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SOCIAL ROBOTS FOR LONG-TERM SPACE MISSIONS

Abstract

On space missions, astronauts are faced with multiple physiological and psychological challenges. To improve performance and productivity, specific support is required and usually provided by ground control. However, this communication is indirect and not situated. Furthermore, on remote missions real-time connections can no longer be maintained. Thus, portable and socially interactive systems, which can accompany the crew on board, offer a solution to overcome these problems and provide a way of direct, situated interaction.

Nowadays, robots and other assistance systems are already supporting humans in various domains, e.g. in robot assisted therapies, rescue efforts, advanced driver assistance systems, educational services et cetera.

However, socially assistive robots (SARs) have not yet been explored for such domains. SARs can improve task performance through individual, effective and adaptive interaction. In addition to social interaction, they are able to give support, feedback and assistance and can keep track of progress towards goal achievement.

Hence, our research goal is to evaluate the benefits of SARs for humans under extreme conditions such as isolation, physical and mental stress on long-term missions. Moreover, we study the concept of social interaction as a tool for efficiently realizing tasks and goals accompanied by robots. Specifically, long-term social interaction with humans is a challenging task for an artificial system.

In this paper, we present concepts and first implementations for a three-week control-group isolation study in the DLR AMSAN isolation lab. Based on findings from human-human interaction, we focus on two robotic interaction scenarios: Within the first, we tackle physiological challenges of long-term space

flight. Here, the robot takes the role of a coach for indoor cycling, supporting the users' physical training. The system adapts to individual performance and distinct needs of each user. This steady and fine tuned training interaction may reduce physiological problems during long-term space flight. The second scenario aims at assessing beneficial effects regarding social and cognitive interaction. Here, the robot could offer games, education and a neutral partner. During interactions, the systems tracks and evaluates the current state (e.g. emotional state) of the users and adapts its behavior. We will report results of first interaction studies in these scenarios.

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