

Virtual Agent System to Induce Reminiscence Utterances with the Past and Present Map Information

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Abstract

In recent decades, the increasing number of elderly people with dementia has become a major social problem. Under such circumstances, virtual agent systems aimed at helping with mental health care for the elderly have attracted increasing attention. In this study, we propose a novel virtual agent system that encourages users' speaking about their reminiscences of their hometown or favorite places. The key idea is that the contents that the agent delivers (i.e., speaks) are generated automatically depending on the present and past information about the places in question.

CCS Concepts

• **Human-centered computing** → **Human computer interaction (HCI)**; Interaction paradigms; Virtual reality;

1. Introduction

The increasing number of elderly people with dementia has become one of the most serious social problems. In Japan, it is estimated that the number of such people will reach six million by 2020. Nevertheless, at present, because of the shortage of care workers, it is already difficult to provide enough care to them. In such circumstances, virtual agent systems have attracted attention as a way to increase the users' mental health. [SNYN12] is a listener agent system for elderly people with dementia. The virtual agent asks the user some questions to induce the user's utterances about their memories or memorable experiences. Evoking remembrance of memories and trying to share those with others is referred to as reminiscence therapy. It is known that reminiscence therapy has effects of increasing happiness and quality of life of elderly people with dementia [OTA08]. Obviously, to induce the user to make a large number of utterances in reply to the agent's questions, it is necessary to create questions adapted to each user in order to avoid asking uninteresting ones. However, creating the questions manually taking into account each user's memories and experiences is not realistic in terms of cost.

Hence, we propose a novel virtual agent system to induce user's utterances about their reminiscence using Google Street View. The agent speaks to the users about topics of their hometown or favorite places. In addition, the topics are generated by taking into account both the present and the past information about those places.

2. Proposed System

Figure 1 shows an overview of our proposed system. In the system, the user is able to stroll anywhere they want to visit (e.g., the



Figure 1: System Overview

hometown, a memorable travel destination, and so on) in Google Street View. The virtual agent (shown on the right side of Figure 1) talks to the user about places and things at or near their location. For example, "50 m ahead, there is a post office. It has existed since 1970." or "100 m ahead, there was a mulberry field in the past; now, instead of that, there is a cafe." As shown in the above examples, the utterance of the agent includes information about the location on both the present and the past. Typically, the dementia patients remember past events better than recent ones. Because of this, our system uses the past information as a trigger to induce more reminiscence utterances by users.

3. Method

Figure 2 represents the proposed system diagrammatically. The system is comprised of a Street View Module and Dialogue Gener-

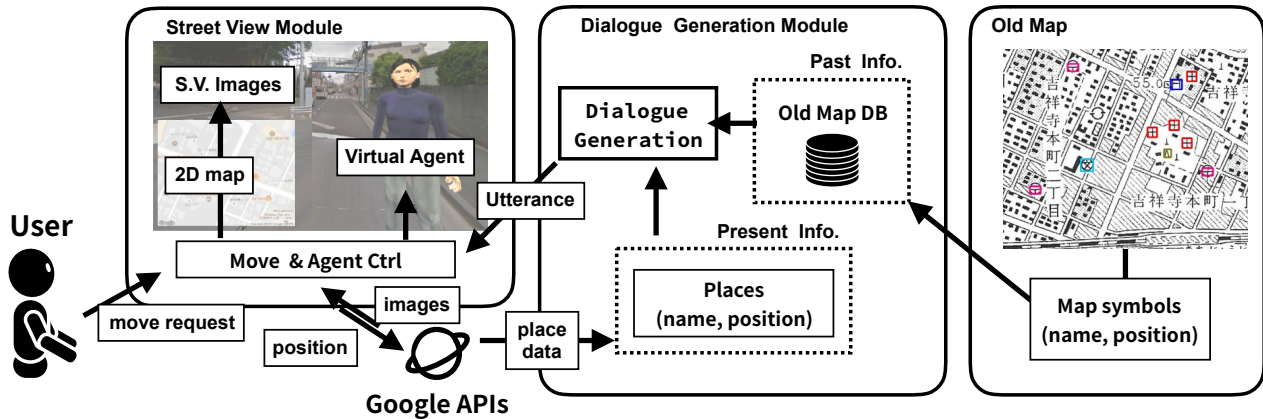


Figure 2: System Diagrams

ation Module. The former enables the user to stroll around his/her favorite locations via Google Street View. The latter generates the contents of the agent's utterances taking into account both present and past (derived from the old map) information.

3.1. Street View Module

The Street View Module is implemented in 3D virtual space using the Unity game engine and Google Street View API. Street View uses images according to the user position, which is received from the Google API, to construct the virtual space, updated in response to the movement requests from the user. In addition, as seen in Figure 1, a 2D map image around the current user's position is displayed on the lower left of the display.

3.2. Dialogue Generation Module

As mentioned above, the contents of the agent utterances depend on both information about the present and the past of the surroundings the user. We used Google Place API for getting present information and old maps for getting past information.

3.2.1. Present information

To get information on the present, we used Google Place API. When this module receives a signal updating the user position from the Street View module, it retrieves names and positions of shops or public buildings (e.g. schools, post offices, parks, etc.) that exist around the user position from the Google Place API.

3.2.2. Past information

To get the information on the past, we created an old map database in advance with the following steps. First, we obtained an old paper map issued in 1976 and scanned it to a digital image file. Various symbols that indicate positions of places such as schools, temples, fields, and so on are printed on the map. Second, we chose sixteen relatively typical map symbols and extracted their positions in the map coordinate system with OpenCV pattern matching (on the right in Figure 2). Finally, we converted each symbol's position

to the global coordinate system with a simple geometric operation. This is possible because the paper map has the global positions (longitude and latitude) of its four corners. We stored these symbol names (types) and global positions in a map database.

3.2.3. Utterance Generation

Finally, the agent utterances are generated by comparing the present and past information. This changes depending on whether each present building or place identified from the past exists in the same position. Because positions of map symbols obtained as above do not represent the exact location where they stood, the system determines the match when the types of two locations (the present and past) are the same and the distance between them is less than 10 meters.

4. Conclusion and Future Work

In this paper, we proposed a virtual agent system using Google Street View. In the proposed system, the user is able to stroll around their favorite places via Street View, and the agent asks them questions about those places. It is generated based on past and present information about the places in question. Future works should involve three tasks: implementing responses of the agent to the user's reminiscence utterances; supporting move control with actual motions, such as stepping exercises, to increase the opportunity to exercise for the elderly; and conducting an evaluation experiment in a nursing home to confirm the effectiveness the proposed system.

References

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