Bandage Man: A Spatial Interaction Design in a Sensible Space for Connecting Family

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Abstract. The alienation between family members is mainly caused by the descendant's work and study, which causes that the elderly live in the countryside lonely and cannot be actually concerned and cared by the descendants. Gradually, the relation between family members is alienated. In this paper, the life information of the elderly is recorded with sensing network through furniture. The physical object on the child end can receive the emotional information of the elderly. Through the interaction mode of feeling transmission between the sensing network and Bandage Man, it is to synchronize the inter-generational family affection contact, so as to increase the interaction opportunity between family members and form a feeling concern network between families.

Keywords: Elderly living alone · Feeling network · Man-machine interaction · Family concern

1 Introduction

The difference between the elderly living alone and the ordinary old people is that the elderly living alone must take are of themselves in life, and their difficulties in psychology and life also increase accordingly. Although many elderly satisfied with the way they live, loneliness is still one of the most serious problems mentally. While desire to have some accompany, the asynchronous living patterns with their descendant's time creates inconvenient for both parties. While their psychological demand can be met only with the high concern and assistance of relatives, they need a way of time synchronous design to connect with their descendants.

1.1 Feeling Communication of Asynchronous Life

Due to demand for life currently, most of the descendants are busy with work and seldom contact with their parents actively, while the elderly living alone also dare not disturb the life of their descendants, but they are always willing to help their descendants actively. Because of being strange to science and technology and insufficient economic ability, they do not know how to help their descendants, and the gradual worsening of health causes less action capability of elderly loving alone, and their range of motion is also shrunk gradually. For a long time, the psychological levels of sense of loneliness, sense of existence, wanting to be concerned and accompanied of

the elderly living alone increase continuously. When communicating with others, most of the elderly living alone think that their ideas are correct, and cannot trust the other side, so it is easy to cause problem in the intergenerational communication; on the other hand, because of transnational information fall, there is no common topic. Most of the elderly think their ideas are correct and often cannot accept their descendant's words, and it is felt that it is unable to trust the other sides between two generations, so problem will occur between two generations, and on the other hand, no common topic may promote the further interaction.

1.2   Intergenerational Family Role Influence

Lee [1] Mentioned 3 types of research that can further develop the intergenerational family role: (1) influence of social structure on the family interaction; (2) interactive influence on subjective factor and self-motivation; (3) influence on communication and interaction of self-feeling with the aged parents. The intergenerational family role expands the idea of blending and communication symbolizing the interaction and provides a condition for the interaction and communication between the elderly and their descendants, in which the behavior, hobby, feeling and faith of the elderly are the influential factors. The factors influencing the interaction mechanism between the elderly and the society include education degree, income condition, age and health condition [1, 2].

1.3   Purpose and Method: Find Out the Daily Behaviors of the Elderly Living Alone, Solve the Asynchronous Living Mode with the Family Members

Through the observation method and interview, this paper intends to analyze the interactive relation between the activity range and daily behavior of the elderly living alone, and understand the daily activity behavior of the elderly. Moreover, it aims to analyze the interaction between the actual idea and demand of the elderly and their family members. The methods and steps are as follows:

1. Observe the activity range and daily behavior of the elderly and understand the demand and purpose of daily life
2. Determine the interaction mode with the descendants through the analysis on the daily behaviors
3. Establish the feeling network between the elderly living along and family members through the sensing network between the physical objects
4. Ask parents to actively concern the life condition of parents

2   Literature Review

2.1   Family Concern and Feeling Contact

The intimacy influencing the family relation is the emotional influence of the elderly, and trust and confidence in the family members are the factors to increase the inter-generational interaction between families. While encouraging the elderly to actively concern with the descendants might increase interaction relation between the descendants and the elderly. The elderly provide many resources, while obtain less return, and the elderly are in poor health and the descendants seldom give concern and assistance, which are the main reasons to reduce the interaction between the elderly and descendants.

Ying et al. [3] Proposed a far-distance emotional interaction design to solve the problem of "Empty Nest". The existence of the family members is known through two lamps. Knowing about the life condition of the descendants or parents through simple interaction can also help to concern the other side. Most of the feeling networks need time to cultivate and establish, but because of far distance and the inconsistency in time, the feelings between each other are lost, causing less and less interaction between the family members.

2.2   Sensing Network and Cloud Computing

For the development of physical computing and embedded computing, it is to use computer computing to control the physical subject. The interaction mode is to sense the behaviors of people in contact type and non-contact type; the computer computes and analyzes the data. The result is known from the information processed by the computer, and such model is to transmit the information through input end, output end and the man-machine communication [4] (as shown in Fig. 1). The user steps on the device to transmit the body weight data to the micro-control electronic circuit in the middle; various data are transmitted into the digital signal, which can be read by the computer via the controller. Through the communication of sequence, the signal is transmitted to the computer for computing processing. The computer-processed data are transmitted back to the microcontroller in the middle and then fed back to the users through the electronic subject [5].

Through the concept of distributed computing, the sensed elements are embedded into the furniture and environment in the daily life. Various computing and sensing and display devices are integrated in our living environment, and the daily schedule of the residents and users will not be disturbed. The computed information is feedback, and the information is transmitted to the residents and users in environment, without sensing the existence of technology. The computer communicates with the users to form an interactive space.
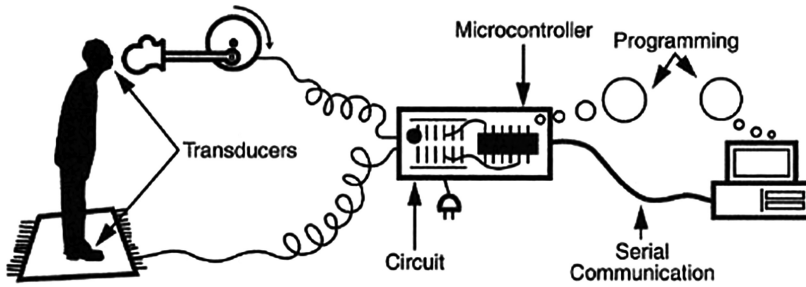
Fig. 1. Physical calculation system mechanism [4]

2.3   C-HANS Model

The Contextual-Human Ambient Network S-C-HANS Model is proposed in [6]. The concept of C-HANS Model respectively includes Network Sever, Ambient Agent, and Human.

Human is the user of activity and behavior of the interaction space. In the space, there is the event of single person and more persons, and different feedbacks will be given according to different conditions. The concept of Ambient Agente is that a communication bridge is established between the computer and sensor in the virtual environment, which is classified into 3 modes, "sensing agent", "event agent" and "response agent". The three models transmit the information sensed by the people in the living environment to the cloud end, through the computing judgment. Based on different information, or the excessive standard, different feedbacks will be made. Network Sever is the hub of the system, which can store the information from different environments, such as the sensing data, user activity, multi-space communication. The collected information is used to know about the environmental condition and the information transmitted by various sensors through the computing analysis, judge the interaction event and make a feedback action. When the data is transmitted to the server in wireless manner in a living environment, the information is written into the data library, while the system records the user habit as the judgment and feedback next time, and the loop interaction continues (as shown in Fig. 2).

3   Contextual Analysis

In this research, 15 elderly living alone above 65 years old are interviewed and their daily lifestyle is observed. Their common behavior and range of daily activity, behaviors and events and the furniture used are sorted out. All the 15 old patients have descendants and they live independently and manage themselves, their descendants work or study in other places. And understand the daily lifestyle of the elderly living alone, and the furniture they usually contact, like chair, bed, TV set, gate, room door kitchen (gas stove), tableware, outdoor vegetable garden and flower watering tool is listed. In this research, the current behaviors and life conditions are known through environment, event, furniture and event, the three situational assumed in this research are as follows:
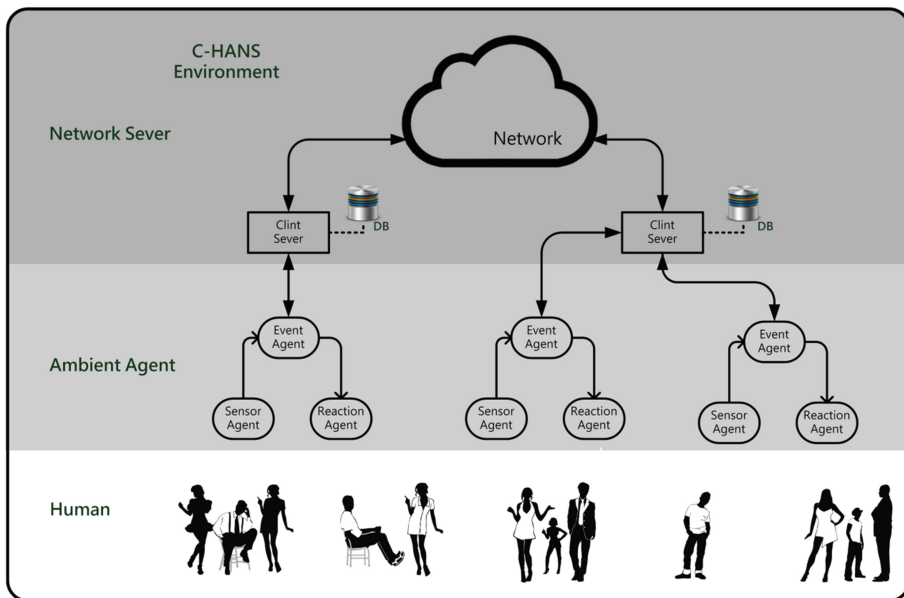
Fig. 2. C-HANS Environment [6]

Scene 1: when the environment is the vegetable garden, the gate and flower watering tools must be contacted, respectively the human infrared detects and temperature sensor detects vegetable garden and flower watering tool. Through the judgment whether it is morning or afternoon, it is able to clearly know that the elderly event is watering in the vegetable garden. Through the time spent in the vegetable garden, it is to judge whether the elderly is happy or worried.

Scene 2: when the environment is the sitting room, the chair and TV set must be contacted. Respectively the pressure sensor detects sitting, the indicative sound sensor detects whether the TV set is turned on, so as to judge that the elderly event is watching TV in the sitting room. Through the force of the sitting chair and the volume of TV set, it is to understand the emotion of the old people.

Scene 3: when the environment is the bedroom, the room door, bed must be contacted, respectively the human infrared detects the going in and out of the room, pressure sensor detects whether it is getting up or going to bed, whether it is morning or evening. Through the time of getting up and going to bed, it is to judge whether the condition of the elderly living alone is good or bad.

4 Experiment and System Design

The digital technology is used to help the interaction between family members, and an emotional network is established. This research analyzes the data about the daily life of 15 old people living alone. The furniture and environmental installation sensors contacted by them are divided into chair with micro switch, bed with pressure sensor, gate

with human infrared, vegetable garden and watering tool with humidity sensor. The sensor transmits the signal according to the activity time of the elderly living alone, the system judges the current event/behavior and whether the emotion is good or not, and the information is transmitted to the cloud system timely via WIFI for judgment. Through the score information, the information is transmitted to the physical entity device. The descendants can see their parents' condition according to the device color, and make a call to their parents, or go home for visit. In the following, scene 2 is taken as an example (as shown in Fig. 3).
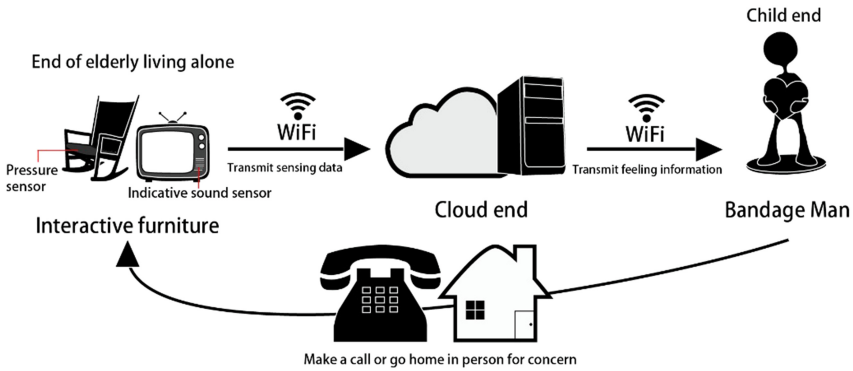

Fig. 3. System architecture diagram of scene 2

Four emotions, including happiness be yellow (50–75), anger be red (75–100), sadness be blue (0–25) and joy be green (25–50) are divided based on the scores (0–100) as the basis for the color of Bandage Man LED in the descendants end, so as to understand the daily condition of the elderly living alone and increase the contact between the old people and family members (as shown in Fig. 4).

Fig. 4. Display of four emotions with colors (Color figure online)

The context of our Bandage Man is mainly located in either the living room of our decent, or the office. According to the observation of living conditions of elderly people living alone, the behaviors are often through furniture sensors to compute behavior that can detect some guessing on the emotional attitudes or changes. Four kinds of emotions, as the displayed in Fig. 4 are divided into four colors representing elderly current mood. As shown in Fig. 5, the Bandage Man is in red, angry or higher temper will trigger decent to concern and contact their elderly to find out what happen and further activate the communication desired by the elderly. These settle reflection will not disturb the current working process and patterns of family members but to amplify the emotion communication as designed.

Fig. 5. Office situational

5   Conclusion

The daily life behavior of the elderly living alone is computed with sensing network through furniture, the daily data are transmitted to the system for computing and judgment, and the life information of the elderly is recorded everyday. The physical subject in the descendants end can receive the emotional information of the elderly. The information between the physical subjects is transmitted to the Bandage Man on the descendants end, and through the color feedback. The descendants can see the life condition of the elderly, and actively concern their parents, so that the asynchronous lifestyle between the generations can synchronize the intergenerational affection connection through the transmission of emotional interaction mode between the sensor and Bandage Man. Hence, the interaction opportunity of family members can be enhanced to form an affection concern network between families. Based on the proposed Bandage Man, further experiments will be conducted on actual users for verification of the design.

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