Study of Community Event Introduction Service for Promoting In-Home Elderly Social Participation

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***Abstract*—Currently, the proportion of elderly population to the total population in Japan is the highest in the world, and the proportion of elderly population is expected to continue to rise in the future. Also, the proportion of elderly people living alone is increasing year by year, and the proportion of lonely and isolated elderly people is increasing. In such a situation, our research group is developing a virtual agent (VA) listening service to listen to the daily lives of elderly people at home. However, this service lacked functionality to engage users in social activities, so there was a challenge in promoting user social participation. Hence, in this study, we proposed and implemented a "Community Event Introduction Service" to promote social participation of elderly people at home by allowing them to learn about community events while interacting with virtual agent. As a result, we were able to implement a service to propose and remind community events through the Virtual Agent Listening Service, promoting social participation of elderly people at home. In the future, we plan to evaluate the Community Event Introduction Service based on the results of long-term evaluation experiments and implement a function to estimate preferences from the dialogue content of the elderly.**

***Index Terms*—virtual agent listening service, social participation, community event introduction service**

I. Introduction

In Japan, the proportion of the elderly population to the total population is the highest in the world, and the proportion of the elderly population is expected to continue to rise [1]. The proportion of elderly people living alone is also increasing, and the proportion of elderly people who are in a state of loneliness and isolation is increasing. Elderly people's social participation leads to their sense of purpose and health maintenance, as well as to the reduction of their social isolation [2].

In response to this background, our research group has developed a Virtual Agent (VA) listening service that uses Virtual Agent to provide psychological care to elderly people living at home by allowing them to talk about their anxieties and worries in their daily lives [3] [4] [5]. The VA listening service provides many microservices in the conversation between the user and the Virtual Agent. However, the VA listening service has the drawback that it does not have a function to promote social activities, so it cannot promote the user's social participation.

The purpose of this study is to promote the social participation of the elderly through the VA listening service. To achieve this purpose, this study proposes a "Community Event Introduction Service" that promotes the social participation of the elderly by introducing community events that match the preferences of the elderly through the VA listening service. To achieve the purpose of this study, the proposed method takes the following five approaches.

A1: Event management
The administrator registers event information in a database according to the schema to digitize the event information.
A2: Setting user preferences
The administrator conducts a survey on the user's preferences and location, and sets the user's preferences based on the survey results. User preferences are information about the user's preferences and location.
A3: Matching users and events
Automatically output events that match the user's location and preferences from event information and user preferences.
A4: Event introduction and selection with virtual agent
Propose information about events that match the user to the user in the conversation between the user and the VA listening service. Specifically, the VA listening service makes multiple event proposals to the user, and the user selects one from them. When the user selects an event, the detailed information of the event is displayed, and the user is asked whether or not to participate in the event.
A5: Event reminders through virtual agent
Remind the user of the event information that the user wishes to participate in. When the user is asked whether or not to participate in the event through the VA listening service, if the user conveys the desire to participate in the event, the information that the user wants to participate in the event is registered in the database of the community event introduction service. As the start time of the event that the user wishes to participate in approaches, the event is automatically reminded through the VA listening service.
Thus, this study aims to complement the lack of social participation in the existing VA listening service by integrating the community event introduction service to promote the social participation of the elderly. The purpose of this study is to promote the social participation of the elderly through the VA listening service. We hypothesize that achieving this purpose will lead to the sense of purpose and health maintenance of the elderly, as well as to the reduction of the social isolation of the elderly. To achieve this purpose, we will realize the proposal of events and reminders of events through the conversation with the VA listening service by coordinating the functions from A1 to A5.

II. Preliminaries

A. Social Participation of the Elderly

Social participation of the elderly is the participation of the elderly in society and the fulfillment of social roles. The social participation of the elderly leads to their sense of purpose and health maintenance, as well as to the reduction of their social isolation. Facilities and services to support the social participation of the elderly are cited as measures to promote social participation. According to the "2022 White Paper on Aging Society" by the Cabinet Office [2], Moreover, the proportion of people who answered that they feel "sufficiently fulfilled" is higher among those who participate in social activities than among those who do not participate.

Fig. 1: Virtual agent [6] [7]. Copyright 2009-2018 Nagoya Institute of Technology (MMDAgent Model "Mei")

B. VA Listening Service

Our research group has developed a VA listening service that uses Virtual Agent to listen to the daily lives of elderly people living at home [3] [4] [5]. The VA listening service is a service that provides psychological care to the elderly by allowing them to talk to Virtual Agent about their anxieties and worries in their daily lives. In the VA listening service, the image of the doll and the chat are displayed on the screen, and it is possible to have a conversation with the user. Figure 1 shows the image of the virtual agent of the VA listening service. The VA listening service provides many microservices in the conversation between the user and the Virtual Agent. One of the challenges of the VA listening service is that it has the function to interact with the Virtual Agent, but it does not have the function to collaborate with social activities, so it cannot promote the user's social participation. To solve this problem, it is necessary to add a function to the VA listening service that promotes the social participation of the elderly.

C. Related Research

We introduce a paper by Katsura and Kitahara [8]. In this research, a net system for the elderly is developed, and it is examined whether the social activities and well-being of the elderly are promoted by promoting the interaction among the elderly through the net system. In this study, it was concluded that it is necessary to consider mechanisms and how to use the Internet that will develop interaction offline, as offline practical experiments have not been conducted.

Here, we introduce a paper by Choi and Lee [9]. This paper summarizes the development trends of ICT interventions designed to reduce loneliness in the elderly, and shows the effectiveness of ICT interventions designed for the elderly in reducing loneliness and social isolation, and for social networks. It has been shown that interacting with software humanoid animation agents that assess the emotional state of the elderly and their daily step count alleviates social isolation. Furthermore, it has been shown that receiving appropriate and healthy feedback from these agents motivates the elderly to engage in physical activity. It is considered that the community event introduction service that promotes the social participation of the elderly through the VA listening service proposed by us also alleviates social isolation and loneliness.

III. Proposed Method: Community Event Introduction Service

A. Purpose and Approach

The purpose of this study is to promote the social participation of the elderly through the VA listening service. To achieve this purpose, this study proposes a "community event introduction service". As mentioned in Section II-B, the VA listening service has the challenge that it cannot promote the social participation of the user. To solve this problem, the community event introduction service promotes the social participation of the elderly by introducing community events that match the preferences of the elderly. The three requirements that the community event introduction service must meet are as follows.

R1: Propose events that match the preferences of the elderly

It is difficult for the elderly to find events that match their preferences from a large number of events. Therefore, the community event introduction service should propose events that match the preferences of each elderly person.

R2: Allow the elderly to know event information in the conversation with the virtual agent

The elderly have the means to know event information, such as the Internet and flyers. However, it is difficult for the elderly to handle digital devices, so it is difficult for them to know event information on the Internet. Therefore, this service should allow the elderly to easily know event information in the conversation with the virtual agent.

R3: Prevent the elderly from forgetting events

It is difficult for the elderly to remember event information for a long time. Therefore, this service should provide a function to prevent the elderly from forgetting events. In this study, to meet these requirements, the following five approaches are taken: (A1) Event management. (A2) Setting user preferences. (A3) Matching users and events. (A4) Event introduction and selection through virtual agent. (A5) Event reminders through virtual agent. In each approach, the functions that meet the requirements are realized.

B. Overall Architecture

The overall architecture of the system is shown in Figure 2. The system consists of the VA listening service, the community event introduction service, the user, and the administrator. The administrator manages event information and sets user preferences. Based on the event information and preferences, events that match the user are proposed to the user from the VA listening service.

C. A1: Event Management

Most of the current local event information is analog and not digitized. In fact, when I visited the Rokko Regional Welfare Center, a facility that holds local events in Nada Ward, Kobe City, Hyogo Prefecture, Japan, and talked to the chairman of the Rokko Fureai no Machi Council, I was told that all event applications at the Rokko Regional Welfare Center are done on paper. That is, to participate in an event

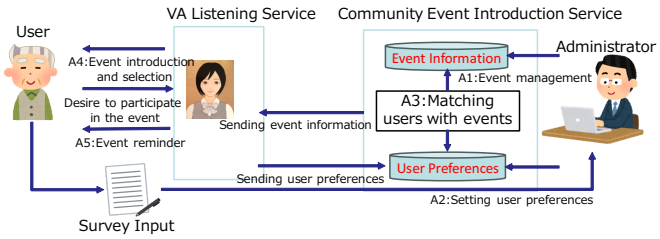

Fig. 2: Overall architecture of the system.

at the Rokko Regional Welfare Center, you need to visit the Rokko Regional Welfare Center, get an application form, fill in the necessary information on the application form, and submit it to the Rokko Regional Welfare Center. However, such work is very cumbersome. Therefore, we think it is very important to digitize the community event information and convey the event information to more people. Hence, we propose to digitize the event information by having the public relations officer of the event register the event information in the database according to the schema. Here, the schema items for event information are "event name", "event start time", "event end time", "event application start time", "event application end time", "event description", "event location", "event participation fee", "whether there is a parking lot", "access to the event", "area where the event is held", "event organizer", "maximum number of participants in the event", "contact information for the event", "URL of the event website", and "image of the event flyer".

D. A2: Setting User Preferences

It is difficult to find events that match one's preferences from the vast number of events in the world. Therefore, by setting the user's preferences and where they live as user preferences, events that match the user's preferences are proposed. Specifically, a questionnaire is conducted on the user's preferences and where they live, and the administrator sets the user preferences based on the questionnaire results. The user's preferences are selected from "travel", "sports", "entertainment", "art", "gourmet", "beauty and health", "real estate", "Internet", "housing", "language", and "pets".

E. A3: Matching Users and Events

1) Overview of Matching: It is very cumbersome to propose events to users by hand based on a large amount of event information and user preferences. Also, event information is updated daily, so there is a possibility that events will be updated and no longer match the user. Therefore, events that match the user's preferences should be automatically proposed to the user based on event information and user preferences. Hence, the community event introduction service has implemented a function to automatically match users and events.

2) Matching Method: To match users and events, tags are assigned to both user and event information. Tags are generated from the user's preferences and where they live,

which are questionnaire items. By assigning tags to users and events, the administrator can match users and events with matching tags. In this study, the purpose is to propose events that the elderly can participate in, so events where the user's place of residence and the event location match are proposed to the user. Specifically, among the events where the user's place of residence and the event location match, events that match the user's preferences are proposed to the user.

F. A4: Event Introduction and Selection through Virtual Agent

It is difficult for the elderly to handle digital devices. Therefore, using the VA listening service, the elderly can know event information in the conversation with the Virtual Agent. First, based on the results of the matching described in Section III-E, the VA listening service receives event information from the community event introduction service, and the VA listening service proposes multiple events to the user. The user selects one event from among them. When the user selects an event, the VA listening service displays detailed information about the selected event and asks the user whether they will participate in the event. As described above, the user can know event information in the conversation with the virtual agent.

G. A5: Event Reminders through Virtual Agent

The elderly tend to forget things, so it is difficult for the elderly to remember event information, event start dates, and start times for a long time. Therefore, a system to remind the event is implemented to prevent the user from forgetting the information of the event they want to participate in. First, as described in Section III-F, when the user selects an event, they are asked whether they will participate in the event. When the user expresses a desire to participate, the information is conveyed to the community event, and it is added to the user preferences. As the start time of the event for which the user has expressed a desire to participate approaches, the event reminder is automatically sent to the user, informing them of the event information. By doing this, the user can prevent forgetting the start time and location of the event.

H. Usage and Sample Description

How the functions of A1 to A5 work together is explained with specific examples. First, the administrator registers event information in the database (A1).

Next, the administrator sets the user preferences (A2).

After that, the community event introduction service matches the user preferences and event information (A3). After that, the matching results of users and events are sent to the VA listening service, and events that match the user are proposed (A4). The user selects an event from among the proposed events. As the start time of the event approaches, the VA listening service sends a reminder to the user based on the database of the community event introduction service (A5). As described above, by coordinating the functions of A1 to A5, the user can know event information in the conversation with the Virtual Agent.

TABLE I: Community Events Overview

Place	Event Name	Overview
Rokko	Chorus Class	Sing at Rokko Station.
Maya	History Study Group	Learn Maya's history.
Rokko	Parent-child Vegetable Cooking Together	Cook seasonal vegetables.
Maya	Child-rearing Circle	Discuss child-rearing.
Rokko	Thread and cloth handicraft club	Craft with textiles.
Rokko	BOUSAI in NADA 2024	Disaster prevention workshops.

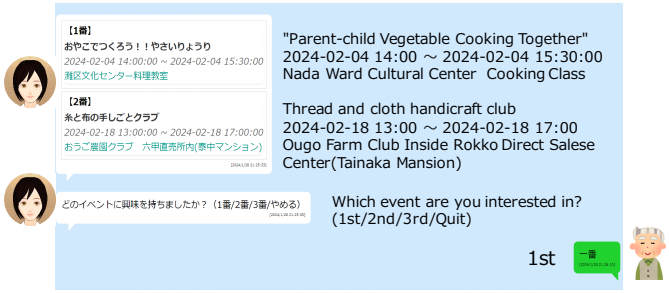

Fig. 3: User event selection screen.

IV. Preliminary Evaluation Experiment

A. Overview of the Experiment

This section describes the preliminary evaluation experiment of the community event introduction service. The purpose of the preliminary evaluation experiment is to confirm the system before verifying the usefulness of the community event introduction service by actually using it for the elderly. Table I shows the event information registered in the database. These events are held in the Rokko and Maya areas around Nada Ward, Kobe City, Hyogo Prefecture, Japan.

"Parent-child Vegetable Cooking Together" is tagged with "gourmet," "Thread and cloth handicraft club" and "History Study Group" are tagged with "art," "Child-rearing Circle" and "BOUSAI in NADA 2024" are tagged with "beauty and health," and "Chorus class" is tagged with "entertainment."

The administrator registered a user named "Mike" and set the place where "Mike" lives to "Rokko." In addition, the administrator set the user preferences of "Mike" to "gourmet" and "art," and set it to propose events with the tags "gourmet" and "art."

As described above, event information and user preferences were registered in the database of the community event introduction service. At this time, it is expected that the two events "Parent-child Vegetable Cooking Together" and "Thread and cloth handicraft club" will be proposed to "Mike" when matching event information and users. Whether these

Fig. 4: Event details screen.

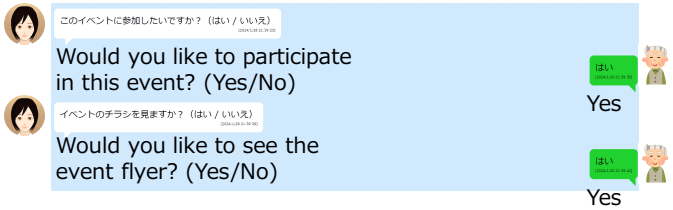

Fig. 5: Event participation screen.

Fig. 6: Event flyer display.

two events are appropriately proposed to “Mike” and whether the user receives a reminder of the event when they express a desire to participate in the proposed event is confirmed.

B. Experimental Results

As shown in Figure 3, two events, “Parent-child Vegetable Cooking Together” and “Thread and cloth handicraft club,” were proposed.

When the user selects “Parent-child Vegetable Cooking Together,” detailed information about the event is displayed as shown in Figure 4.

Fig. 7: Event reminder screen.

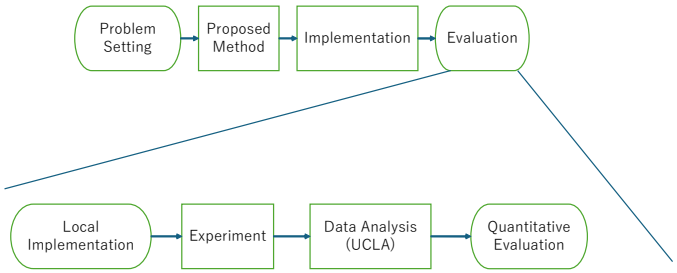

Fig. 8: Research method flowchart.

Next, as shown in Figure 5, the VA listening service asks whether the user wants to participate in the event. Here, when the user answers “Yes”, it is registered in the database of the community event introduction service that “Mike” wants to participate in “Parent-child Vegetable Cooking Together.” This time, it was registered in the database of the community event introduction service because the user answered “Yes.”

The VA listening service displays the event flyer as shown in Figure 6. It is considered that the user is more likely to remember the event information by looking at the flyer.

As the start time of the event approaches, the community event introduction service sends a reminder of the event to the user based on the database. As shown in Figure 7, a reminder of “Parent-child Vegetable Cooking Together” was sent to the user “Mike.” This prevents the user from forgetting the start time and place of the event.

V. Discussion

1) Achievements Obtained through This Experiment: Through this experiment, it was confirmed that users can learn event information by using the community event introduction service. In this experiment, two events, “Parent-child Vegetable Cooking Together” and “Thread and cloth handicraft club,” were proposed to “Mike.” This happened because “Mike” lives in “Rokko” and his interests are “gourmet” and “art.” An event called “Parent-child Vegetable Cooking Together,” tagged with “gourmet,” and another event by the “Thread and Cloth Handicraft Club,” tagged with “art,” were both held in Rokko. That’s why these events were suggested to “Mike.” In addition, it was confirmed that if the user wants to participate in the event, the event reminder reaches the user.

This prevents the user from forgetting the start time and place of the event. As described above, it was confirmed that users can learn event information by using the community event introduction service. It is considered that by using this service, it is possible to promote offline interaction among the elderly, which was raised as a challenge in a paper by Katsura and Kitahara [8].

2) Future Work: Following the flowchart of the research method shown in Figure 8, we have completed the steps up to Implementation, so the next step is to conduct Evaluation. We are planning a long-term evaluation experiment to verify the usefulness of the community event introduction service for the elderly living in Rokko. The plan for conducting the evaluation experiment is shown below. The flow of the evaluation experiment starts with "Local Implementation," which sets up the VA listening service and the community event introduction service to run on the user's device. Next, an "Experiment" is conducted to verify the usefulness of the community event introduction service by having subjects use the community event introduction service through the VA listening service. Based on the data collected here and the results of the pre- and post-experiment questionnaires, "Data Analysis" is performed. The pre- and post-experiment questionnaires use the UCLA Loneliness Scale [10] [11], which is also used in the Cabinet Office's survey on loneliness and isolation, to measure changes in loneliness and isolation among the elderly. Finally, based on the analysis results, "Quantitative Evaluation" is performed to evaluate whether loneliness and isolation are reduced by using the community event introduction service and whether the UCLA Loneliness Scale score decreases. What is expected of the community event introduction service is to promote social participation by allowing the elderly to learn about and participate in local events, thereby reducing feelings of loneliness and isolation.

Currently, based on the results of the user questionnaire, the user preferences are set from "travel," "sports," "entertainment," "art," "gourmet," "beauty and health," "real estate," "Internet," "housing," "language," and "pets" that the user is interested in. In the future, it will be a challenge to estimate the user's interests from the conversation between the user and the dialogue agent and to appropriately change the user preferences so that the user can more appropriately propose events that interest them.

VI. Conclusion

In this study, we extended the previous study "VA listening service" and proposed and implemented a community event introduction service. The background of proposing and implementing this service is that the proportion of elderly people living alone is increasing, and social participation is not yet sufficiently promoted to alleviate the loneliness and isolation of the elderly. The purpose of this study is to promote social participation of elderly people living at home. The approach used five approaches: "A1: Event management," "A2: Setting user preferences," "A3: Matching users and events," "A4: Event introduction and selection through Virtual Agent," and "A5: Event reminders through Virtual Agent." By using the approaches from A1 to A5, we developed a community event introduction service that allows users to learn about events through conversations with Virtual Agent. By using this service, it is expected to promote offline interactions among the elderly.

Acknowledgment

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