Human-Agent Experience Sharing: Creating Social Agents for Elderly People with Dementia

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ABSTRACT

As intelligent technology steadily becomes a part of modern societies, people collaborate with agents more frequently, and so agents need to be socially intelligent, i.e. personalised and context-sensitive. This paper introduces a context-sensitive personalisation framework for social agents that facilitates the establishment of human-agent relationships by sharing past experiences through personal conversation, and sharing new experiences by engaging in joint activities together. We apply the framework in a robot application for the dementia care practice: ReJAM - Robots engaging Elderly in Joint Activities with Music.

CCS Concepts

•**Human-centered computing** → **HCI theory, concepts and models;** •**Social and professional topics** → **Seniors;** •**Applied computing** → *Consumer health; Psychology;*

Keywords

human-agent experience sharing; elderly; robot; social; dementia

1. INTRODUCTION

Intelligent technology is ever more pervasive in modern societies, requiring people to increasingly collaborate with intelligent agents, such as avatars, robots, smart home systems, and other intelligent user interfaces that tap into users' daily habits and routines to provide suitable support, feedback, and recommendations [7]. This development - agents becoming a part of society and interacting with humans - has a vital consequence: agents will not only need to be intelligent, they also need to be social [9]. Agents must be capable of establishing long-lasting personal, well-embedded, confidential, and respectful relationships with people. In order to establish such relationships, agents must meet two crucial requirements: personalisation and context-sensitivity, i.e. modeling the user and interpreting the user's situation based on real world personal data.

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2. EXPERIENCE SHARING

This paper introduces a personalisation framework facilitating the establishment of human-agent relationships through context-sensitive *experience sharing*. The framework applies two mechanisms that both aim to develop human-agent relationships through experience sharing [1, 4, 5]:

Sharing past experiences. Triggered by a stimulus (e.g. a song, a picture, a video, or a social network post), the agent engages in conversation with the user about the memories of past experiences evoked by the stimulus. Exactly which stimulus is used, depends on the context of the application (also see Section 3). The framework uses an expressive domain-specific knowledge representation, i.e. an ontology, to engage in conversations about the stimuli and to gradually construct a user model containing personal information about the user. The agent uses its knowledge about the user - as available in the ontology - to determine the intimacy of the relationship. The agent reciprocates by discussing things deemed appropriate for that level of intimacy.

Sharing new experiences. Based on the user's (social) context and preferences, the agent invites the user to engage in joint activities so as to share and create new experiences together. The agent identifies the people present in the room using face and speech recognition. It uses their identities to access the associated user profiles, which are created manually beforehand and are appended automatically with the information acquired during interaction (e.g. when sharing past experiences or when participating in joint activities). The agent uses information about the number of people present (e.g. solitary, dyad, or group activities) and their preferences (e.g. likes to play games or not) to personalise the proposed activities and the content of the activities. The agent continues to personalise its behaviour using a feedback loop (e.g. sensing the users' emotional responses). This feedback loop enables the agent to personalise its interaction to the needs and desires of the users, and their social context.

3. APPLICATION DOMAIN

The framework is currently used in the ReJAM project[1], which aims to develop **R**obots engaging **e**lderly in **J**oint

[1]http://www.rejam.nl

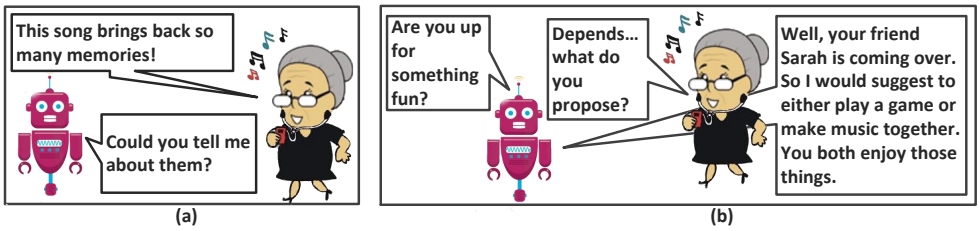

Figure 1: The agent and the user develop a relation by sharing (a) past experiences and (b) new experiences

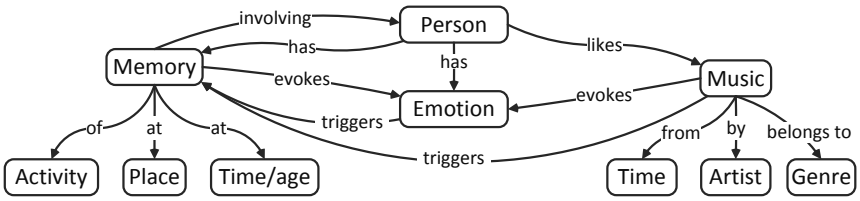

Figure 2: The ontology which describes the main human-agent experience sharing concepts for dementia care

Activities with **M**usic. The objective of ReJAM is the promotion of physical, cognitive, emotional, and social well-being [6]. The main target group of ReJAM are elderly with dementia (also see Figure 1(a) and (b)).

Sharing past experiences in ReJAM: Research shows that talking about past experiences is particularly beneficial for elderly people with dementia. Patients are still able to recall past experiences until advanced stages of the disease, and reminiscing about the past helps improve their mood and well-being [2]. As music has been shown to activate memory in people with dementia [6, 8], ReJAM uses patients' favourite music to initiate past experience sharing: we use music as a stimulus because the context of the application is always music-related. The ontology describes that music can trigger memories (also see Figure 2), and so when a song is played - especially in the context of the reminiscence activity - the agent can infer that it is reasonable to ask whether the music evokes any special memories. If the user confirms, the agent can use the information about memories available in the ontology to ask follow up questions, e.g. about the associated location or people involved. The user's answers to these questions are stored in the ontology for future reference, resulting in the construction of a model of the user's life story.

Sharing new experiences in ReJAM: A common challenge in dementia care is apathy of the patient. At advanced stages of the disease patients become passive, causing family, friends, and caregivers to experience a deterioration of their relationship with the patient [3]. ReJAM aims to motivate people with dementia to engage in activities with their social environment, by proposing music-related activities, e.g. playing a game with other patients, reminiscing with their spouse, or singing a song with their grandchildren. All activities are designed to scale from individual settings to group settings, making ReJAM well-suited for a broad range of social contexts.

4. DISCUSSION & CONCLUSION

In this paper we presented our framework for human-agent experience sharing. The framework enables agents to share both past and new experiences with their users. The framework is currently implemented in a proof-of-concept for the dementia care practice. Future research aims to investigate its effects on the human-agent relationship.

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