

# EXPERIMENTS OF LIFE MONITORING SYSTEMS FOR ELDERLY PEOPLE LIVING IN RURAL AREAS

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**Abstract:** The authors' project has been developing some life monitoring systems for elderly people living alone in rural areas. The developments and experiments of the life monitoring systems were carried out for Kawai village, Shiwa town and Tono city at Iwate prefecture in Japan. Based on these experiences, this work describes the information obtained and the issues which need to be resolved in the construction of a useful and successful life monitoring system.

## 1 INTRODUCTION

Computers and Internet technology are now used in businesses, governments and other enterprises worldwide. However, there are still many rural areas where elderly people are living without the information services provided by computers and the Internet. In these rural areas, there are many social problems such as low birth rate, aging and a declining population. The aim of our research is to provide useful but low cost information systems to ensure a safe, secure and comfortable life for elderly people in such rural areas.

We have proposed the concept of a Life Zone Network (LZN) (Sasaki et al, 2001, 2002), which is a closed network and makes the sharing of information on clients' medical and health conditions between organizations possible.

Based on this concept, we proposed a new concept of Life-Support Network (LSN) (Sasaki et al, 2008). After discussion on the LSN concept, we are proposing that the following services should be realized there:

- (1) Information sharing using integrated management of clients' healthcare data and regional Intranet (CATV network, VPN etc.).
- (2) Implementing cooperative relationships among hospitals, clinics and healthcare/welfare facilities.
- (3) Provide a monitoring service for elderly people who lives alone.
- (4) Provide a remote healthcare service.

- (5) The use of an emergency information system.
- (6) The use of informal resources provided by regional volunteers or remote living families.

This paper shows our developed systems and its experimental results for three different rural areas in Iwate Prefecture in Japan. In addition, the information obtained and future issues which would allow the construction of a useful and successful life monitoring systems are discussed.

## 2 EXPERIMENTAL SYSTEMS FOR LIFE MONITORING

### 2.1 Kawai Village

In order to ensure the safety of elderly people living alone in Kawai village, an emergency call system was introduced by governmental office. However, there is a problem in that the system is not available in an emergency if the elderly person is lying down and cannot operate the system (Yamaki, 2004). There are other methods available such as the life-condition monitoring system, which can be used in remote places by using a kettle or a door with a sensor and a telecommunication function (Zoujirushi, Japan). Currently, such positive-type systems tend to be difficult to expand because there are problems with error actions and resistance from elderly people due to privacy concerns.

On the other hand, there are examples of active-type systems, which provide monitoring services for elderly people and allow health information to be sent by the elderly themselves.

One of our projects has been the development and management of an active-type monitoring system called “Mimamori Network System” (Ogawa, 2004 and Yoneda et al, 2006) in Kawai village, where 40% of people are over 65 years old.

The Kawai project developed an active-type, monitoring system for elderly people as a Web application (AP) using information communication technology. The Web AP server is located in Iwate Prefectural University, the terminal for the elderly is an L-mode telephone produced by NTT East Ltd., and the terminal for the Social Welfare Centre (SWC) is a personal computer (PC).

Figure 1 shows examples of the system display for the elderly. The elderly person inputs his/her information on their health condition using a three-step push button on the L-mode telephone every morning. The information is sent via the Internet to the AP server and the SWC confirms it on the Web browser of the client PC. We designed the human interface, for example color coordination and button distribution on the display, to ensure easy operation for elderly people.

For ease of management, system functions have been added gradually. These added functions include: daily message sending from the SWC to the elderly person, presentation and self confirmation of the monthly sending information history and a display for mobile phones. Furthermore, a button for “I want to talk”, schedule information for the next three days and sending e-mail to mobile phones of watching-over volunteers and remote living families have been included.

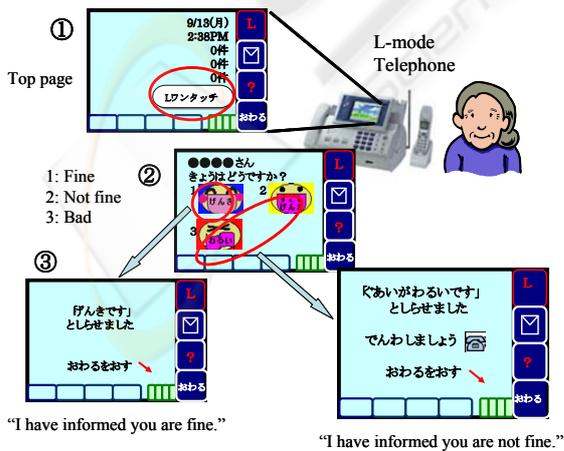


Figure 1: Life monitoring system in Kawai village.

As a result of the system management from September 2004 to May 2008 (3 years and 9 months), over 90% of users did not forget to send their information and confirmation of their safety was 100%.

Though, the L-mode service is announced to be finished in 2010 by NTT East Ltd. because of its management reason.

## 2.2 Shiwa Town

In the 2006 fiscal year, our project carried out the development and field testing of a new life monitoring system in Shiwa town.

In this system in Shiwa town, a television terminal is used instead of the L-mode telephone, because L-mode service is scheduled to stop in 2010, and every resident of Shiwa town has a television. In order to use the system, a set-top box (STB) called “Raku Vision”, produced by NEC Magnus Communications Ltd., is needed to connect between the Intranet and the television (NEC Magnus Communication, Japan).

In using this system, when a person turns the TV on, the divided display, shown in Figure 2 (a) appears at first, where the left side is the usual TV

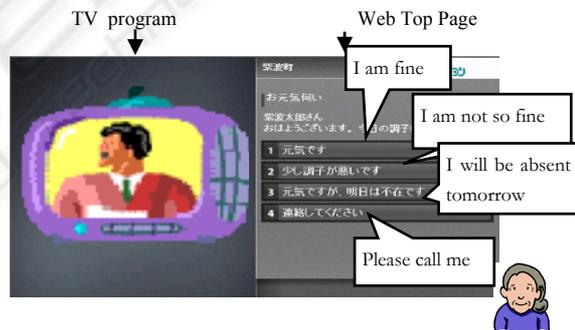


Figure 2(a): Sample of the TV display (selecting condition).



Figure 2(b): Sample of the TV display (after selecting condition).

display and the right side is a Web browser. The Web browser has four buttons:

- (1): My condition is fine.
- (2): My condition is not so fine.
- (3): I will be absent tomorrow.
- (4): Please call me.

The user can easily select a button using the remote control device of the STB. After the user selects his/her current condition, the 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 broadcast program. The information selected by the user is transmitted to the system manager and/or remote living families as Intranet data for display on a PC and a text message for display on a mobile phone.

If the user does not use the system to report their condition in the morning, the contact life-supporter (home helper, care provider, family member, neighbour, etc.) calls him/her to confirm their condition.

Following the experimental period, we visited Shiwa town and obtained the users' opinions on the system by way of discussion and a survey questionnaire.

The experiment was carried out from December 18th 2006 to February 9th 2007. We selected and requested the participation of three people (male aged 80, female aged 82, and female aged 76 (average age: 78.5 years)), who were living alone in Shiwa, to use the life monitoring system. The users sent information on their condition through the system every day by using the remote control device of the STB.

The operability of the life monitoring system was described by two home users as "comprehensible" and by one female home user as "incomprehensible." Two users said that the TV screen display was easy to understand and they hoped to continue using it. The system managers responded that they were able to operate the system. Family users living apart from the home users felt a "feeling of safety" regarding the home users.

We confirmed that users could use the system with little difficulty and that the life supporters and their families experienced a feeling of safety when checking the information sent by the user every day using a text message on a mobile phone and web page input data.

Other opinions on the life monitoring system were as follows:

- The response of the STB was a little slow.
- A period of adjustment to the operation was necessary in order to use it easily.

- An emergency call function was very important and necessary.

Which organizations will be responsible and optimal management in the case of a lack of safety information are issues which remain to be resolved.

### 2.3 Tono City

In the 2007 fiscal year, our project designed a whole LSN and developed some components of the LSN for field testing in Tono city. The concept of the LSN service consisted of child-rearing, healthcare and elderly life support.

We developed the elderly life support system which had a send function for daily safety information, an information site on EOL (end of life) and a support function for construction of a Web page for use by the elderly. In the send function of daily safety information, we developed this so that the information was sent using a Nintendo "Wii" (a game terminal), a mobile phone or a PC. We also carried out field testing, an example of the display is shown in Figure 3(a), (b).



Figure 3(a): Example of the send function display on safety information for Tono city (in the case of using Nintendo "Wii").

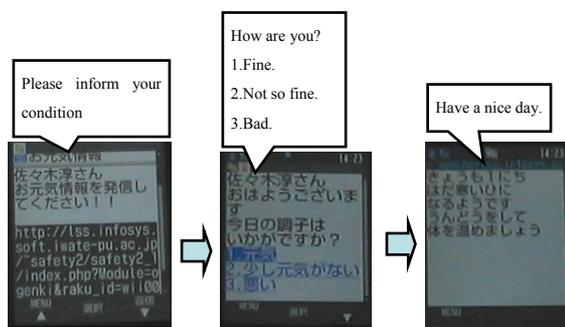


Figure 3(b): Example of the send function display on safety information for Tono city (in the case of using mobile phone).

The safety information could be sent to watching-over people such as neighbours, families and related formal (governmental) officers by e-mail on a mobile phone. As multiple people could be watching over an elderly person, the workload of formal officers decreased even when the number of elderly people was high.

We carried out field tests on the newly developed life monitoring system from December 17<sup>th</sup>, 2007 to February 22<sup>nd</sup>, 2008. Two elderly used the "Wii" and another two elderly people used mobile phones to use the daily safety information sending system. The average age of the four participants was 79. The nine monitors were either family or relatives.

Good results on sending health information were obtained from the elderly people using the "Wii" system. However, the elderly had to undergo a short training program before using the "Wii" remote controller. On the other hand, the mobile phone was not considered user-friendly because users only recognized that the phone could be used as a telephone. There were also problems in that the system might cause some worry in the monitors when the elderly did not send their safety information.

### 3 DISCUSSIONS

From these findings, it is considered that the service in Kawai village was the most practical and successful. The factors leading to this success were:

- (1) In Kawai village, as the population density was very low and the ratio of elderly people was very high, the need to watch over these elderly people was very strong.
- (2) The SWC in Kawai village was very active and provided enough services such as sending different messages daily to the elderly. The responsible organization was clearly the SWC.
- (3) The purpose of the service was to prevent solitary death.
- (4) The monitoring system for the elderly people of Kawai village was developed by the Spiral Model, where functions were added gradually according to the requirement of the users.

In the case of Shiwa town and Tono city, each service for providers and users was developed rapidly, and we can not say whether this was satisfactory. Although the system was developed and evaluated in a short time, it can be used as a function in an information system. If the needs of residents could be surveyed and services focused

then sufficient, successful services could be provided in these areas.

### 4 CONCLUSIONS

This paper introduces a concept of the LSN for elderly people living in rural areas to support their health, safety and comfort. Then, experimental systems related to the main functions of the LSN were introduced including a life monitoring system for the elderly for Kawai village, Shiwa town and Tono city in Iwate prefecture. Based on those experimental results, we describe the information obtained and some of the issues which need to be solved in the future to construct a useful life monitoring system for rural areas.

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