Life-Area Broadcasting System (LABS) for Normal and Emergency Cases by Using Easy Contents Management System and New Speaker Devices

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ABSTRACT

The "community" has played an important role in enhancing the regional disaster management capabilities in Japan. This paper proposes a Life-Area Broadcasting System (LABS) for usual and emergency cases. In order to realize very simple and easy management of LABS, we developed the Easy Contents Management System (ECMS). By this system, people can obtain life-area information related to their life support, small events and accident news occurring at their living area not only in emergency cases but also in normal cases by voice, images and text. Further, we developed some new Speaker Devices for unfamiliar users of ICT devices such as elderly users. Those users can receive the service of LABS as like as a television or a radio broadcast terminal anytime and every day. In this paper, we describe the concept of LABS and introduces the developed new systems and devices.

Keywords

Broadcasting, Artificial Voice, Emergency Information, Community Construction, Universal Design

INTRODUCTION

March 11, 2011, the East Japan Great Disaster and Tsunami occurred, and the authors experienced a lot of things about the disaster response, people action and information systems to a large-scale disaster. Murayama et al. (2015, 2016), and other related papers reports the experience in detail. After, regarding to the emergency information system, Murayama and Sasaki, et al. translated the book of Hiltz et al. (2009) "Information systems for emergency management" and published it in Japanese.

Through the above experience, we noticed that there were important issues in the information system for emergency management. One is the problem of government work difficulty of decision making in the emergency management and the other is the "digital divide" problem. In the case of a large-scale disaster, non-government

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(community) activity such as self-help and mutual aid are more required than public help by government. Because, when a large-scale disaster occurs, the response capacity of the local government is lacking. In order to promote non-governmental (community) activities, everyone in the area needs to share information immediately. For that, it is important to solve the "digital divide" problem. In this paper, at first we introduce conventional researches for the public support, and we describe the importance of the non-government (community) activity and propose an information system to solved the "digital divide" problem.

CONVENTIONAL RESEACHES

In emergency case, the ordinary government work changed into a completely different mode. Especially, an organization transformation, a quick decision making and communication with many related people are required. There are many papers on the emergency management systems, the decision making and communication methods in the case of emergency. For example, Turoff et al. (2004) designed the Dynamic Emergency Response Management Information System (DERMIS), Tu et al. (2009) proposed some working flows of transformation in a self-organizing team for emergency responses, and Gonzales et al. (2016) constructed a simulation model of disaster response. Paltta et al. (2012) described the communication gap in disaster management. Regarding to using Social Media, there are some papers. For example, Hilts et al. (2014) proposed to use of Social Media for U.S. Public Sector Emergency Manager and Abdllah et al. (2017) discussed about the issues on information spreading by Twitter in the case of the disaster. Regarding to the decision making in emergency, Cesta et al. (2014) proposed the training for the decision making in crisis based on plan adaptation. Further, Bernabé et al. (2018) also studied the impact of warning situations for decision making in transportation companies through social media. For decision making in medical area, Sasaki (2017) proposed the patient transport decision making in multiple hospitals in a large-scale disaster.

Above problems are related with the "public support" in an emergency case. Not only in an emergency case but also in normal case, the "public support" has a limitation because of the budget and human resource limitation. Therefore, voluntary evacuation by citizen is important for emergency, and it is necessary for all citizens to share disaster information promptly. If there is an information gap by "digital divide", the risk of response delay for a disaster will be serious.

IMPORTANCE OF COMMUNITY

Recently in the advanced countries including Japan, the aging society has progressed rapidly. In order to provide living in the familiar area continuously, the Japanese Government is constructing the Comprehensive Community Care System (CCCS), which is an integrated care system of medical, nursing, and health care, and including living support. In the CCCS, the "public support" provide the medical, nursing and health care service to required people. The living support (housekeeping, housework and shopping support, etc.) is difficult for the Government to provide as the "public support" because of the budget problem. Therefore, the living support by "mutual aid" as well as "self-help" is necessary by such as volunteers and NPOs (without official fund) so that elderly people can live the region comfortably in the future.

We expect the "mutual aid" to reduce the cost of "public support" in not only the normal case mentioned above but also in emergency cases. To activate the "mutual aid", we focused on the function of "community". MacIver (1917) defined the "community", which was not association or State but a free, natural, spiritual, common sense and voluntary association for people to make a comfortable social life. Matsumoto and Yatabe (2008) studied the determination factor to continue the disaster prevention activities was the sense of community. The sense of community means "affection for the region" and "the spirit of self-devotion for the region". They concluded the sense of community means the "humanity and love for mankind within local resident" and it is the most important factor towards the continuous disaster prevention activities. Tsuburaoka et al. (2014) reported the community information as the living information is important to reconstruct and to keep the function of "community". They also described the problems of "digital divide" and "non-digital citizens".

In this research, we focused on the "digital divide" and "non-digital citizens" to re-construct the "community", which means regional community for safety social life. Further, this paper proposes a new information system to realize re-construction of the community with solving the problems of "digital divide" and "non-digital citizens".

BLIND SPOT OF INFORMATION SOCIETY

The "community" has played an important role in enhancing the regional disaster management capabilities in Japan. In other to keep the "community" function, people has been using various regional information systems such as newspapers, radio broadcasting and a cable broadcasting, television and Social Network Systems (SNSs) by the Internet. Those systems are useful for getting and sharing more wide area information, but they are still too

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large for a person to get more near information related to their life support, small events and accident news occurring at their living area. The reason why the media covers wider area than the living area is the facilities' cost and the maintenance cost of broadcasting system and other related media are still too large to construct and keep the life-area information systems and services for required areas. As a result, there is a blind spot between Internet and other information media.

Figure 1 shows the image of the blind spot between in Internet and other information media. Our proposal of Life Area Broadcasting System (LABS) aims to eliminate this blind spot. Here, the size of the Life Area means the area where even the elderly can walk, or the range of a school or kindergarten (about a radius of 2-3 km). In addition, the blind spot includes not only elderly people but also people who are not good at information manipulation such as visual impairment, hearing impairment and dementia. For those people, excessive information from the Internet will be a flood of information and they will reject all information from the Internet. As a result, the "digital divide" and "non-digital citizens" are appearing and leads to the collapse of the community in current information society.
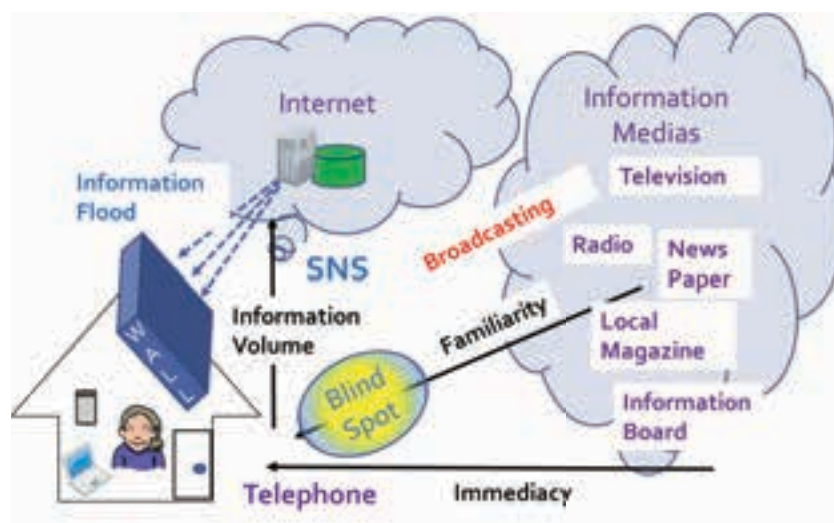

Figure 1. Blind Spot between Internet and other Information Media

CONCEPT OF LIFE-AREA BROADCASTING SYSTEM (LABS)

This paper proposes a Life-Area Broadcasting System (LABS) for usual and emergency cases. Figure 2 shows the concept of the proposed system of LABS. The feature of the system is as follows.

(1) **To provide both the formal information from Government Office such as emergency regional information and informal information from shops and community by the same system.** The conventional emergency system was for the government office and works in only emergency, but this does not connect to re-construct the community. Our proposal that the residents are receiving daily life information and sharing in the life area by LABS will connect the community re-construction. As a result, it leads to a high disaster responsible region.

(2) **To use our developed Easy Contents Management System (ECMS) described later in detail.** As the system distributes not only local government information but also private company or shop information, we consider that a non-profit organization (NPO) will manage the system. For this reason, we have developed an extremely easy-to-use contents management system so that even people without IT skills can manage the system.

(3) **To use new Speaker Device (SD) described later in detail.** In order to eliminate the "digital divide" and "non-digital citizens", we developed new speaker devices (SDs) for elderly people with weak hearing and vision and people who are not good at operating information terminals.

We also developed a smartphone application of the LABS for smartphone users. They can obtain the same service of LABS by using smartphone. The user can select the media of the information from voice, images, text (e-mail) and the combine of them. Smartphone users can directly obtain information from local government and stores not through LABS. Additionally by using the LABS, every users including non-smartphone users and smartphone

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users can receive required life-area information every day as well as emergency information. By this system, all users in the same area can share the same information.
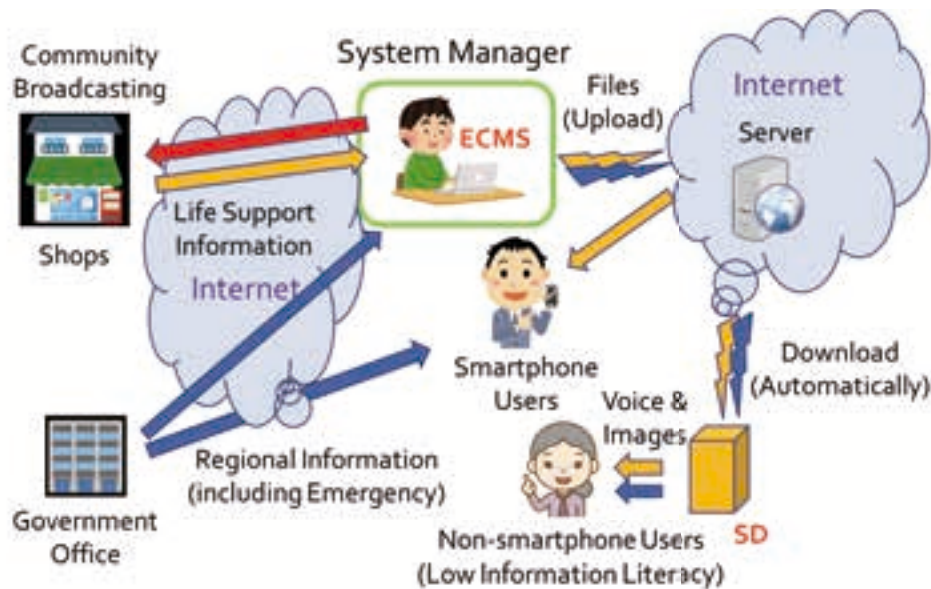

Figure 2. Concept of LABS

EASY CONTENTS MANAGEMENT SYSTEM (ECMS)

A feature of LABS is to use our developed Easy Contents Management System (ECMS). Figure 3 shows an example of the display of ECMS. The system manager of LABS for non-smartphone users uses this ECMS. The local government office sends their information directly to the smartphone users. The directly received information is still text (e-mail) and is not voice and images. Therefore, we developed an application which the smartphone users can receive the same information as that for non-smartphone users by the smartphone. The application provides the same information in voice or images or combine of them.

We divided contents of LABS into three classes, Emergency, Fixed Time and Optional Time. Each class has a specified time for the broadcast as follows,

- Emergency: one minute after the submit time,

- Fixed Time: pre-specified time in a day such as 7:00 am, 12:00 (noon), and 5:00 pm,

- Optional Time: depending on the contents.

For each classes, the system manager can select contents files and submit them to the system server. The contents files are voice files and image files. The system can send also text information as the image files. Recently, we can make the voice files from text files easily by using free software in the Internet. Further, the quality of the artificial voice becomes quite well, so we have not to use human resource to make the voice files. If the condition of the selected contents file is "open", SD automatically downloads the file at the specified time. The user can delete the selected files and the user can change the condition of selected files from open to close anytime. There is an indicator of the number of downloads, the system manager can know the user's terminal condition. As mentioned above, the ECMS has very easy human interface, so everyone can use it and everyone can be the system manager. There is no additional broadcasting facilities and it realize a very low cost broadcasting environment.
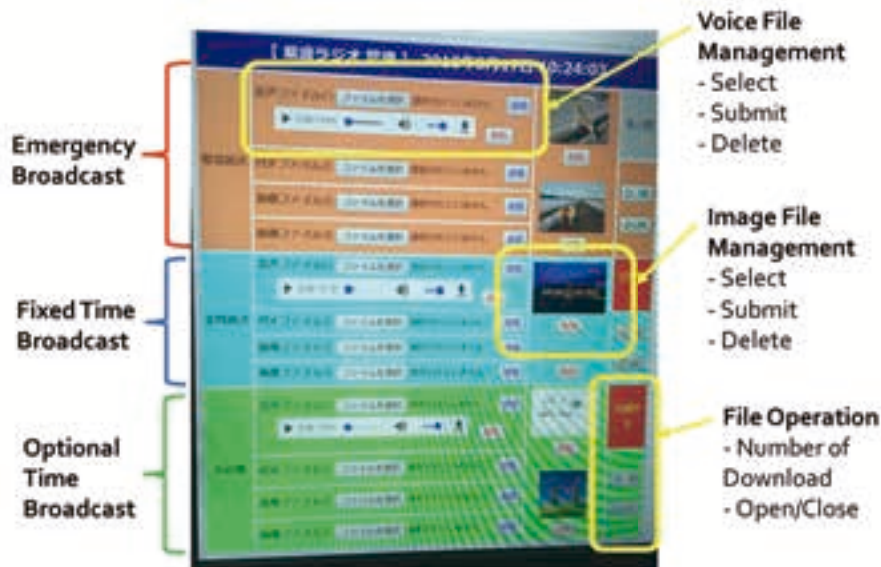
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Figure 3. Display of ECMS

DEVELOPED SPEAKER DEVICES (SDs)

The other feature of LABS is to use our newly developed Speaker Devices (SDs). Figure 4 shows the photo of SDs. We developed two kinds of SD, one's name is "Radie" (Figure 4 (a)) which has a display and another's name is "Radita" (Figure 4 (b)) without display. We developed both of them using Raspberry Pi3. They can connect to Internet via WiFi and have file automatically download functions from the system server at the specified time mentioned above. After download the files, the SDs open the files and out the voice and image to the speaker and display (in the case of "Radie"). User can control the volume of the voice by turning the volume controller like a television or a radio. We developed the "Radita" (without display) by using the parts of conventional speaker terminals, which was for cable broadcasting. As a result, the "Radita" is very low cost and has a high-power speaker. This speaker is effective for the elderly with weak vision and slightly deaf ears.

In Japan, there are still many non-smartphone users. The most of them is elderly and needed the life-area information in the both of emergency and normal cases. We designed those devices for non-smartphone users. They require very easy use terminal like a television or a radio to get the life-area information. With this terminal, elderly and "digital divide" people can spend safely and convenient life because they can receive necessary life-area information automatically, and they not need to get information from themselves like the Internet.

Of course, as mentioned above, we also developed a smartphone application to receive and play LABS's contents by using regular smartphones. As a result, smartphone users and non-smartphone users are able to receive the LABS's service fairly. Namely, this will form a "universal designed" information community that no one will leave behind.
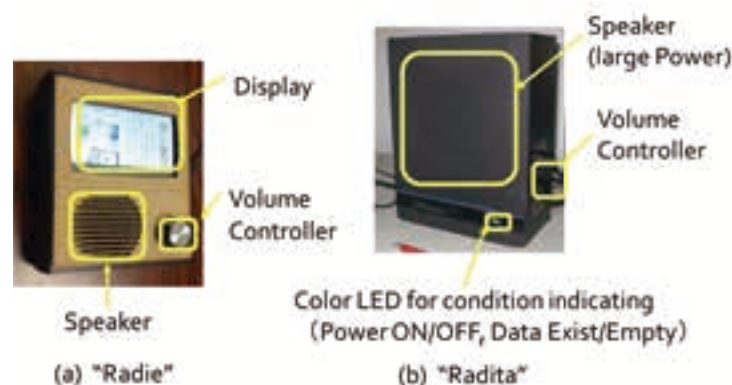

Figure 4. Developed Speaker Devices

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CONCLUSION AND FUTURE WORKS

This paper proposed the concept of Life-Area Broadcasting System (LABS) for usual and emergency cases. To realize the LABS, we developed the Easy Contents Management System (ECMS) and some new Speaker Devices (SDs). We also developed a smartphone application to use the same service of LABS. By this system, every people including non-smartphone users and smartphone users can obtain life-area information related to their life support, small events and accident news occurring at their living area not only in emergency cases but also in normal cases by voice and images.

Using the LABS, we expect the re-construction of "community" by information sharing among the same life-area residents and increasing the communication opportunity at event in the life area. We believe the re-construction of "community" will connect to make a villages, a town and a city with high resilient to disasters.

The system introduced in this paper is still in the prototype stage. In the future, we have a plan that the actual elderly people and system managers use and evaluate the prototyped system. Then, improve the prototype system based on the evaluation results. After that, we have a plan of carrying out the field experiment on the effectiveness of the proposed LABS in Shiwa-town and Yahaba-town, Iwate Prefecture, Japan in 2019. Finally, we plan to establish an industry-government collaboration business model to operate this system and establish an NPO. By performing the continuous operation, we hope for the re-construction of "community", and the construction of a high disaster prevention, safety and secure region development.

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