Chapter 57
Human-Robot Communication Based on Self-Serving Bias for Daily Exercise Support

Takenori Obo
Tokyo Polytechnic University, Japan

ABSTRACT

This paper presents a health promotion system with robot partner for elderly care. Aging society in Japan has been a big serious problem. The number of caregivers is not enough in the current situation and is not expected to substantially increase in future. Hence, comprehensive care and health promotion should be provided to heighten awareness about health. In this study, we built a daily exercise support system with a robot partner utilized as an exercise instructor. Moreover, we propose a human-robot communication model based on self-serving bias. In the experiment, we conduct a demonstration experiment and interview survey to discuss the validity of the communication model.

INTRODUCTION

Aging society in Japan can be a big serious problem. According to the National Institute of Population and Social Security Research, the increase of elderly individuals living alone is estimated to reach into approximately 37.7% overall by 2035, and to 44% in Tokyo area. Caregivers should take time to support elderly people regularly. However, the number of caregivers is currently not enough, and it is not expected to sufficiently increase in future. Elderly care has been shifting from hospital care to community-based care and home care, but this can lead to raise the burden on their family members. Therefore, a comprehensive care provided by their local communities is becoming more essential for elderly people.

Information and Communication Technology (ICT) has recently been used for various health care applications (Clark, 2015; Haluza, 2015; Anguita, 2012; Boulos, 2011; Blaya, 2010; Street, 2013; Bemelmans, 2012). We can easily obtain a wide variety of information by using smart devices (e.g. smartphones and tablets). However, it is said that most elderly people are still not really familiar with ICT. In fact, there are many elderly people that avoid unfamiliar smart devices and complicated ICT applications.

DOI: 10.4018/978-1-5225-8060-7.ch057

Meanwhile, according to annual report published by Ministry of Internal Affairs and Communications, the internet population of seniors (aged 60 years of age and older) has been increasing steadily over time: the population in their 60s reached nearly 75% at the end of 2014. This indicates that ICT could be necessities for their life if the devices would be more human-friendly for them.

Integration of a smart device and human-friendly robot can be a solution to realize a human-friendly system. Smart devices such as smartphones or tablet PCs provide us with the human-friendly interface and the easy access to every type of information such as (1) personal information, (2) environmental information, and (3) Internet information in addition to (4) people, (5) place, (6) objects, and (7) events. Furthermore, such smart devices are equipped with various sensors and a high-end CPU that is enough to be applied to a robot partner. We have developed smart device interlocked robot partners for elderly care (Obo, 2016). The robot partners are utilized from viewpoints of different interaction styles: physical robot partner, pocket robot partner, and virtual robot partner. Physical robot partner can interact with a person by using multi-modal communication like a human. Pocket robot partner can be easily brought as a portable smart device everywhere. The virtual robot partner is in the virtual space within the computer, but we can interact with it through avatars in the virtual space. The interaction styles of these three robots are different, but they can share the same personal database and interaction logs. This functional flexibility leads to a comprehensive health promotion for the users, e.g., lifelogging, user modeling, and daily exercise encouragement.

Health promotion is one of the most important tasks to improve quality of life (QOL) and quality of community (QOC) for elderly people. The purpose of health promotion is to reassess their lifestyle in order to heighten awareness about health. To manage own health continuously, they should have self-confidence to achieve it. Such belief in own capabilities to achieve a goal or an outcome is called self-efficacy in psychology. Self-efficacy can be enhanced by apparent success and effect of own efforts. However, without the clear feedback, it can be difficult for elderly people to continue with a habit of daily exercise. Therefore, the quantitative evaluation and objective advice are required to motivate them to take an action for their health maintenance.

This paper presents a daily exercise support system with a robot partner utilized as an exercise instructor. The robot partner can give elderly people an opportunity to incorporate daily exercise into their life. In previous works (Ono, 2015), we have proposed a model of human-robot communication based on Maslow's hierarchy of needs. As a result of the investigation, advice and compliment could lead to increase the level of motivation for daily exercise with the robot partner. Especially, compliment were an effective means of communication to have a positive relationship with an elderly person. On the other hand, there were concerns that some persons might blame every poor result for their abilities when a person could not receive positive feedback very well. In this study, we therefore propose a human-robot communication model based on self-serving bias. The self-serving bias refers to a human tendency to attribute successes to personal factor, and failures to situational or external factors. To prevent a decrease of self-efficacy, we model a human-robot communication to attribute good exercise performance to personal factor, and bad performance to the robot instruction.

This paper is organized as follows. Section 2 describes the robot partners and surrounding systems. Section 3 shows a health promotion system for daily exercise support with a robot partner. Section 4 explains the details of the proposed human-robot communication model. Furthermore, Section 5 shows the experimental results and interview survey to discuss the validity of the communication model. Finally, we summarize this paper, and mention the future direction of this study in Section 6.