingspeak.

ThingSpeak web page is used for (IOT) Internet of Things application and Application Programming Interface (API) to store and recover data from things using the Hyper text transfer protocol over the Internet access. ThingSpeak enables the creation of sensor logging applications, data analysis applications, and a day to day things with status updates. ThingSpeak is used to support of IoT applications. The Thingspeak is the core logic of the proposed system. In general, a dataset is needed to train the machine to in the data in order to decide whether or not. For better precision, a Open weather map.com API is with the aim of knowing when the earthquake level is changed or not. The pseudo code gives a simple illustration on how the machine learning system works producing code that is portable across wide platforms.

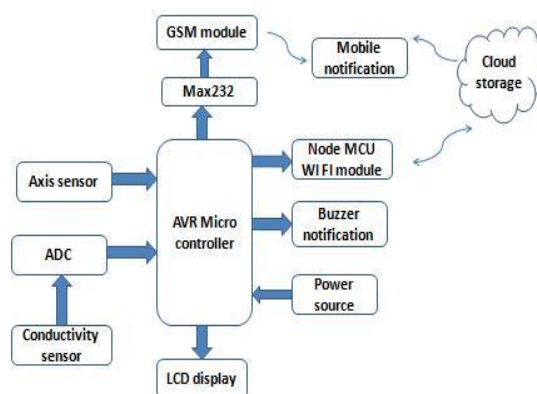


Fig. 2. Hardware used Block diagram

Development atmosphere that is engineered around a System-on-a-Chip referred to as the ESP8266. The ESP8266, designed and created by Esp Systems, contains all crucial components of a computer: electronic equipment, RAM, networking (wifi), and even a modern operating system and SDK. The Development Kit supported primarily based code for the ESP8266 WiFi SOC from Esp, integrates GPIO, PWM, IIC, 1-Wire and ADC all in one board.



Fig.3 : Node MCU

3. AXIS SENSOR

Node MCU WIFI module

The Node MCU (Node Microcontroller Unit) is open source software and hardware

1. Axis Module

3-Axis Module is a three axis accelerometer sensor module based on ADXL integrated circuit. It is a three axis x, y and z accelerometer with low noise and power consumption. The sensor has a full sensing range. It can measure the static acceleration of gravity in vibrate-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. There is an on-board 5V voltage regulator to power the ADXL so power provided should be between 3 and 5V DC.

AVR microcontroller This is a modified Harvard architecture 8bit RISC single-chip microcontroller. The size of the program memory is usually indicated in the naming of the device itself (e.g., the ATmega64x line has 64 KB of flash, while the ATmega32x line has 32KB)

2. Conductivity sensor

The conductivity sensor module is an easy tool for land slide detection. It can be used as a switch when water drop falls through the raining board and also for measuring water fall intensity. The analog output is used in detection of drops in the amount of land fall.

4. LCD DISPLAY

liquid crystal display (LCD) is used to display weather land slide is detected or not. And magnetic axis are shown in this display.

5. GSM MODULE

Global System for Mobile communication is a digital mobile telephony system and other parts of the world. Long term evolution(LTE).LTE is a mobile network technology that is being deployed by mobile operators on both the GSM and the CDMA (code division multiple access) technology paths. Depending on the spectrum available, live Long Term Evolution networks can deliver very fast data speeds of up to 100Mbps in the downlink and 50Mbps in the uplink.

6. RESULT & DISCUSSION

Thus the people who lived in the coastal areas in earthquake prone zones can be benefited from this system. Early security precautions and measures can be taken by using this system. The results produced by the system are faster and accurate results.



Fig: 3. Live Data of axis data and vibration date and Time from Thing speak view android app.

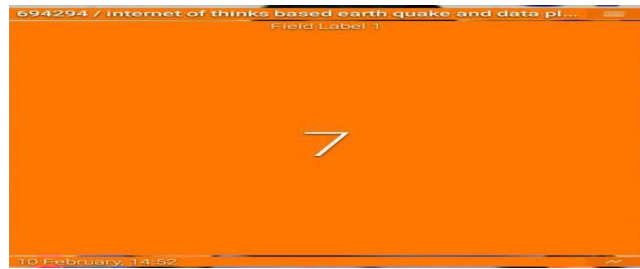


Fig: 4. Live Data of axis data and vibration date with day and Time from Thing speak smart widget

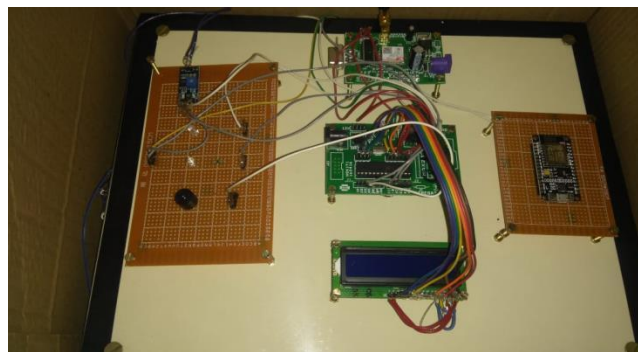


Fig..5. Hard ware kit snapshot .

7. CONCLUSION

The main goal of this paper was to detect the unusual vibrations and generate the alert when the limit exceeds. This can be useful for emergency response planning. It is going to implement by using both hardware and software and thus its implementation is easy and economical. Emergencies can come without warning at any time. Emergencies are the source of risk and therefore have the probability of causing an undesired event. The emergency shelter may be needed in some situation. After a disaster occurs, immediate action is taken to protect staff, visitors & collections and sending alert text messages to concern authority using SMS alert. Contact names and phone numbers must be listed for sending alert SMS. Direction indicator using AVR microcontroller has proved to be an economical and user-friendly product. Very low Power requirements of the system. Precautionary measures are required for this product and it can be easily operated by the user.

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