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EVALUATION OF TRUST IN A VIRTUAL ASSISTANT UTILIZED FOR ENHANCING CREW AUTONOMY

Abstract

Communication delays during Long Duration Exploration Missions (LDEMs) may result in untreated emergencies. To mitigate these possible in-flight anomalies, and to enhance mission and crew safety, crew autonomy is essential for efficient on-orbit operations, especially when the ground support is not readily available. Virtual Assistants (VAs) are Artificial Intelligence (A1) agents that have demonstrated improve human performance in safety- and time-critical operational environments where timely intervention is required. Daphne is a VA designed to assist the astronauts in detecting, diagnosing, and resolving similar in-flight emergencies. The VA interface was designed in accordance to human-computer interaction principles, and it was tested inside a laboratory environment (n=12), and inside NASA JSC's Human Exploration and Research Analog(n=16). Subjects were recruited from university students (novices) and astronaut-like population (experts). Participants' trust in automated VA was evaluated using Jian's Trust in Automation survey. During laboratory study, the subjects worked individually to resolve five different spacecraft simulated anomalies. Their overall trust was measured to be 30.67 +/- 2.83 (Mean +/- SE). For analog study, each subject worked both individually and in a group of four. The overall trust was measured to be 25.95 +/- 3.03 (Mean +/- SE) for individual sessions, and 30.60 +/- 3.14 (Mean +/- SE) for group sessions. We also analyzed the data to understand if there was any effect of individual differences of chosen subjects such as sex, previous experience, and age to understand how it alters their trust in an AI (artificial intelligent) agent. The impact of training and expertise between laboratory (novice) and analog (expert) participants is also evaluated. The implications of these results and lessons learnt are summarized to develop understanding of how humans interact with AI agents in the context of spacecraft anomaly resolution. The findings are also generalized to generate guidelines for use of such VAs in future human spaceflight missions beyond Low Earth Orbit (LEO).