

A LIFE SUPPORT NETWORK FOR ELDERLY PEOPLE LIVING IN A RURAL AREAS

Bayme Abaydulla, Jun Sasaki, Michiru Tanaka, Keizo Yamada and Yutaka Funyu
Faculty of Software and Information Science, Iwate Prefectural University, 152-52 Sugo, Takizawa, Iwate, Japan

Keywords: Independent Senior, Remote Healthcare, Life Support.

Abstract: This paper proposes a new concept, a Life Support Network (LSN), for elderly people living in rural areas. The network is an intranet that incorporates a safety confirmation system, a remote healthcare system and an emergency information system. We developed an experimental LSN system and carried out a field experiment in a typical rural town “Shiwa” in Iwate Prefecture of Japan. We demonstrated the experimental LSN, called “Yui Net,” performs well in the field.

1 INTRODUCTION

Recently, the number of elderly people living in the rural areas of the world, especially in developed countries, has been increasing. In Japan, the number of families which include people over 65 years old is 17,273,000 (37.7% of all homes), the percentage of senior citizens who are in a couple is 28.7%, and that of elderly people who live alone is 19.7%. These rates are still increasing, and at an unexpectedly high speed (The Cabinet Office, 2005).

Support systems are necessary to address problems associated with advanced depopulation and aging in rural regions. These systems might, for example facilitate senior citizens' being able to live alone. In addition, various research approaches are necessary in order to help prevent the solitary death of elderly people. Some researchers have asserted that information technology (IT) can be effective in improving the welfare situation of the elderly.

In section two of this paper, we present the concept of a Life Support Network. Then in Section 3 we introduce an experimental system we developed, called “Yui Net,” and the results of the field experiments performed on the system are discussed in Section 4. We present our conclusions and suggestions for future work in Section 5.

2 THE LIFE SUPPORT NETWORK

We propose a type of intranet for a closed rural area to support elderly life. We call this intranet a “Life Support Network” (LSN). The LSN creates a constant connection among volunteers, home-visiting nurses, the regional hospital, drugstores and other life and health related organizations. The LSN is a high-security and high-speed network, which is like a Local Area Network (LAN) carried over optical-fiber cables. With current technology, it is possible to construct such a network within an appropriate budget (Komine et al., 2001 in Japan).

With the LSN, a senior citizen living alone can send a daily safety confirmation message to his/her remote contact person by way of an easy-to-use terminal. The remote contact person could be, for example, a helper or a care provider in a social welfare council, a doctor or nurse in a healthcare center or hospital, a friend, a neighbor or a family member.

An elderly person can use the healthcare terminal in his/her home every day. Each person measures his/her vital data and confirms it through a public facility such as a healthcare center connected to the LSN (Sasaki et al., 2006). In this case, nurse home-visits, home medical services, residential care, emergency calls, and other necessary services remain available. In case of an emergency, necessary personnel such as a doctor or helper can quickly

engage in correspondence with the elderly client (Shinagawa et al., 2006).

This plan was designed to achieve all stages or services in the LSN through an information system. The system ensures a safer living environment for residents and senior citizens living alone in rural areas, not only in Japan but throughout Asia (The Cabinet Office, 2004).

3 EXPERIMENTAL SYSTEM

3.1 Structure of “Yui Net”

As the concept of the LSN is quite broad, we decided to focus on some specific important functions: safety confirmation for elderly people living alone, and the remote healthcare service. We call the set of the systems “Yui Net,” where “Yui” means “helpful relationship” in Japanese.

The development project team consists of the NEC Group for hardware development, Iwate Prefectural University for software development, and the Shiwa town in the Iwate Prefecture of Japan as the feasibility test field. We developed each system as an open source Web application, which is available over a Virtual Private Network (VPN) in the Shiwa town.

The Local Authorities Satellite Communications Organization (LASCOM) of the Japanese Support Organization supported our project by funding the development. We would like to thank LASCOM for their contribution.

3.2 Safety Confirmation System

The most commonly used technology to ensure the safety of elderly people is sensor-type systems. One Japanese company produces an interesting sensor-type system. In this system, when the elderly client uses the electronically-equipped kettle that has telecommunication functions, the system sends a text message to a remote family member’s cellular phone (Zojirushi Corporation, 2005).

Many people dislike using such sensor-type systems because of privacy concerns. Furthermore, there are occasional occurrences of false alarm messages being sent. Alternative safety systems with human behaviour sensibility and high reliability are required to augment sensor type systems (Shinagawa et al., 2006).

We have reported on the development and operation of a “Mimamori” (meaning “watching over someone”) network system for the elderly in

the Village of Kawai in the Iwate Prefecture of Japan. In developing the Mimamori system, an L-mode terminal produced by NTT (Nippon Telephone and Telegram Ltd.) was chosen. An L-mode terminal is a telephone with a touch panel display and internet connection function. When the elderly client touches the display, the terminal sends a message to the social welfare council and remote family members (Yoneda et al., 2006). Unfortunately, NTT has decided to stop producing the L-mode terminal in 2010.

We therefore proposed a new method to confirm elderly people's safety by using TV terminals instead of L-mode terminals. We chose TV terminals because most elderly people in Japan watch TV routinely. According to a report by the NHK (Japan Public Broadcasting Corporation), elderly people, particularly those 70 years or older, watch TV for five hours or more a day on average.

Figure1 shows the structure of the safety confirmation system. The television with STB (Set Top Box) and the Intranet environment are set up in the home of an elderly person. The Web server with the custom developed support system is located at Iwate Prefectural University.

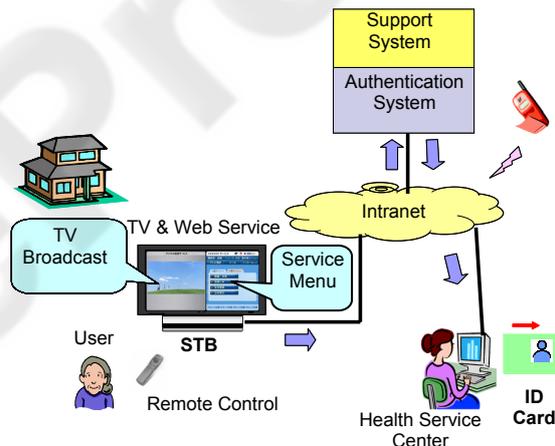


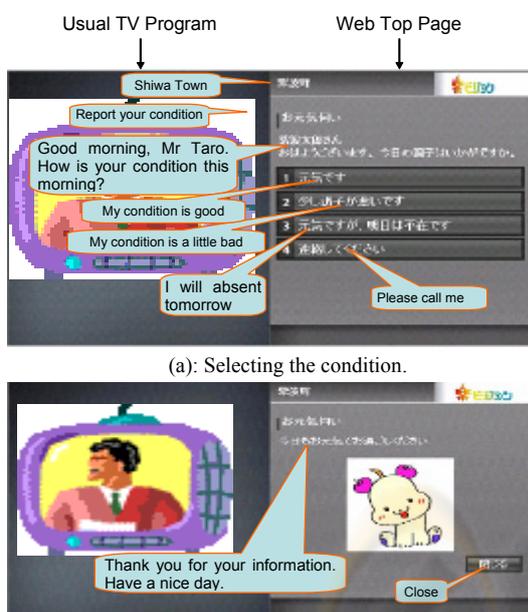
Figure 1: Safety confirmation system.

We can see the display is divided into two sections. The left-hand section represents the current TV program and the right-hand section represents the first page of the Web-based safety confirmation system. This page shows a brief message, below which there are four response buttons to select from:

- (1): My condition is good
- (2): My condition is a little bad
- (3): I will be absent tomorrow
- (4): Please call me

The user can easily select a button using the STB's remote control device. After the user selects his/her current condition, a Web page displays a confirmation message as shown in Figure 2(b). After the user presses the close button, the TV screen reverts to display the usual program broadcast. The information selected by the user is transmitted to the healthcare center and/or the remote family member over the intranet for display on a PC as well as a text message for display on a cellular phone.

If the user does not use the system to report their condition in the morning, the related life supporter (home helper, care provider, family member, neighbour, etc.) uses a telephone to confirm the user's condition.



(a): Selecting the condition.

(b): After selecting the condition.

Figure 2: Samples of the TV display.

3.3 Remote Healthcare System

Figure 3 shows the structure of the remote healthcare system.

The user can measure his/her vital data such as blood pressure, heart rate, electrocardiogram, body fat ratio and internal organ fats every day using ahealth checker'; a stand alone device. The items to be measured are determined according to user's specific health condition and interest.

The measured data stored in the health checker is automatically transmitted to the PC via infra-red. The PC, in turn transmits this data to the server located at Iwate Prefectural University through the intranet.

If a user has measures his/her vital data at a facility, the system transmits the data to the user's file in the database. All the data for a user can be input and accessed from anywhere.

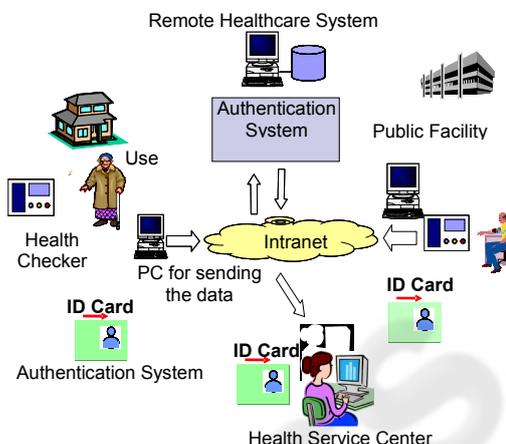


Figure 3: Remote healthcare system.

4 EXPERIMENT

4.1 Experimental Method

We carried out the experiment from December 18, 2006 to February 9, 2007 to confirm the effectiveness of the system.

We selected and requested the participation of three persons (a male aged 80 and two females aged 82 and 76) who live alone to use the safety confirmation system. The users sent their condition information through the system every day using the STB's remote control.

We selected and requested the participation of three different persons (three males aged 73, 59 and 82) to use the remote healthcare system. We set up the remote healthcare system in the office of three public facilities located in Shiwa town. There, any person with an ID card can use the remote healthcare system.

Table 1 shows the categories and numbers of system users in the experiment.

Table 1: System users in the experiment.

| Name of system | Category of users | Number of users |
|----------------------------|--|-----------------|
| Safety confirmation system | Home user living alone | 3 |
| | Family user living apart from the home user | 2 |
| | System manager | 6 |
| Remote healthcare system | Home user | 3 |
| | User in each office of three public facilities | 36 |

Following the experimental period we obtained the users' opinions on the systems by way of discussion and a survey questionnaire.

4.2 Experimental Results and Discussion

4.2.1 Safety Confirmation System

Regarding the operability when using the safety confirmation system, two home users answered "comprehensible" and one female home user answered "incomprehensible" because of her low IT literacy. Two users said the TV screen display is easy to understand and they hope to continue using it. The system managers responded that they were able to operate the system satisfactorily. Family users living apart from the home users reported they felt a "feeling of safety" regarding the home users.

We confirmed that users could use the system with little difficulty and the life supporters and their families felt assured by checking the information sent from the user every day by cellular text message and web page.

The assimilation of the system into the responsible organizations and optimal management in cases of a lack of safety information are issues which remain to be resolved.

4.2.2 Remote Healthcare System

Sixty percent of all users said the remote healthcare system was "comprehensible" and easy to use, including the health checker for measuring health data and the PC for sending the data on.

We confirmed that the users could operate the system comparatively easily and they could take interest in their own health condition by using the remote healthcare system.

In future we plan to propose systems to effectively use the vital data captured for users in the town.

5 CONCLUSIONS

This paper proposes a new concept: a Life Support Network (LSN) for elderly people living in rural areas. We developed two experimental systems as part of the LSN and carried out a field experiment. The experimental system, which has a safety confirmation system and a remote healthcare system, obtained a satisfactory evaluation from users and shows good feasibility with satisfactory results in the field.

The experiment is the first step in constructing the LSN concept. It is important to prepare several life-support services, which the users and their relatives can select according to their particular health condition and social environments.

REFERENCES

- Cabinet Office, Government of Japan, 2005. The 6th life and international comparison investigation result summary concerning consideration of senior citizen. In *online*, http://www8.cao.go.jp/kourei/ishiki/h17_kiso/index.html.
- Komine, Y., Nakazono, M., Ikaruga, S., Iwamoto, S., Sato, T., 2001. Residential network in rural area neighboring city. In *Journal of City Planning Review*, Vol.; No. 230, pp: 77-82.
- Nakazawa, J., Takahashi, K., 2006. Policy and planning for ensuring information and communication networks/services in disasters. In *The Journal of the Institute of Electronics, Information, and Communication Engineers*, Vol.89, No.9, pp: 782-786.
- Sasaki, J., Wano, K., Yoneda, T., Kamata, H., Mizunuma, Y., Funyu, Y., 2006. A medical consultation support system to reduce time and costs for life-style related disease. In *Japan Journal of Medical Informatics*, Vol. 26, No. 1, pp.13-22.
- Shinagawa, Y., Kishimoto, T., Ohta, S., 2006. Development of an automatic alarm system for elderly living alone. In *Japan Journal of Medical Informatics*, Vol. 26, No. 1, pp.1-12.
- Shinagawa, Y., Kishimoto, T., Ohta, S., 2006. Development of an algorithm for automatic emergency calls using non-response intervals of infrared sensors. In *Kawasaki Medical Welfare Journal of Japan*, Vol. 15, No. 2, pp: 553-563.
- Yoneda, T., Ogawa, A., Sasaki, J., Funyu, Y., 2006. Development and operation of mimamori network system for elders in Kawai Village, Iwate Prefecture. In *Personal computer users' application technology association*, Vol. 16, No. 3, pp:31-38
- Zojirushi Corporation, Mimamori Hotline, 2005. In *online*, <http://www.mimamori.net>.