ISSN 2229-5518

SMARTPHONE BASED DISASTER ANALYSIS

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Abstract*-Earthquakes are measured using observations from seismometers. Intensity of shaking is measured on the modified Mercalli scale. Installing a seismometer is more expensive for a private concern, so that, only government and weather department having seismometer for measuring earthquake. A main device called as Accelerometer is present in the seismometer. Our Motivation to implement this project is, now a day's mobile devices contain accelerometer and it calculates the shakes ratio. The mobile device will monitors for shakes, in case the wall shakes even 1 mm, the application will trigger out and send the X, Y and Z axis to the company server and the reading can be seen in the system and then buzzer will be triggered out. The company may take necessary actions at that time. This method saves many lives in a simple and economic manner. Cloud Computing is powered by data centers running in a simultaneous, cooperated and distributed manner. It delivers faster recovery times and multi-site availability at a fraction of the cost of conventional disaster recovery. Cloud computing, based on virtualization, takes a very different approach to disaster recovery. Disaster recovery as a service solutions allow to avoid the costs of purchasing the infrastructure and software needed for a secondary or tertiary disaster recovery site and to pay for the disaster recovery solution out of operating budget.

***Keywords:* Earthquakes, seismometer, Accelerometer, shakes ratio, cloud computing.**

I. INTRODUCTION

Earthquake is occurred within the earth's crust by the sudden release of large amount of energy. This energy produces some destructive waves which are called as the seismic wave. It has been found that the seismic wave includes shear-wave, longitudinal wave and surface wave. Longitudinal wave's vibration direction and of the forward motion is found to be same whose speed is 5.5-7 km/s and the destructive force is small. However, shear wave's vibration is perpendicular to the forward direction whose speed is 3.2-4 km/s and the destructive force is high. The surface wave is the slowest wave and the most destructive [4].

The more numerous earthquakes smaller than magnitude 5 reported by national seismological observatories are measured mostly on the local magnitude scale, also referred to as the Richter magnitude scale. These two scales are numerically similar over their range of validity. Magnitude 3 or lower earthquakes are mostly imperceptible or weak and magnitude 7 and over potentially causes serious damage over larger areas, depending on their depth. The largest earthquakes in historic times have been of magnitude slightly over 9, although there is no limit to the possible magnitude. Intensity of shaking is measured on the modified Mercalli scale. The shallower an earthquake, the more damage to structures it causes, all else being equal. As mentioned above the seismometer and Mercalli scale are measuring earth quakes using X axis, Y axis and Z axis.

We are exploring the use of accelerometers in smartphones to record earthquakes. We have developed an application for Android phones based disaster analysis to record the acceleration in real time. These records can be saved on the local phone or transmitted back to a server in real time[10].To enhance current earthquake early warning (EEW) systems, emerging technologies, including social and mobile computing, have been the focus of much attention. As smartphones have benefitted from significant development over the last few years, it is now possible to capture various kinds of motion using a smartphone's sensors, (e.g., accelerometer, GPS, etc.) including earthquake motion. To that end, we developed smartphone software to capture and backend analytics to determine whether the motion captured by a smartphone is caused by an earthquake or by human motion [3].

The data stored in the cloud may be frequently updated by the users, including insertion, deletion, modification, appending, recording, etc. To ensure storage correctness under dynamic data update is hence of paramount importance. However, this dynamic feature also makes traditional integrity insurance techniques futile and entails new solutions. Individual user's data is redundantly stored in multiple physical locations to further reduce the data integrity threats. Therefore, distributed protocols for storage correctness assurance will be of most importance in achieving a robust and secure cloud data storage system in the real world.

The rest of this paper is structured as follows. Section II introduces related work of the earthquake and fall detection. Section III introduces existing system and defines the problem that our approach aims at solving and Section IV proposed system discusses how we evaluated our approach. Section V Implementation and result and Section VI conclude this paper.

II RELATED WORK

Lei ZHONG et al. [1] focus on Big Data analysis is considered as a powerful tool to help the disaster management in many fields. In this study, we investigated and applied the Big Data techniques for the disaster estimation of mobile communication systems. Firstly, we have developed a data analysis model by analyzing the large amount of data generated and collected from the previous earthquakes.

Tianjiao Shi et al. [2] proposed a threshold based fall detection algorithm that processes data from common sensors in modern smart phones, such as tri-axial accelerometer and magnetometer in order to detect falls. The algorithm uses Signal Vector Magnitude (SVM) peak value, base length and post-impact velocity to distinguish falls from most of daily activities.

Ying-Wen et al. [6] proposed a smartphone fall detection system featuring a three-axis accelerometer sensor with a voice interaction function is presented. When a fall is detected, the voice function asks whether the user needs help. If the fall is not serious, the user can cancel this emergency notification by means of either the voice interaction function or the touch panel. Otherwise the smartphone would automatically send out an emergency signal to the help center to request assistance for the user.

Qingkai Kong et al. [3] focus on the goal is to establish a new type of seismic network using smartphones which enhance traditional seismic networks. This paper evaluated the use of smartphones as detection devices; collected both human and simulated earthquake data using the smartphones, and developed an algorithm to distinguish earthquakes from human activities. The results show that using the algorithms, a smartphone can not only be used as a recording instrument, but also a highly accurate earthquake detection tool. As a result, creating networks of seismic sensors based on smartphones will enhance the safety of communities vulnerable to earthquakes, worldwide.

Shubhangi Choure et al. [4] proposed the system consists of an Accelerometer sensor for sensing seismic signal along 3-axis corresponding to accelerations and can save the respective data in the memory which can be used for further analysis. An ARM processor compares the input signal with reference signal which is already set into the ARM processor. If the value of input signal exceeds reference signal then an alarm about possibility of an earthquake rang in PC**.** Sanjib Kalita [7] focused on one of the emerging instruments is MEMS (Micro-Electro Mechanical System) Accelerometer, which can be used for measuring proper acceleration. However, it can measure vibration, shock etc.

ShayanMehrazarin et al. [9] MacSeisApp expands on SeisMac by using Apple's Push Notifications (APN) via a dedicated server for earthquake notification. MacSeisApp utilizes an open-source library to detect the vibrations via the Sudden Motion Sensor and to translate it into points to be plotted as a seismograph**.**

Qingkai Kong et al. [10] proposed a series of shake table tests were conducted and recorded different human activities using these smartphones. Different features were extracted from the recordings and were used to distinguish earthquakes from daily activities. A classifier algorithm based on an artificial neural network, which shows a 99.7% successful rate for distinguishing earthquakes from certain typical human activities.

III. EXISTING SYSTEM

To realize the fall detection algorithm, the angles acquired by the electronic compass (e-compass) and the waveform sequence of the tri-axial accelerometer on the smart phone are used as the system inputs. The acquired signals are then used to generate an ordered feature sequence and then examined in a sequential manner by the proposed cascade classifier for recognition purpose. Once a fall accident event is detected, the user's position can be acquired by the global positioning system (GPS) or the assisted GPS, and sent to the rescue center via the 3G communication network so that the user can get medical help immediately.

Figure 1 Fall accident detection

A. DEMERITS:

- Fall detection produce false alarm even for the normal activities
- Difficult to distinguish between the fall and human activities
- Accuracy of fall detection was not predicted
- Difficult to locate the fall area

IV. PROPOSED SYSTEM

Cloud Computing delivers faster recovery times and multi-site availability at a fraction of the cost of conventional disaster recovery. Cloud computing, based on virtualization, takes a very different approach to disaster recovery. With virtualization, the entire server, including the operating system, applications, patches and data is encapsulated into a single software bundle or virtual server. This entire virtual server can be copied or backed up to an offsite data centre and spun up on a virtual host in a matter of minutes.

Disaster recovery-as-a-service solutions allow you to avoid the costs of purchasing the infrastructure and software needed for a secondary or tertiary disaster recovery site and to pay for your disaster recovery solution out of your operating budget. From the proposed system, we observe that performance, confirmed that the virtual cluster performance is significantly lower than the cluster running on physical machine due to the overhead of the virtualization on the CPU of the physical

ISSN 2229-5518

host. The factors which affect the performance (RAM size, network bandwidth) were considered in our experiment.

A. MODULES

- Mobile Accelerometer
- Data Partition and Priority
- Disaster Engineering
- Executing IP conflict for TPA
- Data Transfer and Restore

1) Mobile Accelerometer

This is the initial module of this project. In this module a mobile device will be fixed in a rigid surface like walls or ceiling. A Corresponding application has been developed for reading the value from the accelerometer in the mobile device. This application will be installed in the mobile device for disaster monitoring. The mobile device will monitors for shakes, in case the wall shakes even 1 mm, the application will trigger out and send the X, Y and Z axis to the company server through Bluetooth. And the reading can be seen in the both Mobile device and in the system.

a) Merits:

- ❑ Everyday using handheld device(mobile)is more comfortable
- ❑ Easy to be embedded in portable devices
- ❑ Better accuracy from existing system
- ❑ Easy to locate the disaster area

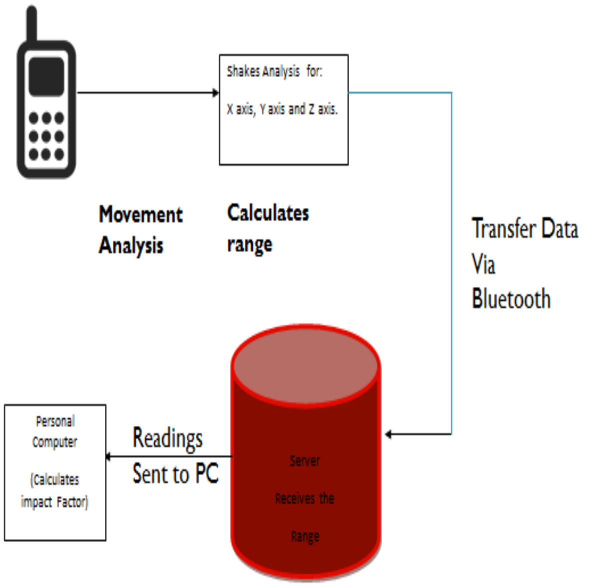

Figure 2 Mobile Accelerometer

2) Data partition and priority

This is the pre processing module. Here the data base will be set to into a priority wise schedule. The entire table in the database will be available in this module. Admin can set the priority to the table according to the importance of the data. While setting priority, one priority option will be available for one table. Admin cannot assign same priority for two tables. After the assigning the priority the data transfer location will be selected. This is one time option; this process will be set down while the server created initially

3) Disaster Engineering

This is the most important module is this project. This module will receive the data from the mobile device. After receiving the data the system will calculate the X, Y and Z value for the wave of earth quake. A pre define reading will be available to calculate the force of the impact. This data will be created into a digital signal. The server could be proposed as central of data processing to run service like service listener. It has function to capture and store information sent from the remote client. Otherwise, it could be used for the central data storage and application server to display the processed results to the user.

4) Executing IP conflict for TPA

The TPA will receive the digital signal. This module will take cares the database migration process. So that when ever disaster will occur the CSP will trigger through the IP conflict and the data base will be transferred in the concern location. Before the transfer the transferable data will be encrypted under Quantum Cryptography method. This module deals with the software architecture of the cloud service provider, which is inter related with the remote disaster tool, so that when ever disaster will occur the cloud service provider will trigger out the malware process. This process may execute through Intranet, Internet and also through GPS. So that global communication will be possible here. This architecture should be assigned during the server configuration.

5) Data Transfer and Restore

Finally the database will be transferred in to the admin assigned location with secured cryptographic file. The file from the other side cannot able to access by other users. The file will become usable only after it reached its native location. This module will execute after the disaster and CSP trigger out process. The roll back process too needs IP conflict procedure for analysing the failure calculation as the location of the database. According to the admin request original database can be transfer to the default location and also transfer of duplicate database also possible.

B) Advantages of the proposed system

- No Need to depend for the disaster signal form third party. Warnings can be generated from mobile phones itself.
- Because of the availability of cloud service provider the cloud disaster remote monitoring system can be executed successfully.
- High data transfer is possible due to the availability of higher bandwidth. So that while disaster data loss will not occur.
- A highly prioritized database is available in order to prior up the data base tables during the time of destruction.
- More data accuracy can be provided during roll back process.
- Can provided unlimited bandwidth for data transfer.
- Transaction logs can be generated
- No time consuming.

V. IMPLEMENTATION

A. SOFTWARE DESCRIPTION

It uses both Android SDK and Visual Studio. For Mobile device android SDK and eclipse has been used. For PC interface C# and SQL Server has been used. Here the mobile application will communicate with the window application. Interfacing android with C# done here.

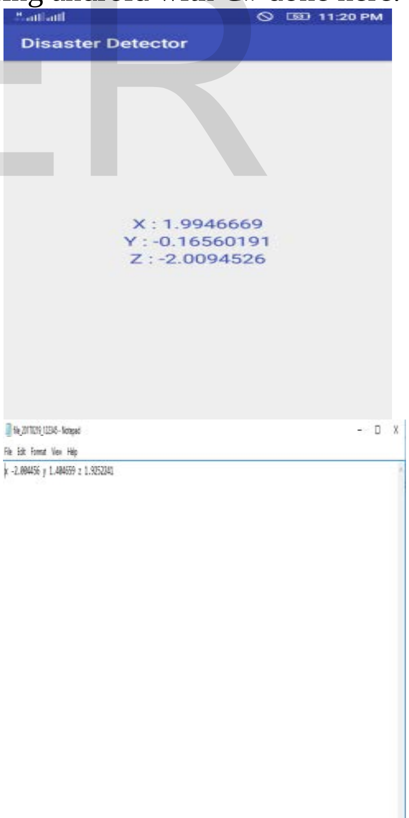

Figure 3 Accelerometer value

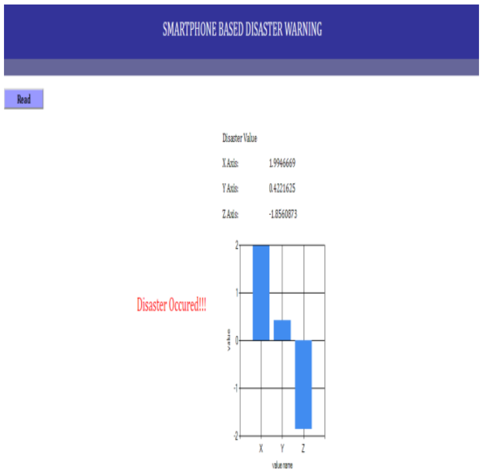

Figure 4 Disaster Analysis

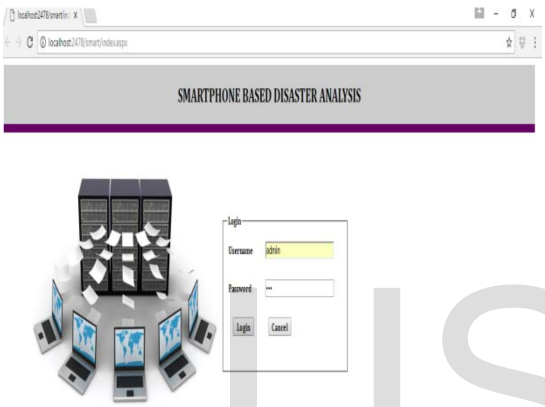

Figure 5 Login page

VI. CONCLUSION

This paper concludes smartphone in-built consists of many sensors embedded in it. For the earthquake detection here we have used accelerometer which provides accurate result. However, our study was directed towards the effect of environmental factors on the performance. Whenever destruction occur the database architecture will transfer the database to the concern location assigned from the admin. So that database can be saving exactly with the last fine transaction. Here data loss will not occur at any cost. This method is based on IP conflict procedure. So that roll backing process can also be possible. Using the same procedure of IP conflict method and this method will shows the data up to last minute transaction.

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