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Active personal Earthquake Emergency Alarm base on Mobile BTS Network

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ABSTRACT─ We usually call earthquake as Natural disaster because it comes with death, injury and Financial damage, but is it really a disaster or because we can't predict the exact time to warn people to protect themselves actually until today, mankind couldn't predict the exact time with available technology in other hand even if mankind can predict based on tests and statistics there is no opportunity to warn people on time. In this article we're going to explain the perspectives of the new method that makes two-layer cell zone of seismology and Mobile BTS base on the area makes Electrical wireless network between the two-layer network and Mobile phones that would be able to warn people when base on depth Seismology data pre-shake risk gets enough high to warn people by the help of their mobile phones or smart phones. In this network, which works based on seismological there is a close relation between fault distance and seismological center also to have a better effect and save more time it's necessary to locate seismological sites beneath grand when result shows high risk of earthquake connected mobile phone receive alarm.
Keywords: seismological, earthquake, fault, BTS

Introduction

When we look back through history, we can see the result of Surprising earthquake disasters. scientist proved that animals can here shaking faults noise at first seconds of beginning to help them scape from dangerous locations although unfortunately we don't have this ability we use devices to save our self but that equipment aren't qualified enough to save us. Same as Bam earthquake on 2006 native people surprised by earthquake and unfortunately Bam earthquake happened when most of people were sleeping and they didn't warn, as result more than 80000 people faced death and injuries. In this article we'll explain new method that can warn people everyone on shaking zone when it's necessary right at their homes.

Seismology system

Seismology is the study of earthquakes and seismic waves and what they tell us about Earth structure. Seismology is a data-driven science and its most important discoveries usually result from analysis of new data sets or development of new data analysis methods. Most seismologists spend most of their time studying seismic-grams, which are simply a record of Earth motion at a particular place as a function of time Modern seismograms are digitized at regular time intervals and analyzed on computers. Many concepts of time series analysis, including filtering and spectral methods, are valuable in seismic analysis. Although continuous background Earth\noise" is sometimes studied, most seismic analyses are of records of discrete sources of seismic wave energy, i.e., earthquakes and explosions. The appearance of these seismic records varies greatly as a function of the source-receiver distance.

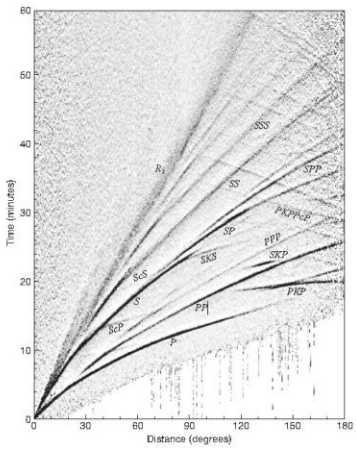

Figure 1 A stack of long-period (>10 s), vertical component data from the global networks between 1988 to 1994. (From Astiz et al., 1996.)

The gravity and velocity gradient terms and has assumed a linear, isotropic Earth model. Scientists separate this equation into solutions for P-waves and S-waves by taking the divergence and curl, respectively, and using several vector identities.

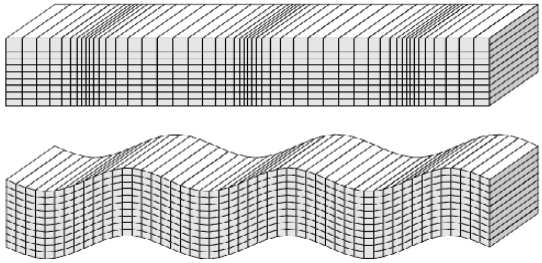

Figure 2 Displacements occurring from a harmonic plane P-wave (top) and S-wave (bottom) traveling horizontally across the page. S-wave propagation is pure shear with no volume change, whereas P-waves involve both a volume change and shearing (change in shape) in the material. Strains are highly exaggerated compared to actual seismic strains in the Earth.

For P-waves, the only displacement occurs in the direction of propagation along the x axis. Such wave motion is termed "longitudinal" The motion is curl-free or "irrational" Since P-waves introduce volume changes in the material ($\nabla u \neq 0$), they can also be termed \compressional" or \dilatational." However, note that P-waves involve shearing as well as compression; this is why the P velocity is sensitive to both the bulk and shear moduli. For S-waves, the motion is perpendicular to the propagation direction. S-wave particle motion is often divided into two components: the motion within a vertical plane through the propagation vector (SV -waves) and the horizontal motion in the direction perpendicular to this plane (SH-waves). The motion is pure shear without any volume change (hence the name shear waves).

P-wave equation (1)

$$\nabla^2(\nabla.u) - \frac{1}{\alpha^2}\frac{\partial^2(\nabla.u)}{\partial t^2} = 0$$

$if \ \propto$ (2)

$$\propto = \sqrt{\frac{\lambda + 2\mu}{\rho}}$$

S-wave equation (3)

$$\nabla^2(\nabla \times u) - \frac{1}{\beta^2}\frac{\partial^2(\nabla \times u)}{\partial t^2} = 0$$

$$if\ \beta \tag{4}$$

$$\beta = \sqrt{\frac{\mu}{\rho}}$$

In addition of earthquake location distance depth of Seismic, to understand and analyze risk of earthquake this method is called Rey theory base on this theory we can use integral equations below to compute travel time and distance along a particular ray for a surface-to-surface ray path, the total distance X(p) is given by

$$X(p) = 2p\int_0^{zp} \frac{dz}{(u^2(z) - p^2)^{1/2}} \tag{5}$$

Where sp is the turning point depth. The total surface-to-surface travel time is

$$T(p) = 2\int_0^{zp} \frac{u^2}{(u^2(z) - p^2)^{1/2}}\, dz \tag{6}$$

These equations are suitable for a model in which u(z) is a continuous function of depth. The travel times of seismic arrivals can thus be used to determine Earth's average velocity versus depth structure, and this was largely accomplished over fifty years ago. The crust varies from about 6 km in thickness under the oceans to 30-50 km beneath continents

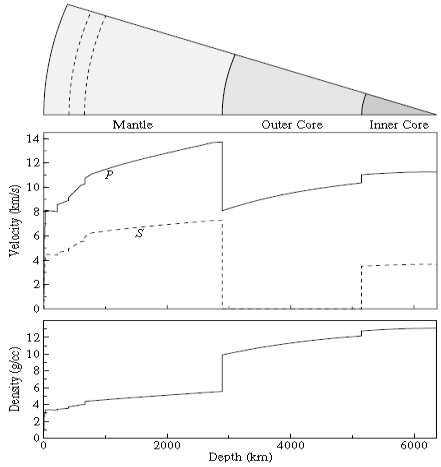

Figure 3 Earth's P velocity, S velocity, and density as a function of depth. Values are plotted from the Preliminary Reference Earth Model (PREM) of Dziewonski and Anderson (1981); except for some differences in the upper mantle, all modern Earth models are close to these values. PREM is listed as a table in Appendix 1.

In modern time, earthquakes are studied with more authenticity, as high quality seismic and geodetic data are available globally. Progress in this field with the establishment of Broad band digital seismograph and geodetic network. Data accumulated through the seismological, geological and geodetic observations by Optical and mechanical methods that can be of great help in the delineation of the earthquakes prone areas. This will have direct impact on the hazard assessment and public safety measures. GIS provides a tool for effective and efficient storage and manipulation of remotely sensed data and other spatial and non-spatial data types for both scientific management and policy oriented information. Although remote sensing can gather data much faster than ground based observation GIS and Remote Sensing can be used for preparing seismic hazards maps in order to assess the exact nature of risks Global Seismic Hazard map is result of these technologies.

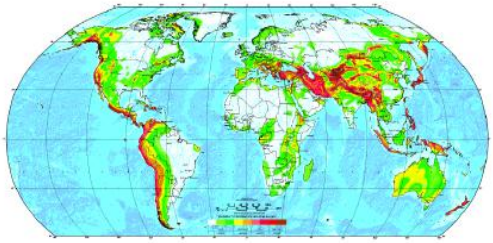

Figure 4 Global Seismic Hazard map

Base Transceiver Station (BTS)

The BTS is a telecoms infrastructure used to facilitate wireless communication between subscriber device and telecoms operator network. The subscriber device can be mobile phone, wireless internet devices while the operator network could be a GSM, CDMA or TDMA platform

Figure 5 Global Mobile Subscription, December 2010

A typical BTS comprises of a Transceiver (TRX) which handles transmission and reception of signals; sending and reception of signals to or from higher network entities, a Combiner which Combines feeds from several TRXs so that they could be sent out through a single antenna thus reducing the number of antennas that need be installed, a Power amplifier which aids in signal amplification from TRX for transmission through the antenna, a Duplexer which is used for separating sending and receiving signals to or from the antenna and an Antenna which is an external part of the BTS one major problems of BTS is amount of their load

Types of Base Stations	Load Requirements kW
GSM Base Station 2/2/2	1.8 – 2
GSM Base Station 4/4/4	2.3 – 3.5
UMTS Node B Macro/ fibre 4/4/4 base station	1.7 – 2.0
Large WiMaxi base Station	1.6 – 1.8

Figure 6 load requirements of BTS

GSM is a globally accepted standard for digital cellular communications. GSM uses narrowband Time Division Multiple Access (TDMA) for providing voice and text based services over mobile phone networks A GSM network comprises of many functional units. These functions and interfaces are explained in this chapter. The GSM network can be broadly divided into:

•The Mobile Station (MS)
•The Base Station Subsystem (BSS)
•The Network Switching Subsystem (NSS)

•The Operation Support Subsystem (OSS)

Given below is a simple pictorial view of the GSM architecture.

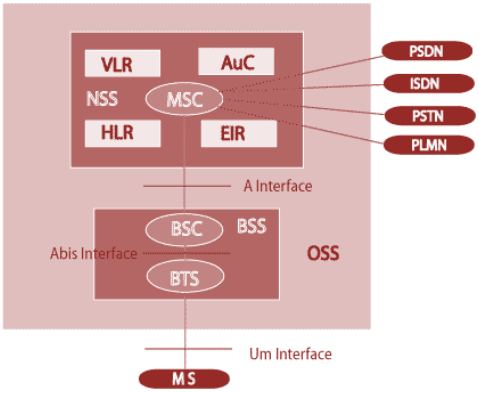

Figure 7 GSM architecture.

BTS Seismology Rescue Network (B.S.R.N)

long field research shows that, the strategic actions formatted on papers, discussed in numerous conferences, and even creating building codes base on Global Seismic Hazard map, have not ensured that earthquake hazard mitigation is effectively and practically incorporated in the Third World Countries' planning and retrofitting programs (if any) we are witnessing a cascading failure in this business, and should accept that base on table bellow we all were unable to break the disaster cycle in this field and we need more efficient method to overcome Seismic Hazard with this method mankind will be able to reduce death rate after Seismic Hazard.

Table 1 Seismic Hazard

Magnitude	Location	Lives lost	Date
6.6 Ms	Bam , Iran	800000	2003
7.3 Ms	Rudbar-Tarom , Iran	40000	1990
7.1 Ms	Loma Prieta , California	62	1989
7.2 Ms	Buyin Zahra	12200	1962

These lives are lost because of lack of management factors such.as:

(i) rapid urban growth
(ii) weak economy
(iii) lack of government funds to support earthquake hazard mitigation programs in cities, towns and villages
(iv) lack of seismic rehabilitation programs for upgrading all highly vulnerable public buildings and multiple family residential buildings
(v) inexpensive and poorly constructed private dwellings that often fail even in the absence of earthquakes
(vi) a tendency in government and general population to ignore the earthquake hazard due to more immediate and basic needs
(vii) lack of, or low awareness about the earthquake hazard,
(viii) Lack of enforcement of existing building codes, could definitely affect earthquake risk management in developing countries.

Could definitely affect earthquake risk management in developing countries. This new method we will set new protocol named BTS Seismology Rescue Network or “B.S.R.N” is made of Seismology systems network that can be any type of pre mentioned systems which is combined with ordinary BTS can warn people when pressures on fault increase and earthquake risk is more than standard or base on recorded data on data center fault movement and seismic increased, Seismology processor send an alarm activation request to local BTS then BTS calls every connected user nearby with message of “earthquake risk” to notice people to save their lives. This life saving protocol can easily write by logical If equation to simulate this method. The computer program PLAYMOD is designed to compute synthetic reflection pulses to model this waveform stack using a graphical user interface (GUI) so that the user can interactively explore deferent S-wave velocity models by make link for people to Seismology

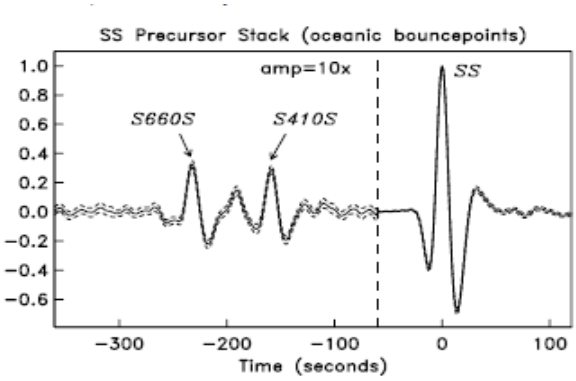

Figure 8 A stacks of SS precursors in 1142 transverse-component seismograms between 120_ and 160_ range, showing peaks from the underside reflected phases S660S and S410S. The precursors are stacked along the predicted travel time curve for a reflector at 550 km and adjusted to a reference range of 138_. SS is stacked separately and scaled to unit amplitude; the precursor amplitudes are exaggerated by a factor of 10 for plotting purposes. The 95% confidence limits, shown as dashed lines, are calculated using a bootstrap resembling technique. Note the peak between the 410- and 660-km peaks, suggesting an additional reflector at 520 km depth.

PLAYMOD will display a plot of the velocity-depth function on the left side of the screen, the predicted surface-to-surface travel time residuals relative to the ak135 model, and the fit of the synthetic SS precursor waveforms. The residuals are included to show how sensitive the model is to small changes. Globally averaged travel time observations show variations of less than 1 to 2 seconds. Thus models can be excluded that produce travel time residuals that exceed these limits. Today BTS around the world have more than 6 billion connections so it will wake up everyone near every BTS on earthquake risky locations so they'll be able to save their life seconds before earthquake happens and buildings collapse hopefully humanity won't face any more massive natural disaster like Bam in 2003 this network block showed in figure 7.

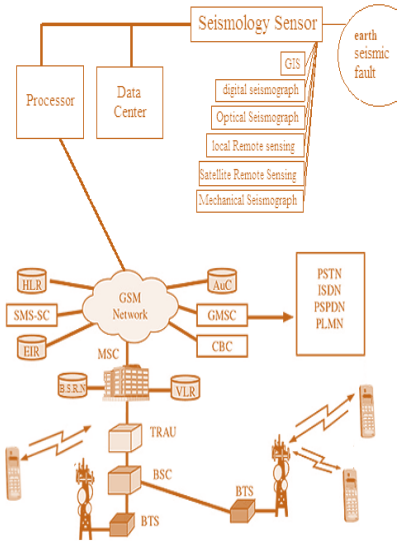

Figure 9 BTS Seismology Rescue Network (B.S.R.N)

Conclusion

Long field research shows that; the strategic actions shows humanity couldn't even save its own life that's because of lack of accessible technology and financial backup so we need to find new way that we can handle earth quake hazard base on today technology. In the present era of electronic communication, the internet provides a useful platform for disaster mitigation communications this method hopefully is accessible to all mobile users and it will help them save their lives by with simplest and cheapest equipment, cellphone's ring, to develop this technology we can make a linking software to connect each cellphone to seismology data center to help them have their own statics and data analyze.

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