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SYSTEMS AND PROGRAMS FOR COMMUNITY DISASTER MITIGATION ACTIVITIES

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SUMMARY

Newly developed disaster information systems and its applications for community disaster mitigation activities are introduced. The AnSHIn (Anti-Seismic Hazard Information) system is an intercommunications system for administration office, researchers, inhabitants and engineers. The system is a series of following sub-systems which are used for collecting, arranging and sharing regional disaster information.

The AnSHIn Web is an internet-based WebGIS server providing disaster information. It can be used for data broadcasts by local governments. AnSHIn-KUn is a portable units and can be used by personnel of neighborhood associations; it has a variety of capabilities for use during all phases, before and after onset of disaster. AnSHIn Station can be installed in elementary schools, which are the regional emergency bases, and can be used for a wide variety of purposes; under ordinary conditions, they can be connected to web cameras and a variety of environmental sensors and used for disaster preparedness activities and education, while under emergency conditions, they can be used for collection and reporting of local conditions. AnSHIn DIG is a GIS system for Disaster Imagination Game (DIG) to collect detailed community disaster mitigation information by the inhabitants themselves. Created database will be much available than original DIG performed on paper maps. The AnSHIn system shown here presents a new framework with bottom-up disaster information collection and distribution, which is opposite to conventional top-down information flows.

INTRODUCTION

Preparations against disaster are being rushed into action in the Tokai region in the wake of a review and expansion of the projections of vulnerable areas after the Tokai Earthquake. There are limits to the human and financial resources and time available for mobilization in the conventional top-down emergency response directed by local civil authorities in the event of an ocean-trench earthquake affecting a wide region. It is essential that each of the four parties, authorities, industry, academic institutions and the general populace, make their own preparations for disasters, while cooperating with the other parties. The most essential goal for regional preparedness, however, is to facilitate the bottom-

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up process of efforts and promote suggestions that spontaneously arise from the public. The neighborhood associations and schools, rooted in the communities, must be proactive in conceiving and carrying out activities that not only represent realistic drills for dealing with the aftermath of a disaster, but also emphasize sharing of information about the disaster and training of members of the public. Methods must be explored for raising the public awareness of disaster-readiness activities and countermeasures.

The authors have proposed and developed a complete disaster information system capable of two-way transmission and reception among all components, called the "AnSHIn System"[1][2]. "Anshin" also means Security in Japanese. In this paper, outline of the AnSHIn System is shown, and an activity called "AnSHIn DIG" (disaster imagination game) is proposed for handling regional disaster information. Some observations are also made concerning how the activity could be used by organizations for better coordination in regional disaster preparedness activities.

ANSHIN SYSTEM

Figure 1 provides an overview of the organization of the AnSHIn System. The system is a series of sub-systems for collecting, arranging and sharing regional disaster information.

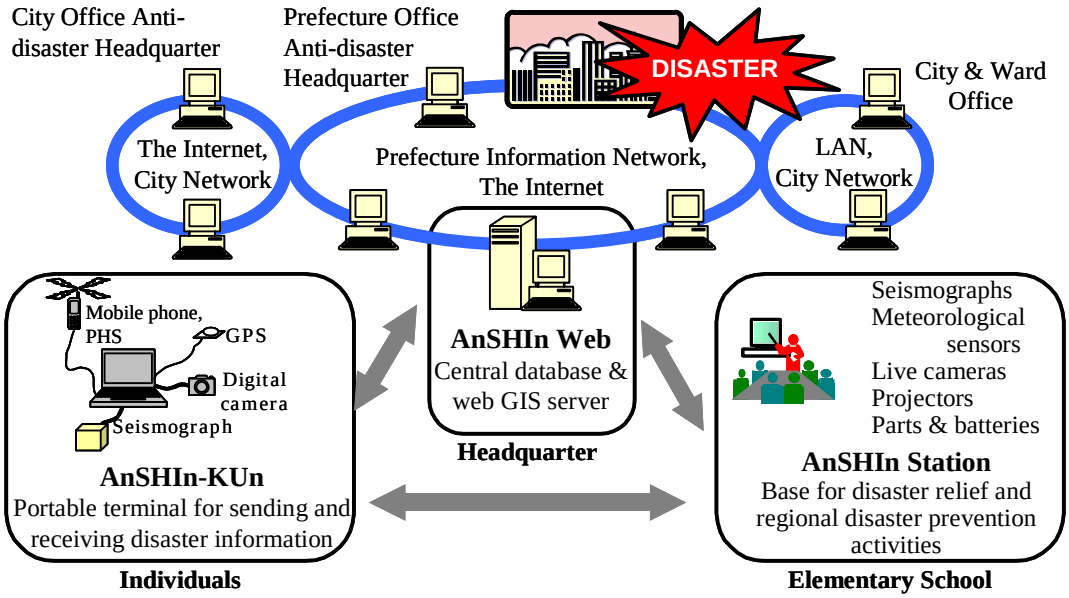


Figure 1 Overview and components of AnSHIn System

AnSHIn Web is a Web GIS system for disaster prevention, earthquake engineering and aseismic design of buildings (Figure 2). The server cooperates with systems and data provided by the administration side. Data on earthquake source and faults, recorded ground motions, soil conditions, buildings, urban facilities and damage estimation is stored. Using JAVA applications, users can access the database system via the Internet or LAN, and no specific software is required. The administration can utilize the system for examination of disaster prediction and disaster prevention planning, while inhabitants can obtain regional information on disasters. In addition, engineers can obtain technical information on architectural design and disaster prevention. Information from mobile terminals, such as position, maximum acceleration, and image data, are received via Personal Handy-phone System (PHS) and

entered directly into the database. When a disaster occurs, the system collects real-time information. Such information is then fully utilized for disaster relief activities.

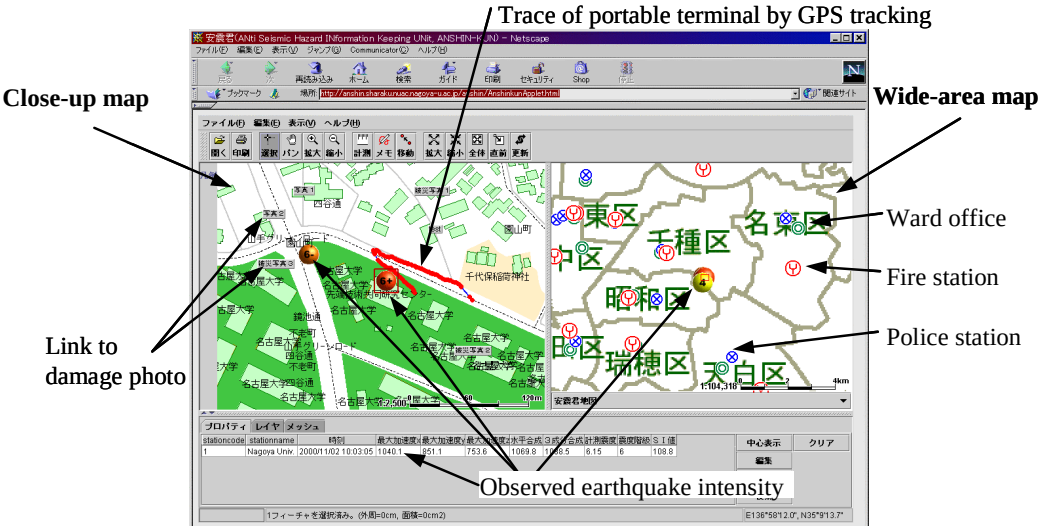


Figure 2 AnSHIn Web: Web GIS system for disaster information

AnSHIn-KUn (Anti-Seismic Hazard Information Keeping Unit) is a portable information terminal composed of a PC with a small seismometer, a wireless telecommunication interface, a digital camera, a GPS unit, and GIS with navigation software. This unit is used by several users such as delegates of local unions, architects, lifeline engineers, local government staff members, and researchers. Using this terminal, users can access data on the server to be used for disaster prevention activities. When an earthquake occurs, the terminal immediately sends observed earthquake shaking data to the server. A high-density shaking map is obtained from data from several units in the area, and the system functions as real-time observation system. Then, the terminal sends various information, such as answers to simple questionnaires on damage. Field surveys are performed using a GPS for navigation, a GIS software package, a digital camera, and various terminal software. Information collected using the terminal is then sent to the server by a telecommunications device and is added to a database on the server. In the case of damage of the telecommunications facilities, users can access the main server by visiting a base station at shelter facilities.

AnSHIn Station can be installed in elementary schools, which are the regional emergency bases, and can be used for a wide variety of purposes (Figure 3); under ordinary conditions, they can be connected to web cameras and a variety of environmental sensors and used for disaster preparedness activities and education, while under emergency conditions, they can be used for collection and reporting of local conditions. The system consists of sub servers of AnSHIn Web, which connects city offices and ward offices by dedicated lines or by radio. LC projectors and screens are prepared for the purpose of displaying disaster information. Spare parts and batteries for these terminals are also maintained at the AnSHIn base station. Meteorological sensors and live cameras are also used for daily environmental observation, crime-fighting and education. The system supports shelter management during disasters and is usually used for education in science, social and environmental studies and disaster prevention activities at schools.

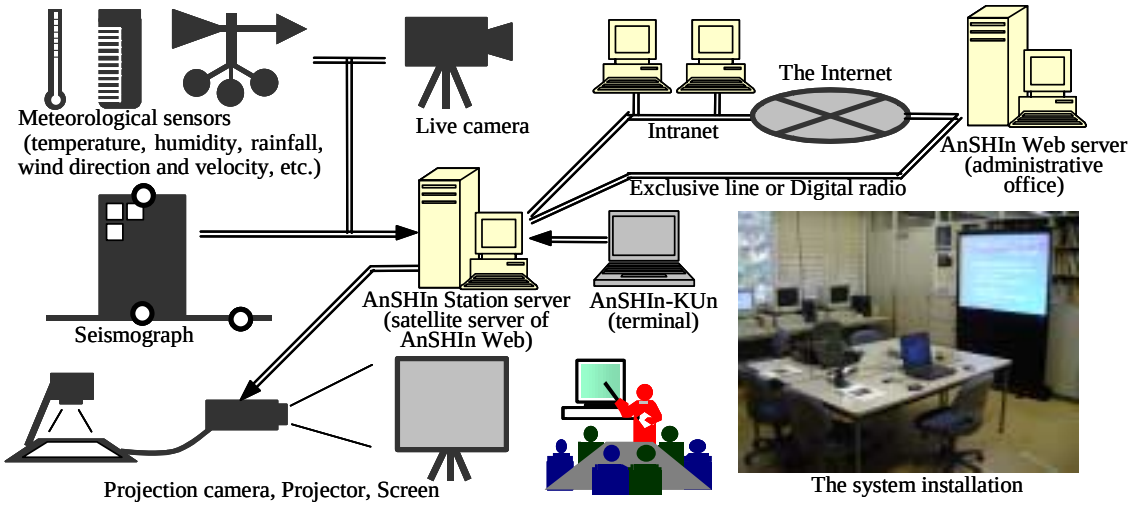


Figure 3 Structure of AnSHIn station

ANSHIN DIG

Concept and Components of AnSHIn DIG

AnSHIn DIG is an electronic version of the simple paper version of DIG (disaster imagination game). It forms part of the support system for the disaster preparedness system, and can be thought of as a personal interface to the system. Individuals are provided with regional information for a simulated disaster, and are also allowed to request additional information after they think over the simulated situation. The system is capable of collecting and storing data for creating a disaster map. Figure 4 shows location of the AnSHIn DIG system in the AnSHIn system.

Originally, DIG was a paper-based training method for disaster management. The group in training assumes that a disaster has struck the region and draws the conditions and responses on a map. This process has proven very effective for training capable personnel, but it is difficult to store, share, transmit or re-use plans that have been drawn onto paper maps. The AnSHIn DIG system uses GIS instead of paper maps, and data gathered through DIG is stored in a database. An on-line GIS (WebGIS) is used because entry and sharing of information is easy and the system is designed to allow easy expansion.

Figure 5 shows the outline of AnSHIn DIG. A wireless LAN incorporating multiple personal computers allows participants to input comments, sharing information and debating countermeasures. The entire process is projected onto a large screen. Ordinary keyboards and mice can be used as input devices, but the system also allows use of LCD pen tablets, which are more user-friendly for those preferring free-hand writing.

Figure 6 shows how users participate in an AnSHIn DIG exercise (in the figure, the user is still in the process of drawing on the screen image). The system incorporates many tools; WebGIS can be used to mask the areas outside the region of interest, and various size scales allow viewing down to individual buildings and schools. These tools provide a readily understandable environment for users who are less familiar with the local map. Users can write freehand, drag and drop disaster information icons, customize their systems to organize their icons by title, and make other changes to create maps in the most effective way for them to participate in disaster management.

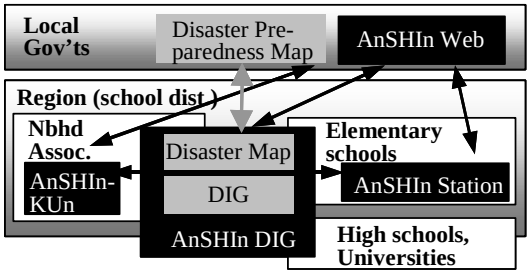


Figure 4 Location of AnSHIn DIG in AnSHIn System

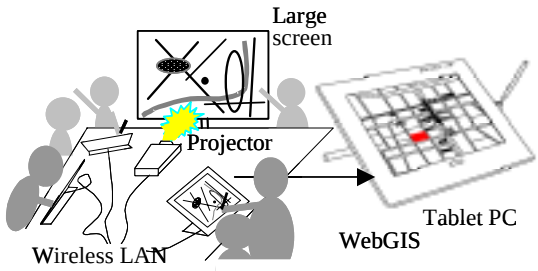
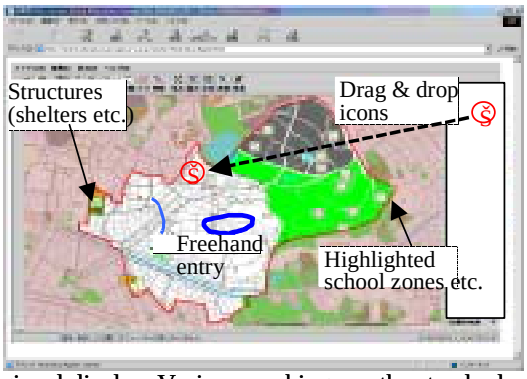


Figure 5 Outline of AnSHIn DIG



Regional display: Various markings on the standard map

Input/display of building data

Figure 6 Display capabilities of WebGIS during DIG

The data-rich maps created by individual users in this way can be combined to supplement the maps provided by authorities, and these can be shared with other regions. There is the issue of privacy of information concerning some of the data from neighborhoods, but this is not an intractable obstacle, and it is easy to distinguish between data that may and may not be shared between local or regional bodies.

Communication among Organizations in Districts (Elementary School Districts)

The appropriate entity for hosting an AnSHIn DIG exercise is the elementary school district. Figure 7 shows an example of a combined district interconnected with an AnSHIn System. It consists of neighborhood associations, elementary and middle schools, high schools and universities.

In this example, the elementary schools have set emergency education of their students as the goal in the DIG exercise. The children are sent out during school hours to gather information about a simulated emergency. They conduct an overall inspection of emergency preparedness and draw emergency preparedness maps after returning. An advantage of this approach is that the results from the children tend to translate through the children's families into greater visibility of these efforts in local society. As preparedness efforts are further developed into activities involving both parents and children, this exercise enhances safety in the home, collection of information relevant to preparedness, and increases public awareness.

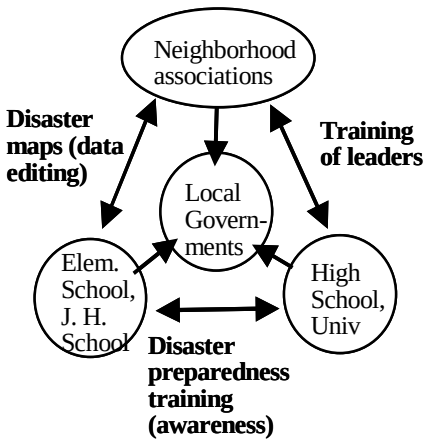


Figure 7 Roles in regional disaster mitigation

There are typically fewer opportunities for high schools and universities to contribute to regional disaster preparedness. DIG informs the students about local conditions and preparedness, and may even attract and train volunteers for rescue teams and increase awareness of the need for individuals to take active part in disaster preparedness activities. If education in disaster preparedness is continued through the elementary and middle school levels, this process surely will contribute to deepening individual awareness of this vital topic.

Neighborhood associations must summarize and organize the information provided by elementary, middle and high schools, and must be proactive in involving local school districts and neighboring schools in their AnSHIn DIG exercises by exchanging personnel and information with other organizations. Not only will these drills be useful for disaster preparedness, they will also contribute to local planning. The enhanced cooperation between organizations is therefore expected to have a synergetic effect on disaster preparedness efforts.

At the same time, local authorities will gain invaluable information and experience through the AnSHIn Web. For example, they will be able to gather detailed data about concrete block walls, vending machines, signage and other fall hazards.

CONCLUSIONS

There has been much development and sophistication of the disaster preparedness systems implemented by local governments in the Tokai region. For example, the Gifu Prefecture GIS Center's "Hiyari Map" (a kind of accident location map) is currently being created, along with other resources on the web, for use by local citizens. It is of increasing importance to establish overall solutions to disaster preparedness, rather than the previous piecemeal approach. The AnSHIn system offers many services to this end: It will enable two-way communications for bottom-up information flows, a key characteristic; it will offer continuity between ordinary conditions and emergency conditions; it will offer a user-friendly interface; and through its use for children's education, it will lead to the creation of programs involving common citizens in a variety of roles.

ACKNOWLEDGEMENTS

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