Chapter 55
Behavioral Analysis of Human-Human Remote Social Interaction Mediated by an Interactive Robot in a Cooperative Game Scenario

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ABSTRACT

This book chapter describes the implementation, testing, and evaluation of the first prototype of the "AIBOcom" system, which allows remote users to play an interactive game cooperatively each using a pet-like robot as a social mediator. An exploratory pilot study tested this remote communication system with 10 pairs of participants who were exposed to two experimental conditions characterised by two different modes of synchronisation between the two robots that each interacts locally with the participant. In one mode, the robots incrementally affected each other's behaviour, while in the other, the robots mirrored each other's behaviour. Instruments used in this study include questionnaires, video observations and log files for the game state. The authors used various techniques to measure engagement and synchronization such as quantitative (e.g. rate of occurrence and average values) as well as qualitative measurements. In an exploratory data analysis, these multiple sources of data reflecting participant performance and characteristics were analyzed. Significant correlations were found and presented between the participants as well as participants' preferences and overall acceptance of such communication media. Findings indicate that participants preferred the mirroring mode, and that in this pilot study, robot-assisted remote communication was considered desirable and acceptable to the participants. Furthermore, the existence of interaction variations among different demographic groups was found, while this chapter lists and interprets the most significant effects.

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INTRODUCTION

Nowadays, more people occasionally or permanently live far away from their friends and families, and therefore, remote communication is essential to maintain and strengthen relationships. Current remote communication technologies offer voice and video interaction between distanced users, however, they do not offer tactile sensation (touch) as an important medium that could be transferred over distance. Touch might provide more interactive and enjoyable communication if the means of interaction are designed appropriately and are acceptable to users. Such technology might include a device worn by the user (e.g. tactile gloves (Folgheraiter & Vercesi, 2005)) or robots in various forms and shapes which have been used for domestic entertainment purposes with some of them offering advanced social interaction with humans (Fong, Nourbakhsh, & Dautenhahn, 2003). In order to investigate the role of touch on distanced communication, we developed a novel computer application named AIBOcom to socially connect the users and undertake the communication between the robots (Papadopoulos, Dautenhahn, & Ho, 2010). We used the AIBO ERS7[1] from Sony for the role of an interactive robot because of its advanced technology, pet-like appearance and positive proven acceptability by its users (Bartneck, Suzuki, Kanda, & Nomura, 2006). In our exploratory experiment we decided to choose a small sized robot that easily fits on a normal computer desk and can freely perform the required pet-like behaviour.

AIBOcom is a remote communication system that allows two users to play individually with their robot and also cooperate with each other in an interactive game through existing video communication software by utilizing two AIBO robots in order to maintain and enrich their distant relationship (Bos, Olson, Gergle, Olson, & Wright, 2002). AIBOcom controls two AIBOs, each interacting with a remote user, providing the ability to play a 2-player game via the AIBOs (Figure 1). The human-robot interaction was designed and developed bearing in mind both robot and human perspectives for robot "sociability" (cf. Breazeal, 2004; Dautenhahn, 2007). In this game, users were required to guide their virtual characters out of a maze game (Figure 2-right side) using the AIBOs as an interaction tool while at the same time interacting with the robot. Importantly, each robot is an autonomous system with its own set of behaviours, sensing abilities, and internal variables ("needs," cf. Avila-García & Cañamero,

Figure 1. AIBOcom system components for each participant. The Interface and the connector is located on the computer side while the robot program runs on the robot hardware.