Photo based improvement of virtual living room system using video call to connect family moderately

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I. Introduction

Many senior citizens stay in a hospital, or they are moved into sheltered accommodation. When they live apart from their family, there is a risk of them suffering from serious disturbance in mental ability including delirium due to stress [1][2]. Their family can visit hospital or sheltered accomodation and meet senior citizens so as to reduce their stress and prevent them from suffering serious disturbance. However they might not be able to do so due to epidemics. They can communicate with their family as in the case of life when they live in same house by making constant video calls instead of visit. However, they may feel uncomfortable with constant shooting. We feel a need of the system that they can communicate without feeling uncomfortable even if senior citizens live apart from their family. When we came to think of the place where the families lived in comfortably, the living room came to our mind. Family live freely in the living room, spending much of their time without a strong connection each other. But a person can start a conversation at any time by talking to another person, and the conversation will end naturally without clear termination signal. For this reason, we have proposed "Virtual living room system" [3] that had these feature and reproduced a real living room. We made an experimental system in order to verify the validity of the system and conducted experiments that we had subjects live while using it. In the experiment, we confirm the usefulness of the system. However, we also confirm two problems through the opinions of participants. One is the lack of presence. The system displays an icon on the screen that represents the the information of whether person that lives away from the user is in a certain room or not. The icon is not related to the user, so it may not have made the users feel that they live in the same place. The other is the difficulty of setting up for using the system. Setting up this system is not easy for people who are not very familiar with computer operation. The system will actually be used in a hospital or nursing home. Therefore the staff work in would have to set up the system and help the user use it. They may be unfamiliar with computer operation and probably cannot set up the system and use it by theirselves. In this paper, we propose an improved system based on photos that is created in view of the problem and the actual users.

II. Virtual living room system

A. Real living room

In this section, the main points considered in developing the prototype system [3] is described. The living room is where the family lives comfortably. We think that the system reproduces the real living room connects senior citizens who live apart from their family and their family moderately. Therefore we think that using the system enable the senior citizens to communicate their family and reduce their stress due to environmental changes. We think about the features the living room and some of the features we should have the system reproduce. We decide these feature as below as the feature we should have the system reproduce.

- A person in the living room can see at a glance whether another person is there.
- A person can start a conversation at any time by talking to another person.
- The conversation a person starts ends naturally without clear termination signal.
- When someone leave the living room, people feel the thing.

B. Implementation method

In this section, we discuss the technical elements to build the actual construction of the prototype system [3]. In the living room, you can see at a glance whether family is there. A person needs to be able to know whether the others are the same room when using virtual living room system. On the other hand, people feel a person's leaving the living room when he leaves the living room and a person's entering the living room. A person needs to be able to feel the partner's leaving the living room and entering the living room. The system we have proposed has three functions. One is to show the status of the partner, and another is to activate a video call by voice recognition of a belief word (Fig. 1) and closed it if they stay silent each other for a certain period of time. The other is to display animation when the partner leave the living room and enter the room on the screen (Fig. 2). These functions reproduce the features of the real living room. Therefore we think that these functions can make the users to feel that they are in the same place. The system shows an icon that represents the information whether partner that lives away from the user is in a certain room or not on screen (Fig. 3). The partner

Fig. 1. Video call activated by belief word

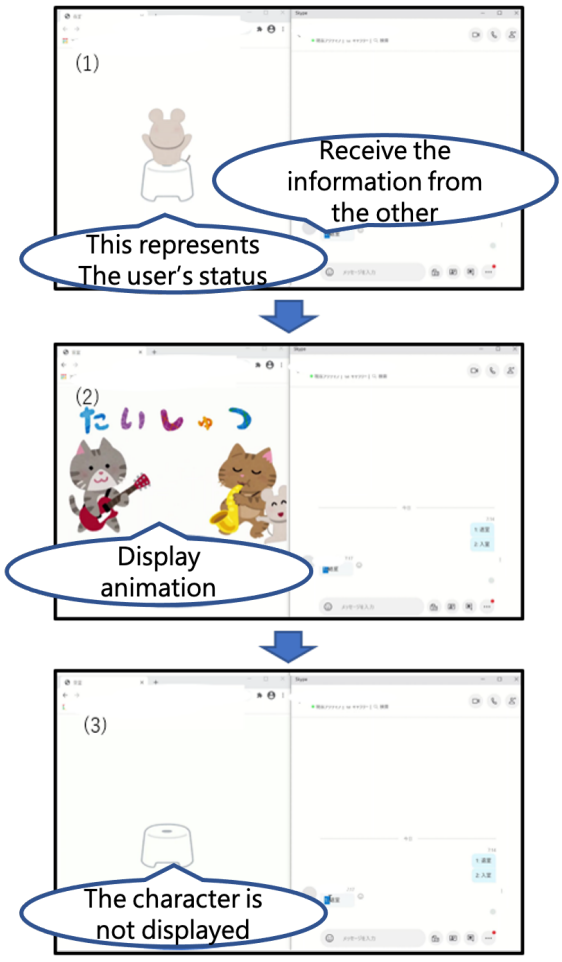

Fig. 2. Animation displayed on the previous system screen when the partner leaves the room

can see the status of the other at a glance. Skype is used as a subsystem instead of developing original video call system. The main system sends the necessary information to the other system through Skype text chat function (Fig. 3). BLE beacons that are been worn by them are used to judge whether they are.

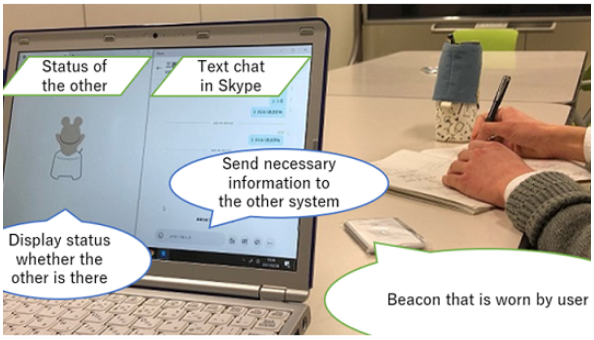

Fig. 3. Previous system screen and appearance of experiment

III. Improvement

A. Photo based notice

We thought that an icon displayed on the screen would be sufficient for the users to know at a glance the status of the other. However, there was no immersive experience, and they did not feel that they were in the same space. Thus, we propose the system that displays users' actual photos superimposed on a photo of the room in which the users actually live instead of the icon and a plain background (Fig. 4). However these functions are not enough because it may be difficult for the user to imagine what the partner does by seeing the photo, and he may not feel that they are in the same room. For this reason, we feel the need of the function that indicates the area where partner is on to the user. The photo of each person moves on one photo of the living room, like moving from one area to the other area, according to the actual their movement (Fig. 5). In addition, the farther away people are, the smaller people looks. Therefore our system displays people who are farther away.

B. Fixed installation beacons and mobile phone receivers

However, it is difficult by using only beacons and one PC as a receiver like as our previous system to realize the functions that estimates the area where the user is on for indicating the area where partner is on to the user. Our previous system cannot estimate the area of a person wearing a beacon when they are in a large room like living, dining and kitchen areas. One solution is to increase the number of PC as a receiver and put on the PCs around the room, but it has a problem with cost. By the way, many people have mobile phones recently. We think that we use the mobile phones as receivers of signal of beacons. We decide that the user sets beacons on the room and carries their mobile phone. We develop an application that signal strength of the beacons and sends the information to the PC. User puts the beacons on the room separately and carries the mobile phone instead of carrying the beacon (Fig. 6). The system can judge the area the partner is on and the user can confirm it.

C. How to setup the system

However it takes time to register photos such as section A and it is difficult for the users to understand what they should do such as section C. In short, it is difficult for the people who

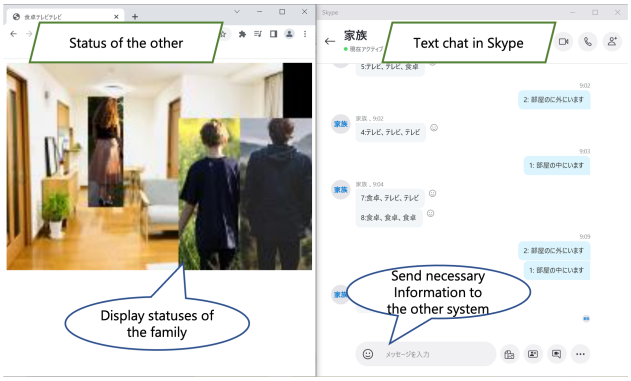

Fig. 4. The screen user sees of the system

are unfamiliar with computer operation to setup the system. This system will be used in hospital or nursing home, and the staff may be unfamiliar to computer operations. Thus, we provide a GUI-based configuration function so that even such people can use the system easily. For setting the system in terms of hardware, user should follow instruction displayed on the system as below.

1–1) For the family side, user puts three beacons on three places of the room separately.
1–2) User clicks the button displayed on the screen of the system works on each person's mobile phone and leaves them as they are (Fig. 7).
1–3) User clicks on the point with the beacon in the room picture from near to far from the camera (Fig. 8).

2–1) For the elderly side, user puts the beacon on the center of the room where elderly lives in and click the button displayed on the system screen and collects it.
2–2) User puts the beacon on near the exit of the room where elderly lives in and click the button displayed on the system screen and collects it.

For setting the both systems in terms of software, user should follow instruction displayed on the system as below.

1) User takes a picture of the room where the family live in and a picture of the room where the elderly lives in.
2) User takes pictures of the each family member and the elderly so that their bodies are the center of picture.
3) User saves the pictures of the people on one side and the room where they live in on PC used on the other side.
4) User clicks the button displayed on the screen to make the system read the pictures. Photos will be cropped to a fixed size.

If the user is not familiar with computer operations, the users can setup the system we propose by following the instruction displayed on the system screen step by step in this way if they finish making Skype's account creation and preparing execution environment of the system.

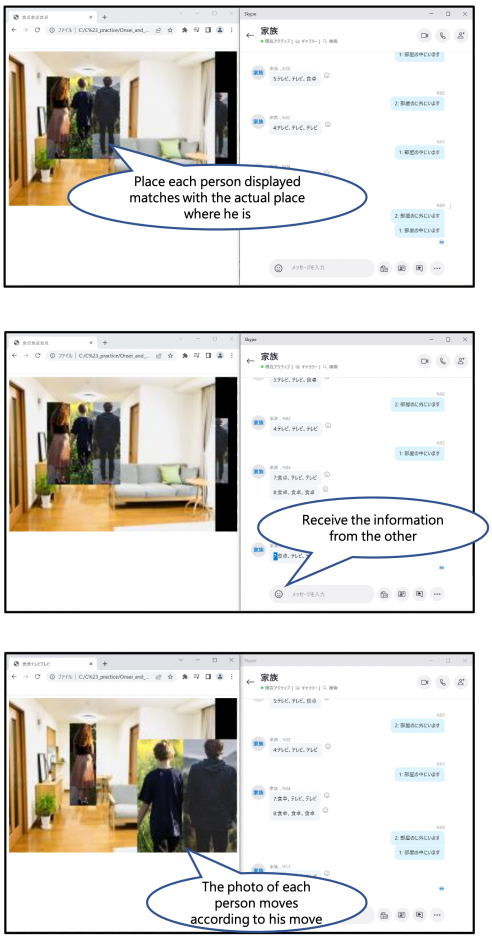

Fig. 5. The change of the system screen user sees

IV. Experiment

A. Outline

We need to see if our systems reproduce the real living room and make the users feel that they live at same place. On the other hand, we need to see if our new system overcome the problem our previous system have. Therefore we conducted experiment that we let the subjects use both our previous system and our new system. First, the participants, an elderly woman and her family, used our previous system in their

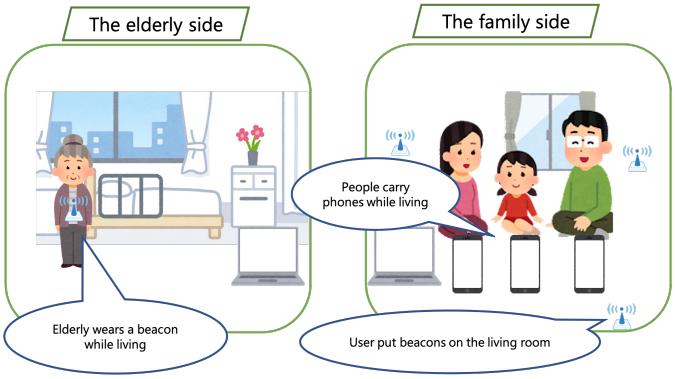

Fig. 6. Usage example of the system

respective homes, which were physically separeted from each other. After a while they used our new system (Fig. 9), and compared these two systems. We obtained opinions from the participants about two systems.

B. Opinion from subjects

In regards to the previous system, we got positive opinions from the subjects as below.

- I felt more freely and comfortably when I live while using this system than when I have lived with constant shooting because camera is on only when necessary.
- I felt free to communicate with the partner, because I did not feel that the connection termination of video chat meant loss of communication with the partner.
- I talked with the partner and communicated with him naturally as when we were in the same space because the video chat terminated when we stayed silent each other.

However, we also got an negative opinion from a subject. An elderly person of them also said that she did not feel that she lived together with their family at the same place because the status of her family that was displayed on screen was an icon. In regards to our new system, they also said that the system reduced the uncomfortable feeling about the constant video call. In addition to the positive opinion, we also obtained a positive opinion from the elderly who was one of the subjects about the presence and operability of the system.

- I felt that we lived together with my family at same place because the system displayed photos of my family and the room photo that we lived in instead of the icon.
- I could have understood the instruction displayed on easily and I could have finished the setting up of the system.
- I was able to finish setting up the system and using the system thanks to easy-to-follow instructions displayed on PC.

C. Consideration

We confirmed three things about our new system. We confirmed that the systems reduced the uncomfortable feeling that they felt when they lived with constant video call. Also, we confirmed that our new system overcame the problem of the previous system about the presence. We confirmed that people who are not familiar with computer operation can use our new system easily.

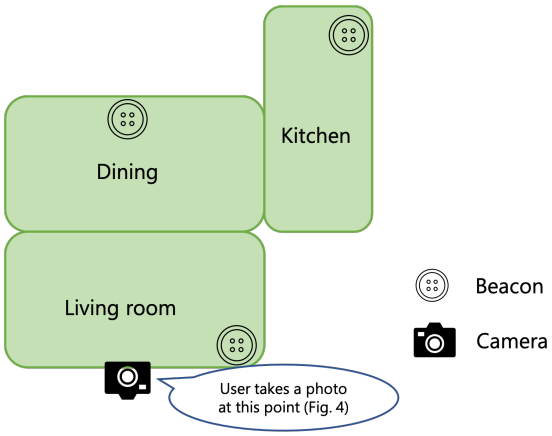

Fig. 7. The example of placing the beacons and taking the picture of the room (family side)

V. Conclusion

In this paper, we proposed an improved system using photos based on our previously proposed system. It was confirmed that the new system was improved about the presence, and made users feel that they live together with their family at the same place. It was also confirmed that the system is easy to use, even for those unfamiliar with computer operations. However, the participants in this experiment did not live in a hospital or nursing home, and the experiment was a simple one, using the system for a few hours. In the future, we would like to confirm the usefulness of this system by having hospital and nursing home residents and their families participate in the experiment and asking for their opinions.

Fig. 8. Setting up the system

Fig. 9. Appearance of experiment (elderly person side)

ACKNOWLEDGMENT

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