Designing Robotic Avatars

Are user's impression affected by avatar's age?

Angie Lorena Marin
Department of Interaction Science
Sungkyunkwan University
Seoul, Korea
angielorena@gmail.com

Doori Jo
Department of Interaction Science
Sungkyunkwan University
Seoul, Korea
jdl6427@nate.com

Sukhan Lee
Department of Interaction Science
School of Information and
Communication Engineering
Sungkyunkwan University
Suwon, Rep. of Korea
lsh@ece.skku.ac.kr

Abstract— **This paper explores the relationship between the aging cue of a robotic avatar and the level of intelligence and safety perceived by the elderly as users. This initial study found that the avatar aging cue indeed, affects the elderly in their perception of the embodied robot, in terms not only of its intelligence but also of its safety: the elderly perceived the robot more intelligent and safer with older avatars.**

Due to the fact that the elderly perceived the aging cue of avatars as an effect of their expectation and interactions with the robot, the finding related to the avatar-user aging cue influences in the design of a series of attributions of the embodied robot. Therefore, the result of this study can provide interaction designers with a guideline in creating the visual appearance of an embodied agency in terms of its aging cue.

Index Terms—**Robotics, Avatar, Embodied agent, Elderly, Aging cue, Interfaces, User experience.**

I. INTRODUCTION

There has been a rapid growth of service robots developed for the elderly during the last decades. Aging population is a worldwide phenomenon, with the median age of the world population estimated to rise approximately to 38.1 years in 2050 from 26.7 years in 2000 [1]. As aging population is intrinsic to the advancement in medicine [2], it prompts the development of novel technologies such as service robots that help solve problems associated with older adults.

For the development of service robots for the elderly, the Almere Model [3] has been proposed as a means to predict and explain the social acceptance of the designed service robots. Service robots use a variety of techniques to portray a face, ranging from the mechanically animated face like Kismet [4] to the graphically animated face shown on a display attached on the body of a robot. For the face displayed on a screen, the portrayal of facial representation by an animated figure includes the embodied conversational agent and/or the avatar.

Using an avatar as the visual representation of an embodied agent for consumer robots that do not have a physical head could increase the sense of sociability and tendency to use. Furthermore, the true challenge in designing the avatar interface for a system that includes autonomous agents is representing the state of those agents.

There is always a possibility that anthropomorphic representations convey in the wrong expectations about agent's capabilities, especially during avatar's initial exposure. [5].

This study investigates the effects of aging cue in the user's perception of the robotic avatars, with the primary consideration of interaction guidelines intending to leverage the resulting effects and improve older adults' user experience.

The study reported in this paper, employs avatars designed by ourselves. Female cartoon characters that specifically allow us to explore whether these avatars with different grade of age similarity with the user produce any effect impressions for an assistant robot.

For older adults, what is the relationship between the robotic avatar with different grade of avatar aging cue and the perceived intelligence and perceived safety? Therefore, we hypothesize the following:

A.   *Hypothesis*

- H1: The older adult's perceived intelligence of the robot will show a variation for each type avatar with different grade of age similarity.
- H2: Regarding older adults' emotional state during the interaction with the robot, the perceived safety will be affected by type of robotic avatar. Younger or/and older.

II. METHOD

A.   *Participants*

Forty older adults were recruited to participate at Jongno Senior Welfare Center in Seoul, Korea. They were randomly assigned to one of two conditions: younger robotic avatar, older robotic avatar. The mean age of the participants was 74.7 years (SD=6.16).

B.   *Stimulus materials*

The robot used in this experiment was "Homemate", a cognitive consumer robot with a female voice. Two different types of female avatar were edited to make two grades of age similarity, one younger cartoon avatar and one older cartoon avatar.

The avatar age similarity grade consisted on visual codifications of aging. For that we have highlighted differences in design for length and color of the hair, well defined wrinkles marks in the face and the neck area, eyes shadows, lips make-up, and glasses "Fig. 1".
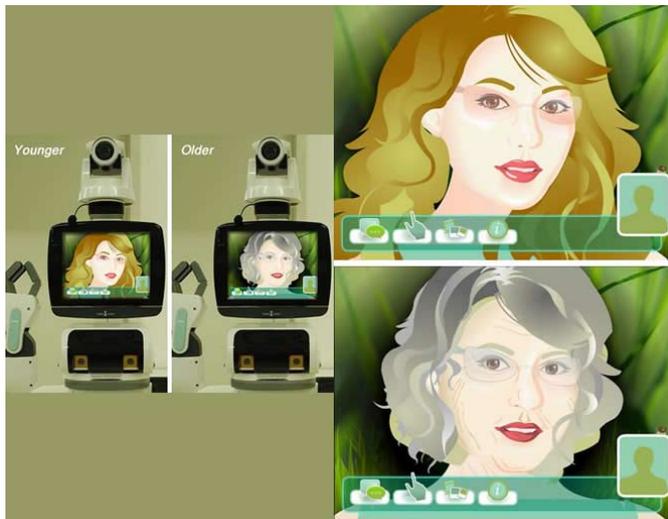

Fig. 1. Younger and Older avatar stimulus in Homemate robot.

C.   *Measures and procedure*

This study adapted the Godspeed questionnaires to measure users' perception of robots [6]. Perceived intelligence was assessed using: Incompetent/Competent and Foolish/Sensible. And the perceived safety was assessed using two questionnaire items for rating the participant's emotional state: Agitated/Calm and Quiescent/Surprised.

The robot approaches them and the experimenter briefly explains the capabilities of "Homemate" using the same discourse in both conditions for each older adult. During the exposure to "Homemate" robot, participants answer the 4 items questionnaire. By the end two more questions were asked for demographic and manipulation check purposes: First, the participant's age, and second, how old they think the avatar is.

III. RESULTS

Data from a total of 40 responses was analyzed.

A multivariate analysis was implemented for each one of the items evaluated and the hypothesis testing shows the following results:

For the participants Perceived Intelligence concept there was a statistical significance of older adults' perceptions for Incompetent/Competent (p=.001) Foolish/Sensible (p=.137)

perceiving the older avatar as more competent. For perceived safety Results showed that elderlies considered their own state interacting with the younger avatar as more surprising and their own state interacting with the older avatar as more quiescent. Quiescent/Surprised (p=.015) Agitated/calm (p=.289).

IV. DISCUSSION

Interaction designers of robotics avatars should be aware of the user's impressions for the selection of appropriate representations, behaviors and visual characteristics. These visual adoptions might have a dramatic effect on the user's judgment of the agent and the perceived intelligence and perceived safety which the user places upon the robot during the interaction.

Our results can contribute in the interaction design for a robotic avatar for a cognitive consumer robot "Homemate". This robot gives elderly assistance with errand services, communication and entertainment tools for older adults. Investigate which is the more reliable way to achieve user expectations about robots, from the interaction design to the technical and engineering implications that it conceives is strongly needed.

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