STUDY ON EMERGENCY AND DISASTER PREVENTION SYSTEM FOR URBAN SAFETY

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ABSTRACT

As the Global climate warming and deteriorating, large-scale disasters occur more frequently. In order to enhance the city's disaster security system and support U-city services' implement, this paper proposes to construct a U-city security disaster prevention system based on U-city. This system is applied in disaster-related department to improve the response and accuracy of judgment and decision-making, ensuring the personal safety and reducing the economic losses. It can help other services to quickly send alarm instruction, the location of the disaster and evacuation information, and eventually reduce the disaster losses.

Keywords: emergency, disaster prevention system, information sharing-city

1. INTRODUCTION

Under the threat of global climate change, the possibility of a wide range and large-scale urban disaster is gradually rising. The urban safety problems are attracting more and more attention. So building an intelligent system platform among the relevant disaster prevention departments is particularly important, which can help disaster prevention department to quickly make correct decisions, improve the initial disaster response capacity.

2. URBAN SAFETY

There is no authoritative and unified definition of urban safety in academic circles. Wu Qingzhou expressed his opinion by developing an urban disaster prevention system which integrated elements of nature, ecology, society and human factors and it's a subsystem of a large-scale system, including heaven, earth, health and human disasters. Alexander and Haddow, crisis management experts, used the word "hazard" in the disasters. In China, "urban disaster" is widely used in official and academic expression, which emphasizes prevention and mitigation, risk analysis and the city's comprehensive disaster prevention system building against urban disasters. Nowadays the factors that threatening the safety of the city have complex diversities (Table 1):

Table1: The factors threatening urban safety

Types of Disasters	Detailed description
Natural disaster	Meteorological disaster
Hygienics Factors	Human sanitation safety , Animal epidemic prevention safety, Aquatic habitat animal epidemic prevention safety
Socia Factors	Criminal safety, Social turmoil, Social suffering
Ecological safety	Ocean ecology safety, Nature ecology safety
Environmental factor	Radioactive contamination , Acid rain, Water pollution
Economic factors	Production safety, Finance safety, Traffic safety, Energy safety,
Information factors	Official secrets, Computer information, Network information, Core technology , Trade secret...
Technology factors	Public technology safeguard, High and new technology negative affect
Culture factors	National conflict, Culture conflict
Politics factors	Politica crisis, Nation abruption, Politics fight
National defence	Foreign invasion , Domin on damage

Natural disasters have always been the most destructive security problems of human society and become a trend in recent 50 years. According to the statistics from relevant agencies in the United Nations, the average number of natural disasters increased from 30 cases per year in 1950s to 400 cases per year in 2000 around the world. The economic losses suffered from $12 billion per year in the 70's to $803 billion per year in 2000. The increase of strength and range of natural disasters brings a new challenge for the city security. The urban safety under natural disasters comes into a new situation.

Though the rapid expansion and promotion of urbanization, the awareness of disaster prevention lags behind. With the change and degradation of the global environment, the intensity and frequency of the natural disasters increases, while the awareness of environmental planning is lacking, the precautions against natural calamities are poor. The class of natural disasters problems is urgent. Because of lacking of adequate preventive measures and relief systems, huge urban disasters were presented to human beings cruelly in cities. In 2005, Hurricane Katrina hit the U.S. Gulf region and destroyed many cities in Louisiana, like New Orleans, and resulted in a $180 billion huge economic loss, made that nearly one million people imminently transferred from their own lands.

Urban planning scholars recognize that climate change is a realistic new security crisis, and cities all over the world are under the threat of climate change. The potential probability of occurrence of large-scale urban disasters is rising, and the records of earthquakes, flash floods, mudslides, tsunamis, landslides and other natural disasters have increased. To reduce losses from these unpredictable natural disasters, urban safety and disaster prevention system platform construction is imminent.

3. U-CITY

E-city, which equivalents to the original concept of digital city concept, is derived from IT industry development and the popularity and deepening of Internet applications. Similarly, U-city concept is derived from the development of the ICT industry and the popularity and deepening of RFID technology (using electromagnetic radiation and electronic tags as a method to determine the identity of persons and objects). People are gradually used to "U" (Ubiquitous, meaning "everywhere") to replace the previous "E" and describe information about things. Some countries even made "ubiquitous" as an essential element of national informatization strategy. Especially in South Korea, the construction of U-city is quite common. U-city can be understood as the digital city in a sense of higher level.

As network technology and mobile computing developing, people want to be able to use any device through any network at any time anywhere to get the information and service they need. This kind of information and services is called “Ubiquitous”, namely "ubiquitous & omnipresent." Cities with such conditions can be called U-city, ubiquitous cities, cities of wisdom, or smart cities. WLAN (Wi-Fi), WWAN (GSM, GPRS, 3G, DTV), WPAN (Bluetooth, ZigBee, UWB) are basic conditions, other communication technologies should also be useful

mixed with them. People can take advantage of high-speed network to deal with everyday life in such environment. U-city and the conceptual diagram of the technologies included are shown in Figure 1:

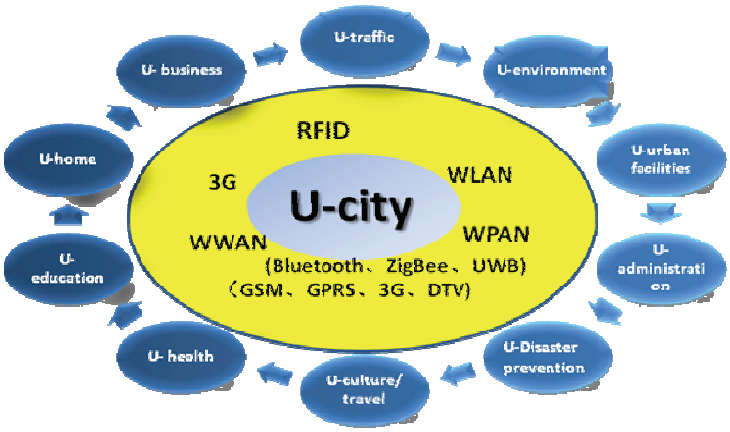

Figure 1: U-city concept plan

U-city fire prevention and disaster prevention includes natural disasters, fire management, electronic monitoring services, emergency measures, etc. This paper will consider the issue of disaster prevention within the U-city, and construct a U-city safety and disaster prevention system.

4. U-URBAN SAFETY AND DISASTER PREVENTION SYSTEMS PLATFORM

4.1 Goals of U-Urban safety and disaster prevention system

In order to strengthen disaster forecasting and disaster response ability, U-city information sharing platform for urban disaster prevention, which is based on a smart sensor, and integrates with existing disaster prevention system, should be built. It can monitoring the status of disaster and hazardous areas, and provides support for relevant departments to make quick decisions and solutions. Figure 2 below is the contents of target achievements of U-city safety and disaster prevention system:

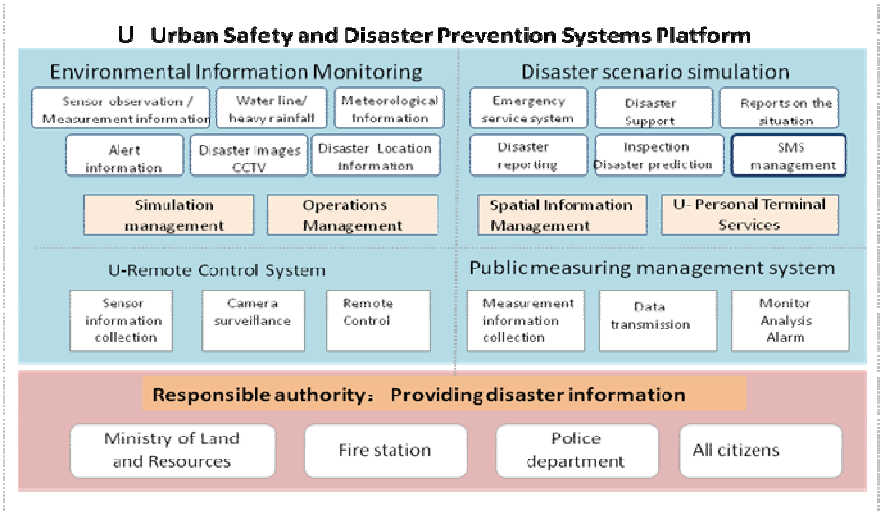

Figure 2: U- Urban Safety and Disaster Prevention Systems Platform

4.2 Information Sharing on U-city Safety System

U-disaster command center of a city uses the U-city transport system facilities to offer a variety of comprehensive information about life security, disaster warning, special disaster reports, large accidents' information, etc, which spreading the public safety education naturally in citizen's life, and developing the ability of immediately response to disaster. When disaster occurs, it can transfer information and response measures quickly in order to minimize property damages and casualties in disasters and major accidents to create a safe city life. We can use electronic information display and messaging platform to inform people the disasters or major incidents which occurred in roads, tunnels and bridges, etc, and we can use SMS and wap (Wireless Application Protocol) wireless application protocol to deliver information.

U-prevention facilities integrated platform allows people to master a good disaster response by handling the essentials of emergency situation, keeping away from difficult paths, and protecting the elderly. While disasters approach, the government and the masses can make spontaneous, organized and systematic response to reduce the loss to a minimum. Figure 3 below is the information sharing concept map of the disaster prevention system:

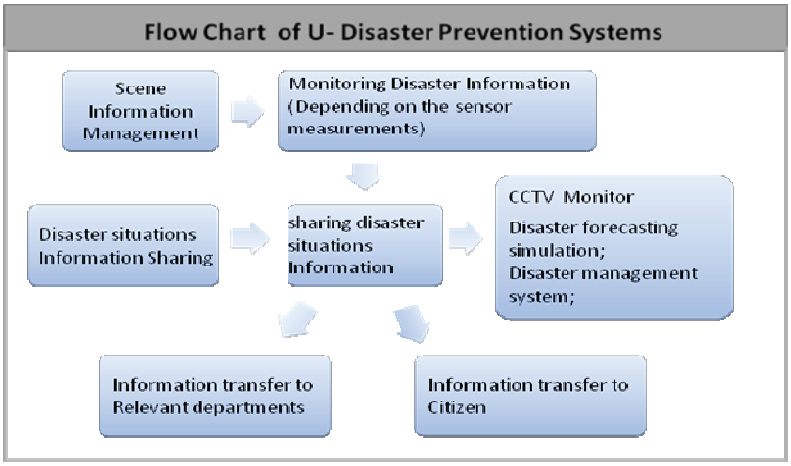

Figure 3: Flow Chart of U-Disaster Prevention Systems

4.3 U-Urban safety and disaster prevention system and U-City

U-city's safety disaster prevention system unifies U-city linkages and integrated services by means of data storage, management and connection between U-city systems. The establishment of U-city internal information transmission system can bring disaster alert system a more efficient transmission of information. U-disaster prevention system is a part of U-city, which can help to standardize U-city systems, including standardizing internal storage format, the data communication mode, the storage period, the linkage method, the distribution of common standard of API and so on.

Relevant information required by the system includes:

(1) The electronic system of disaster map: forecast and alarm the disasters' location;

(2) Integrated information management system: release the basic information, and alarm contents in different scenarios.

4.4 The construction of U-city Safety Disaster Prevention System Platform

4.4.1 Integration of U-prevention services

Target System: Disaster management systems, integrated information management systems, etc. Infrastructure Management: Bridges, Tunnels, rivers, steep slopes and other high-risk area management.

4.4.2 The construction of U-prevention facilities integrated platform

Through the establishment of real-time monitoring systems and the coordination between the relevant authorities when disaster occurs, we can make response program quickly, and uses the masses of alerts / notifications to minimize losses. U-prevention system integration platform collects data distributed in the various system, and analysis the collected data, not only simple data collection but also meaningful standardizing information into unified formation, which is easy to be stored in the database. Based on the stored information related to other U-city services, U-prevention system provides better services to the public linked.

With the help of close collaboration between related departments, the various departments have disasters' relevant information (weather information, disaster information, etc.) shared with each other and deep analysis which can predicting disasters that may occur in the future or other warning information related to disasters. Related departments can use this organic relationship to minimize the degree of the damage of citizen. Figure 4 shows the components of U-prevention systems comprehensive platform:

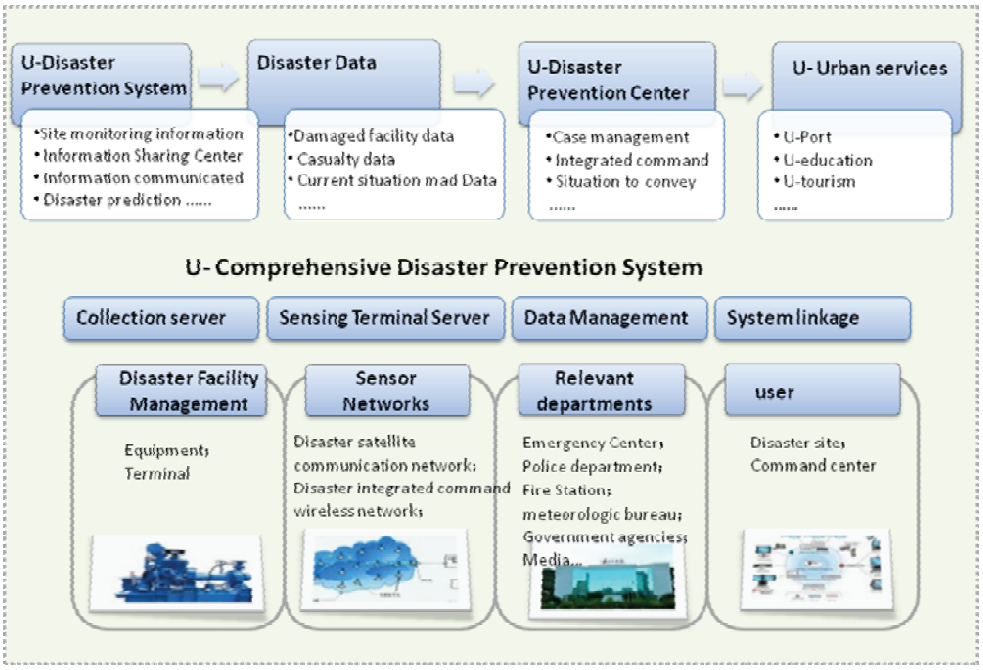

Figure 4: U-Comprehensive Disaster Prevention System

4.5 U-prevention system case: the construction of remote control of drainage pumping station system

Increasingly frequent storms and flooding has aroused widespread concern of the public, at the same time, it has brought new challenges to the city administration's defense and countermeasures. The causes of Urban flood are a lot, including low standard urban drainage system, low standard rainwater pipelines and pumping like ancillary facilities of roads, drainage pumps and other drainage facilities. Drainage pumping station is a sewage pumping station that drains away urban stormwater, sewage, and together with rainwater, which was mainly made up of pump house and collecting basin. Pump and power equipment are comprised into a set of drainage system in the pump house. According to the different properties, it can be divided into three classes: rainwater, sewage, and rainwater and sewage together.

Building remote organic management by associating the costly drainage pumping station with remote control devices connecting with each other can prevent disasters effectively and reduce losses. It is better to build a drainage pumping station which is equipped with advanced maintenance and is based on disaster management system, and put real-time remote monitoring and management into practice. We are aiming at building a constant remote management system that could tell citizens the information of drainage pumping station and it can promptly tell the public the situation when possibility of drown is high. Remote control system of drainage

pumping station can reduce the loss of citizens' life and properties to minimum with which U-disaster monitoring system laid the foundation at the same time. Drainage pumping station could be able to remote monitoring management in mountain area and disaster emergency department. Figure 5 is the diagram of the drainage pumping station monitor system:

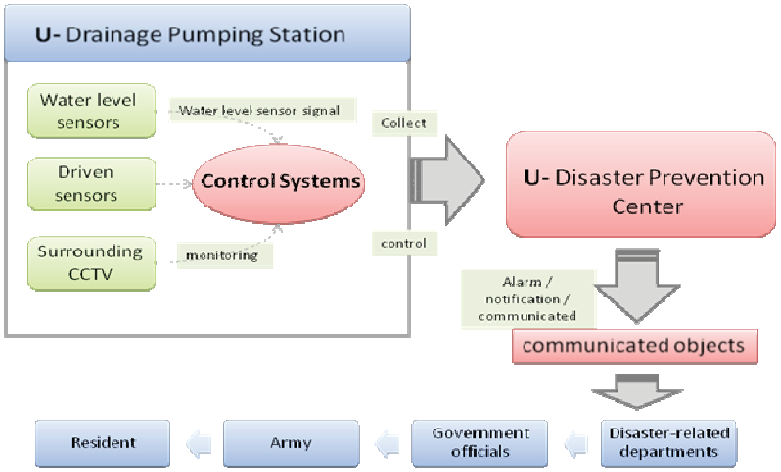

Figure 5: U-Drainage Pumping Station system flowchart

4.6 U- Personal Terminal Services

When disasters occur in frequently flooded area, the landslide danger area, the beach, the tunnel, we can use CBS (Cell Broadcasting Service) to broadcast rapid disaster information or through SMS platform to provide local residents detailed information related to disaster, enabling the public to minimize the loss of life and property, specifically shown in Figure 6.

Through the video capture in disasters, when disaster and danger is predicted or had happened, people there can use the phone line to spread the video filmed of the disasters, and then through the phone their locations can be confirmed. By obtaining the location of disaster/distress and video, rescuers can assure the situation of disaster spot and response timely.

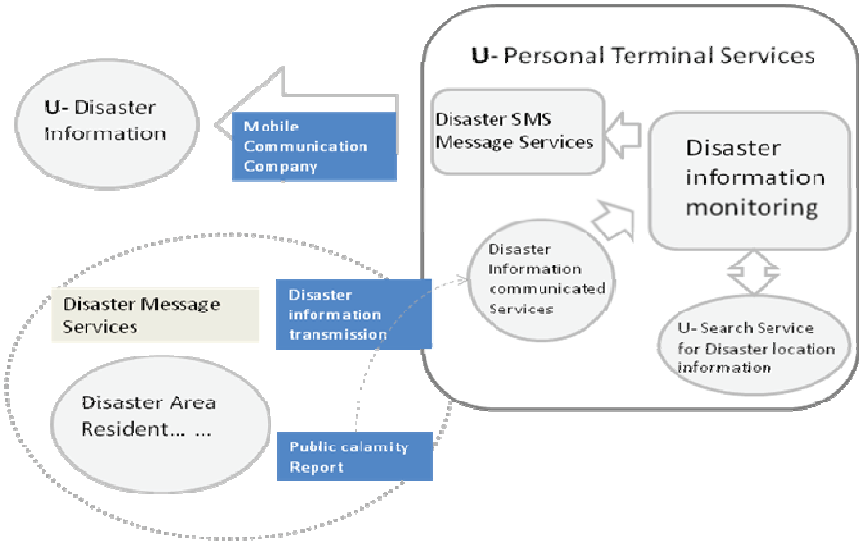

Figure 6: U-Personal Terminal Services

5. CONCLUSION AND FUTURE WORK

In order to improve people's ability to respond early disaster, the paper proposed the necessity and methods of building U-city Safety system platform. This system reaches integrates services including quickly sending alarm instructions, providing disaster locations, spreading evacuation information. It can reduce the extent of the damage disaster, and at the same time through the two-way communication between the public and relevant departments related disaster information can be gathered spontaneously, then disaster response system and the public self-supporting disaster prevention system can be built. This system can be implemented in the fire department, security department, and other disaster management agencies, and it can be connected to the existing data integration platform for sharing a variety of information such as message platforms and video information to stage an emergency meeting to cope with disaster. The ultimate goal is to ensure the safety of residents and reduce damage.

In order to quickly respond major disasters in the future, we will gradually improve the function of the system platform: strengthening collaboration between the disaster-related responsible departments, integrating 3D GIS based services, achieving in forecast and analysis of multi-faceted right typhoons, floods, earthquakes and other disasters, and continuing to strengthen the scope and intensity of services. We will do our best to respond disasters quickly and reduce the losses to a minimum. On the basis of U-city's advanced experience and technology, external communication and performance services in U-disaster information system platform can be used in other U-city system, and integrated into U-city services sequentially. U-city services will be improved more efficient in the future.

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