

Ubiquitous Disaster Information System operated by the Coproduction of Residents and Local Government Employees

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ABSTRACT:

The Tokai earthquake is expected to occur as a hypocenter at the Suruga Trough with a probability of 87 % in the next 30 years in Japan. Since Yamanashi Prefecture is strongly affected by the earthquake, the prefectural government is working for an improvement of disaster management framework and facility. In order to enable accurate disaster response, the authors have commenced a project developing ubiquitous disaster information system, through which residents and local government employees can share disaster information bi-directionally. A social networking service (SNS) is adopted and various communication tools such as cellular phones and wireless gaming machines can be used in the system. The system is operated by the coproduction of residents and local government employees. This paper presents the outline of the information system and activities enhancing preparedness on disaster management in local communities.

Keywords: ubiquitous, disaster management, information system, social networking service

1. INTRODUCTION

The Tokai earthquake with JMA Magnitude exceeding 8 is expected to occur as a hypocenter at the Suruga Trough with a probability of 87 % in the next 30 years in Japan. Most of the region in Yamanashi Prefecture, located in the central region of the main land of Japan, is designated as the reinforced area on earthquake measure. Yamanashi Prefecture is also well known as the flood prone zone. It has long suffered from flood and the dominator here in the 16th century regulated the waters by applying some famous flood control measures. In addition, Mt. Fuji, an active volcano, is located in the prefecture. Therefore, the prefecture is exposed to three menaces of natural disasters, earthquake, flood and volcanic eruption and it is working on an improvement in disaster management framework and facility.

Suzuki (2010) developed a disaster information sharing system for a local government, focusing on an improvement in usability. Noda et al. (2008) have also developed the disaster mitigating information sharing protocol which enables information sharing between different information systems in different public institutions. In addition to public information systems mentioned above, the authors provide information systems for residents in order to enable disaster information sharing between residents and local government employees, by applying a social networking service (SNS) in this paper. Cellular phones and wireless gaming machines other than PCs can be used as an information tool. Such information system is called “ubiquitous disaster information system” in this paper.

In order to make improvements in disaster mitigation activity in Yamanashi Prefecture, the authors have commenced a project supported by a fund, safety and security science and technology project of MEXT, Japan. A city and a town and a local community in each local government were selected as a test field. Workshops for the advancement in disaster response activities of the community and those for a risk communication between residents and local government employees were conducted continually. Then, information contents to be shared during disasters were extracted and they were

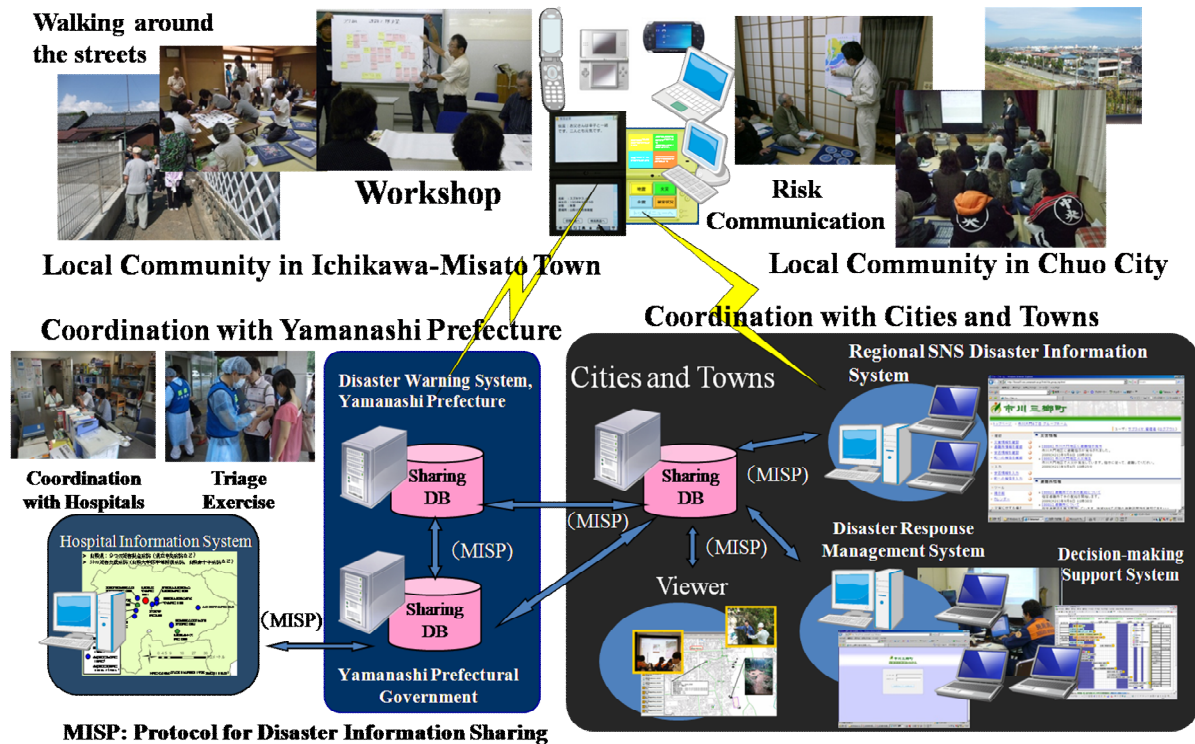


Figure 1. Schematic Representation of the Ubiquitous Disaster Information System

implemented on information systems such as the SNS. This paper presents the outline of the ubiquitous disaster information system and activities enhancing preparedness on disaster management in local communities.

2. UBIQUITOUS DISASTER INFORMATION SYSTEM

Suzuki and Goto (2006) proposed a framework for disaster information systems, based on the results of survey on actual disaster responses of local governments which suffered from large disasters, and have developed disaster response management system which supports local government employees on the frontline of disaster response (Suzuki and Amami, 2007). This system is equipped not only with an enhanced function supporting response operations, but with an enhanced usability in both information input and browsing. It has been used in Mitsuke City, Niigata Prefecture on trial and was actually applied to the actual disaster due to No.18 typhoon in 2009.

Since the number of local government employees does not increase only during disasters, staff alignment for system input is a serious problem still remained. Disaster management which only relies on public agencies is limited and self and mutual assistance of residents is essential. In case of disaster information, it is important that local government employees collect information in corporation with residents, and the information summarized by a local government is smoothly sent to residents.

Figure 1 demonstrates a schematic representation of the ubiquitous disaster information system operated by coproduction of local government employees and residents proposed in this paper. It is called as the ubiquitous system for short in this paper. A zone of local communities is located on the top in the figure. In the lower right, a zone of cities and towns is located. In the left hand side of it, A zone for Yamanashi Prefecture is located. Each of prefecture, cities or towns makes a suitable response with the disaster response management system mentioned above and each local government mutually share disaster information through the information sharing DB. Using such DB, a local



Figure 2. Disaster Response Management System

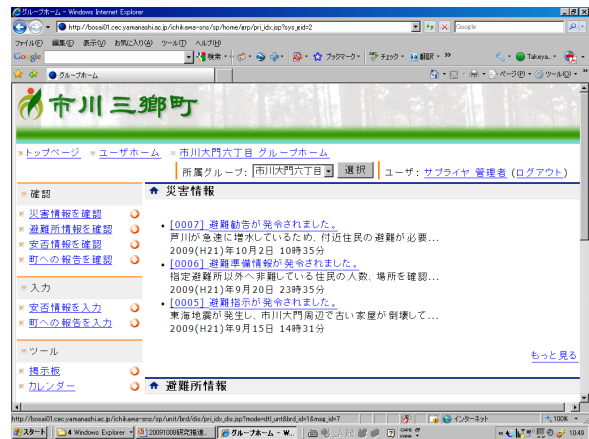


Figure 3. Regional SNS Disaster Information System

government is able to share information with public institutions such as lifeline utilities. Basic hospitals are also included as such agencies for information sharing.

Thus, the ubiquitous disaster information system (the ubiquitous system) enables information sharing not only among public agencies, but between residents and public agencies interactively. An information tool adopted for residents is the regional SNS which is a social networking service for resident groups which promote disaster mitigation activities regionally. Yamanashi prefectural government prepares to establish a new disaster management center and its operation is to be commenced in October, 2013. The ubiquitous system is expected to be one of the effective information tools supporting mitigation activities in the prefecture by a coproduction of residents and public agencies.

3. APPLICATION SOFTWARES DEVELOPED FOR THE UBIQUITOUS SYSTEM

3.1 Disaster response management system

The disaster management system is an information sharing system used in a governmental office, which supports disaster responses of a local government. It is a web application with high usability as a human interface. The system supports information sharing with respect to a minimum of response operations indispensable for disaster management headquarters, and it was developed with assistance provided by Mitsuke City in Niigata Prefecture where two major disasters occurred in 2004. The disaster response management system in Mitsuke City has been operated since 2007.

The disaster management system plays an important role in the ubiquitous system and it was introduced to both Ichikawa–Misato Town and Chuo City in Yamanashi Prefecture. It will be introduced to Yamanashi Prefecture as well. Figure 2 shows a screen shot of the system. Each system is conformed to each disaster management organization of the local government. Fundamental functions of the introduced system are not so different from those of the system operated in Mitsuke City. However, newly introduced one is equipped with a new function which enables bi-directional communication with residents through a social networking service (SNS).

3.2 Disaster mitigation system using regional social networking service

SNS is well known as a service to set up social network on internet. Regional SNS which targets a specified region is in general a highly reliable community site operated by a local government. Some regional SNS provide disaster information on evacuation and damages in Japan. However, there has been no approach that residents and local government formulate together information contents needed

for the SNS and residents themselves examine methods of utilization of the SNS. In this project, everyone can share disaster information everywhere with a variety of tools by utilizing regional SNS effectively. Thus, the SNS is a measure to bring about coproduction of residents and local government employees. In this project, through a risk communication between residents and a local government in the communities mentioned above, the information necessary for residents was first extracted out of the information which a local government is in charge of. Next, the information which should be sent from the disaster response management system to residents was selected. They were emergency information regarding assignment of local government employees, evacuation information and so on. In addition, the request function of rescue, assistance or a provision of damage information from residents to a local government was equipped with the regional SNS, and the function receiving such requests was also equipped with the disaster response management system. Figure 3 is a screen shot of the regional SNS for Ichikawa-Misato Town.

3. ACTIVITIES FOR UTILIZATION OF THE UBIQUITOUS SYSTEM

3.1 Registration on individual information

At Ichikawa-Daimon 6-chome disaster prevention community in Ichikawa-Misato Town, workshops were held on individual information of neighboring family required during disasters. Through workshops held twice, personal information items including information of the family living outside the community, which is indispensable for confirmation of the safety, were selected. Figure 4 is a part of the results of questionnaire survey carried out after the workshops. (a) and (b) in the figure denotes a result of response to the questionnaire on necessary information items to support handicapped persons and to carry a seriously injured person to a hospital, respectively. Meanwhile, (c) in the figure denotes a result of response to the questionnaire on the extent of information sharing during a disaster. Posing such results of questionnaire survey, a table for individual information of a family unit (printed paper) was made. Then, an agreement was made on that the individual information was disclosed to public agencies of disaster management.

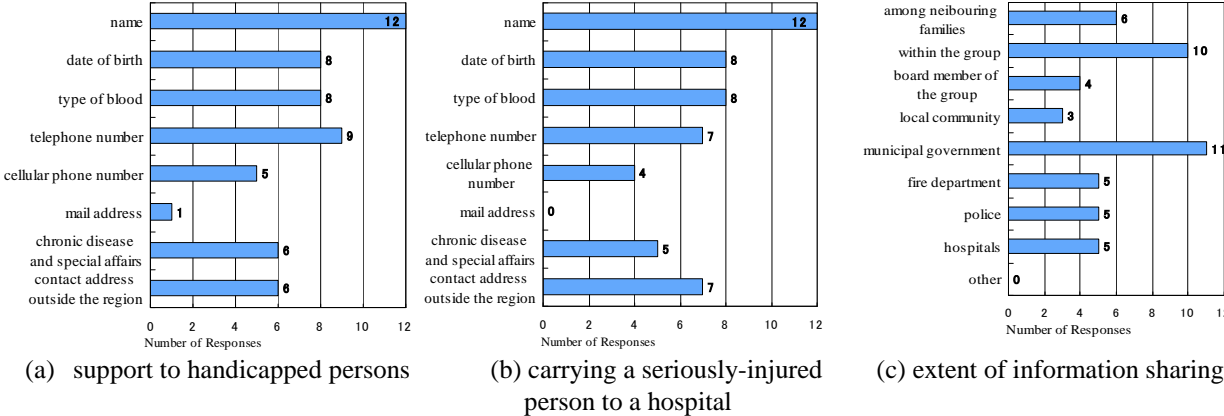


Figure 4. Examples of results obtained from questionnaire survey

After the workshops, a meeting was held by each group unit composed of about 10 family units on the treatment of individual information both in the normal situation and during disasters. Discussed issues in the meeting were in the followings: (1) confirmation on the registration of individual information to the regional SNS; (2) confirmation of personal information items summarized; (3) persons in charge of system input for the registration of individual information to the regional SNS; and (4) storing of printed individual information tables after system input. As a result, a hospital the individual usually visits and a drug usually being taken are added to information items, and every group finally confirmed a registration of individual information to the regional SNS. Two groups selected a few members in charge of system input, who used internet almost every day. Other two



Picture 1. Registration of individual information to regional SNS (Ichikawa-Misato Town)



Picture 2. Demonstration using the ubiquitous system (Chuo City)

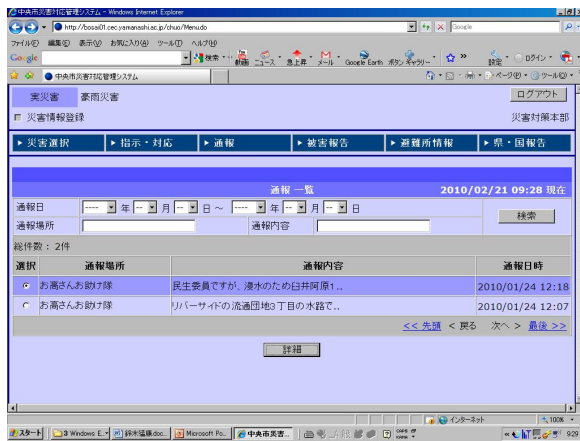


Figure 5. Disaster response management system

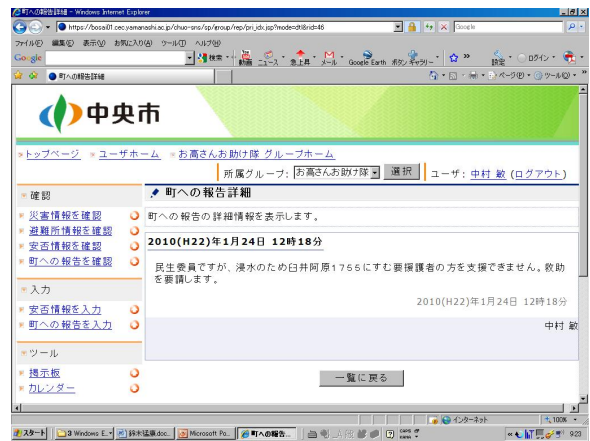


Figure 6. Regional SNS disaster information system

groups concluded that individual information should be registered by each family, even if any member of the family has never used PC.

After the preparation mentioned above, the registration of individual information was carried out at Ichikawa-Daimon 6-Chome disaster prevention community (see Picture 1). 27 family units out of 45 in total took part in the meeting of registration. Since the ratio of residents usually use PC is limited to only 10 % in this community, residents registered information supported by university students.

3.2 Coordination of the two systems

Disaster response exercise on evacuation was performed at the Riverside disaster prevention community in Chuo City (see Picture 2). After the exercise, a demonstration was carried out by university students on the response of disaster management headquarters of Chuo City using the disaster response management system, based on the same scenario used in the exercise. In addition, the coordination between the disaster response management system and the regional SNS was demonstrated. The information on final assignment order (establishment of disaster management headquarters) or an official announcement of evacuation advisories registered in the disaster response management system was automatically sent to the sharing DB. The regional SNS received the information from the sharing DB and displayed it. Then, the regional SNS sent forward the information to cellular phones through e-mail previously registered as individual information. In

addition, a resident requested, using the function of “report to city” of the regional SNS, the rescue of a handicapped person who failed to escape. The headquarters ordered a rescue to the city firefighting office. Residents participated in the exercise appreciated a series of demonstration, and evaluated the effectiveness of coproduction of residents and local government employees on disaster response.

4. CONCLUDING REMARKS

This paper presented the development of the ubiquitous disaster mitigation information system operated by the coproduction of residents and local government employees, centering on implementation activities carried out at two local communities. This approach is on the way. The results were given at the second year out of the three year project in the followings:

- (1) Risk communication between residents and local government employees was promoted in the two local communities and a foundation introducing the ubiquitous system was built in Yamanashi Prefecture.
- (2) The regional SNS was developed and the registration of individual information was made in a local community.
- (3) Disaster response management systems were developed for two local governments.
- (4) The coordination of the regional SNS and disaster response management system was demonstrated to residents and it was evaluated to be effective by the residents.

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