Developing An Android-based Emergency Broadcasting System for Natural Hazards

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ABSTRACT : According to the report of World Bank, there are 73 percentage area and people in Taiwan threatening by many kinds of natural hazards. Especially, more and more seriously global abnormal change speed-up these threatening. The purpose of this project, through integration and value-added way, collect the earthquake observation, abnormal weather, debris flow, river pan-abuse and other emergency information. Then, these emergency contents will be fast deliver to users via web 2.0 and wireless communication technology, let people obtain real-time messages in the shortest possible time. Finally, profit and efficiency of the corresponding system functions will be verified in the Hsinchu area.

The SQL Server 2008 was used as management structure of an emergency contents database in this paper. To publish above kinds of emergency POI data, an emergency broadcasting system had been performed by Visual Studio and Eclipse tools. The results of system test indicate that the built-in system can efficiently provide public and decision-makers more way to understand what it is happened. The practical value of this research is to perform an Android-based application for the natural hazards. Now it is continuously tuning the system functions and evaluating its performance in situ.

KEY WORDS: Natural Hazards, Web Database, Emergency Broadcasting Systems, Smartphone Applications

1. INTRODUCTION

According to the report of World Bank, there are 73 percentage area and people in Taiwan threatening by many kinds of natural hazards (Dilley M et al., 2005). Especially, more and more seriously global abnormal change speed-up these threatening. The global warming has brought the Earth many unexpected or uncontrollable natural disasters usually resulting in widespread destruction of property or loss of life. Not only the threats exists during the event, but the post-disaster hazards have left the human habitat with tons of flowing debris, wooden tree trunks, garbage, and various kinds of contaminations. The social, environmental, and economical problems caused by natural disaster also cost a nation’s tremendous resources and manpower. There

are 270 events of natural disasters in Taiwan in 50 years from 1958 to 2007 including categories of typhoons (71.1%), flooding (15%), earthquakes (8.5%), torrential rainfall (2.2%), wind-storms (1.5%), mountain flooding (0.7%), and landslides (0.7%) (Liu et al., 2009). As shown in Figure 1, the frequency of natural disasters is in a trend of increasing.

The Geographic information System, GIS has been developed extensively in the 21th Century. The application of GIS in disaster management has great potential to offer the society a one-stop solution in the natural disaster for the generation to come. It provides a platform for effective data entry, management, maintenance, analyses, and output. The greatest value exists in optimization of instantaneous decision making at four stages of the disaster mitigation actions. Donohue indicated that the GIS enable administrators in post disaster management. An effective, speedy mitigation action will not be possible unless the GIS are fully implemented. The Location-based service (LBS) is the delivery of data and information services where the content of those services is tailored to the current or some projected location and context of a mobile user (Brimicombe and Li, 2010). This is a new integrated concept of geographic information, since the late 1990s, an extension of context awareness services. Its related applications including self-positioning, route query, tour guide, and emergency road rescue. The purpose of this paper, through integration and value-added way, collect the earthquake observation, abnormal weather, debris flow, river pan-abuse and other emergency information. Then, these emergency contents can be fast deliver to users via 3.5G or WiFi communication techniques, let people obtain real-time messages in the shortest possible time.

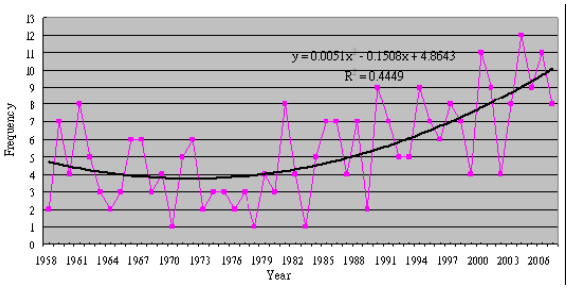

Figure 1. Statistics of natural disasters in Taiwan from 1958 to 2007.

2. A WEB EMERGENCY DATABASE

As stated in the Disaster Prevention and Rescue Law "the natural disasters are defined as damages caused by wind, water, earthquakes, drought, freezing weather, debris flows, catastrophe, explosion, gas, oil spill, power lines, aircraft crashes, shipwreck, transportation, toxic chemicals". They can be subdivided into two principal categories as natural and man-made disasters.

As of today, the natural disasters present common threats. It is prudent to manage the disaster relief of natural disasters through warning system classification, identifying baseline of warning indices, and quantifying the emergency response operation procedures.

The common types of natural disasters in Taiwan include: Typhoons, earthquakes, flooding, and mud flows. According to the above mentioned purpose and schema design of emergency contents, the retrieval codes were performed in Visual Basic language (Chang et al, 2011).

3. DESIGN OF THE EMERGENCY BROADCASTING SYSTEM

3.1 Analysis of the System Requirements

According to the functional requirements for the system, three sub-modules can be designed for the system as following illustrate:

(1) Web Application Subsystem (WAS): Let users inquire published emergency information on the Internet.

(2) Emergency Database Subsystem (EDS): To create

a database with up to date alert contents for the natural disasters. Let users obtain the newest emergency information to help people evacuating.

(3) Embedded Mobile Application Subsystem (EMAS): Let users inquire published alert information on the smart phones or Tablet PC with mobile Internet services.

Above mentioned illustration for the three sub-modules indicates that the Service Architecture Diagram (SAD) can be shown as Figure 2 (Chang et al., 2011).

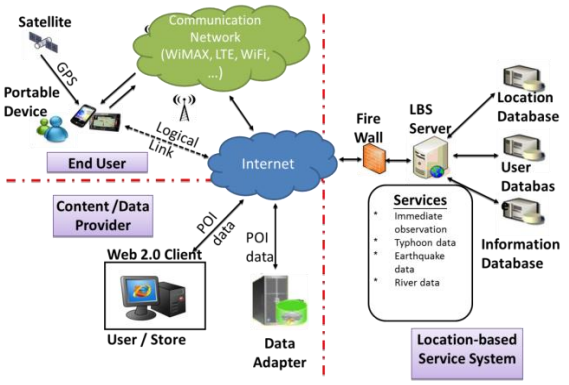

Figure 2. Service Architecture Diagram for the emergency broadcasting system.

3.2 Results of the system design

The scope of the research objective includes the development of Web Robots or Web Spiders to perform auto selection on internet. The most critical information will be collected while browsing through the information posted on the internet. The Web Robot complies with the international standard exchange codes for ease of search. The task process is performed as described in Figure 3. So far the majority of the natural disaster prevention and broadcast system network do not set limits on automation in data retrieval.

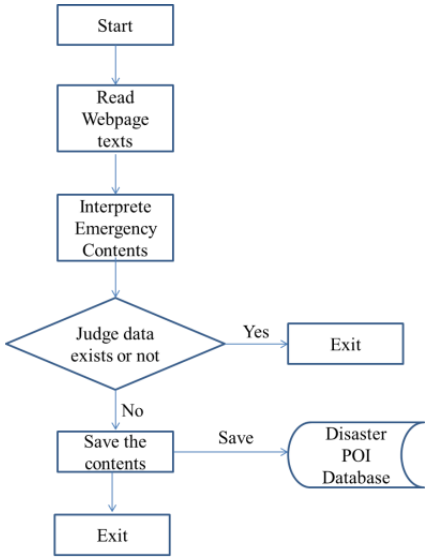

Figure 3. Workflow for the Emergency Contents Retrieval.

The SQL Server 2008 was used as management structure of an emergency contents database in this paper. To publish above kinds of alert POI data, an emergency broadcasting system had been performed by Visual Studio and Eclipse tools (Reto, 2010). Let users can access up to date emergency data by using cross-platform.

After users login to the system, all five types of alert information can be obtained in the designed system. Because of space limitations in the article, the river pan-abuse information are demonstrated as Figure 4 and 5. In the figures, when the rivers exceeded the warning water level, a point with different color located on the river will be shown in the system.

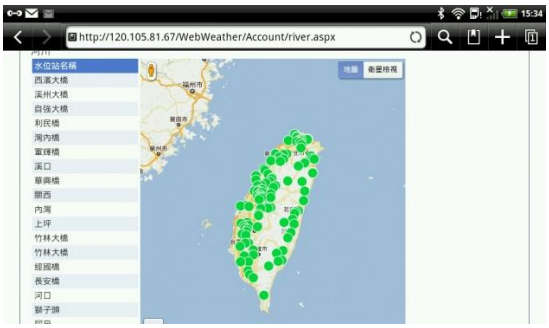

Figure 4. Monitoring stations of river water level.

Figure 5. Pan-abuse river information.

4. CONCLUSIONS AND SUGGESTIONS

In this study, the current popularity of convenient network is used to pass emergency information of natural disasters happened in Taiwan. The system requirement specification and design for three functional subsystems had been performed in the paper. The testing results indicate that all five published alert data types can be real-time and accurately accessed from this system. It is believed a valuable channel to inquire emergency information via mobile devices.

Now the system is still ongoing and slightly tuning, and doing some assessment for the system performance under different communication environment, e.g. GSM, 3.5G, WiFi, and IEEE 802.11.

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