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Development of a Community-based Hazard Information Sharing System for Traditional Towns with Local Heritage

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Abstract: This paper describes development of a community-based hazard information sharing system by local residents in their daily life. We designed and developed an unique ICT-based hazard information system which contributes to community based disaster prevention and reduction. The continuous resident participation and posting design are core concept for our sustainable community-based approach. Our system continues to support making a hazard map by integrating the community-based hazard information. Local residents register information about the spot that can be dangerous in case of disaster. In addition, this system enables information sharing through a Web server. We expect that this information sharing effects usefulness of our system by utilizing collected local hazard information of each district.

Keywords: disaster prevention, hazard map, traditional town, ICT-based, community-based

1. Introduction

Japan has many natural disasters such as earthquakes and typhoons, or volcanic eruption. Therefore, studies on these disasters have been made widely. Not only a DIG (Disaster Imagination Game) which is a map exercise for disasters to enhance disaster prevention of communities(Komura & Hirano, 1997), but also a variety of ICT-based approach including information collection by using cameras and sensors, notification of disaster information by using ICT or game-based training has been proceeded (Mitsuhara et al., 2015). The traditional local towns are characterized by preservation of traditional landscape and environment, depopulation and aging. They are vulnerable to disasters because these factors causes spatial and human constraints.

Our approach in this paper is small start scalable ICT-based disaster prevention, which rooted in the region and based on the characteristics of these towns as disaster prevention efforts in these constraints (Okazaki et al., 2016). The traditional local towns are a characteristic that there is a strong connection between residents. Our idea is to utilize the power of these local communities in disaster prevention and reduction by ICT. To achieve safety and sustainability of livelihoods, our system encourages the local residents to be conscious of disaster risks and to participate disaster prevention/reduction activities. Furthermore, it enables the detailed hazard information collecting by local residents themselves. This continuous resident participation and posting design can make a significant contribution to sustainable community based disaster prevention and reduction.

We selected Hizen-Hamashuku in Kashima City of Saga Prefecture in Japan as a model areas of traditional local towns. We have tested the usefulness and possibilities of our prototype system in the model area (Okazaki et al., 2016). The easy-to-use interface contributed to the smooth registration of information. Our pilot study suggests usefulness of our ICT-based hazard mapping by local residents.

In this study, we designed and implemented a community-based hazard information sharing system for traditional towns. By this system, we expect that residents have higher knowledge of disasters and deeper awareness of disaster prevention.

2. System Overview

We have developed a hazard map creation support system with community participation type using the location information. Disaster prevention awareness can be improved by participation activities. Local residents can collect detailed information. Making hazard map with resident participation activities can improve sharing local community information. The exchanges of the conventional information based on conversations, telephones and letters. This system consists of three functions, information posting function, information sharing function and information management function. Using these functions, this system makes it possible to collect and provide information from residents.

(a) User selection screen (b) Map screen (c) Positional information screen (d) Information registration

Figure 1. Screens in information posting

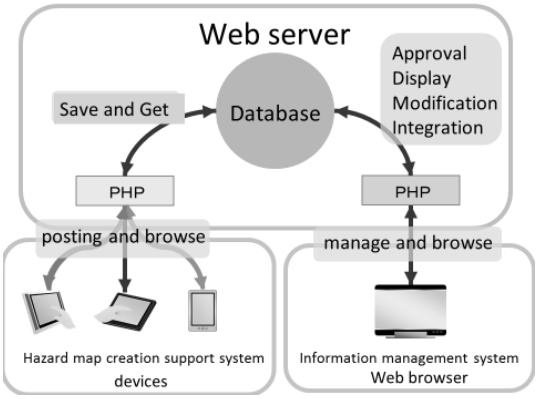

Figure 2. System overview

3. System Functions

3.1 Information Posting Function

Information posting function is composed of a user selection screen, a map screen, a positional information screen and an information registration screen. The map screen displays risky locations stored in a database and the present location of the user acquired by GPS. The balloons point to the risky locations. The photograph of the location is included. A user can watch the information (a disaster type, a risk level, comments) of the location by tapping the balloon. On a positional information screen, users designate the location that users feel danger. When a user registers information, at first user drags a pin with a positional information registration screen and appoints a risky location. Then the position data that the pin points at is handed to the next information registration screen. On an information registration screen, this system saves information such as a disaster case, the photograph of the location and risk level in SQLite of tablet-type devices. Saved information is displayed on a map screen.

3.2 Information Sharing Function

Information sharing function is available to tap the information update button on the map screen in this system. Then user tap the button, saved information in SQLite of tablet-type device is sent a designate

PHP program on the Web server. This sent information is taken off the information sent before. This sent information is saved in MySQL in the Web server. The photo data is sent a directory in the Web server and the reference path of photo data is saved in MySQL. Consequently, information is collected from each tablet-type device and integrated in the Web server. The integrated information is output as a JSON file. Each tablet-type device gets that file. Received information is overwritten before saved information in SQLite of tablet-type device.

3.3 Information Management Function

Information management function has four functions, they are an approve function, a display function, a modify function, and an integrate function. The aim of the approve function is to ensure reliability of information that has been posted by system administrators to approve information. Display function is aimed to provide only the information necessary for the residents by hiding the old information and the information that is not necessary to be displayed among posted information. Modified function is aimed to provide more reliable information by putting function to modify the posted information on the Web server side. The integrate function is aimed to improve a quality and ease of viewing of the information by organizing and integrating a number of information. The integrated information is directed to the information that is several posted to the same location. The integrated information is newly registered in the Web database. As we can refer to the information prior to integration, the system keeps integration history.

4. Concluding Remarks

We have developed a community-based hazard information sharing system for traditional towns. Sustainable community-based disaster prevention/reduction is quite characteristic of our approach. We are focusing safety and sustainability of livelihoods. Our system encourages the participation of local residents and collects the detailed hazard information of the area by post of residents themselves. The continuous resident participation and posting design are core concept of our approach, which can make a significant contribution to sustainable community based disaster prevention and reduction.

As future works, we will establish the management structure of the system. Moreover, we need to try this enhanced system in the field and evaluate it. After evaluating the system, we are going to apply our system continuously on a larger scale to demonstrate usability of our ICT-based modern approach of community-based disaster prevention and mitigation.

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