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ANSIBLE: Virtual reality for behavioral health

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Abstract

We describe a virtual reality telecommunications ecosystem developed under funding from NASA entitled ANSIBLE: A Network of Social Interactions for Bilateral Life Enhancement. ANSIBLE is a communication support toolset which enables multi-faceted human-human and human-virtual agent interactions designed to accommodate technical and environmental limitations of long duration space flight. The primary objectives are to address communication limitations and provide telehealth options to combat behavioral health threats in future long duration exploration class missions. The system is current being evaluated in a human subject study that takes place at the Hawaii Space Exploration Analog and Simulation (HI-SEAS) facilities in Waimea, HI. There, an international mixed gender group of scientists are undergoing adjustments in physiology and lifestyle that are analogous to some of the challenges in a confined environment over twelve month isolation mission under Mars-exploration conditions (e.g. with communication latencies and blackouts, in close quarters, under restricted water and energy use). Preliminary analysis show that the ANSIBLE treatment group scored better perceived social closeness and perceived relationship satisfaction in self-report surveys compared to a control group who participated in a prior eight month isolation mission in the same facility and used only conventional asynchronous communication methods (i.e. email, voice and video recordings). In the real world, verbal interactions go hand-in-hand with interactions with tangible things. Virtual items can be called upon to serve as powerful and meaningful aides for communications. We posit that the observed increase in social connectedness is due to the affordances of VR, where situational contexts that are often not communicated in traditional telecommunications are made explicit in the virtual world.

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1. Introduction

Future manned exploration class spaceflight missions beyond lower Earth orbit present unprecedented challenges in engineering as well as the psychological support to future astronauts. An estimated network latency of 22 minutes each way will impact communications between Space and Earth, which in turn will influence the crew's autonomy. The potential no-abort and no-resupply scenario can add to anxiety and stress during a two and a half to three year mission to Mars. Evidence from historic spaceflight and analogs such as research stations in Antarctica also suggest that prolonged durations of social and sensory monotony can adversely impact psycho-social health (see [1] for review). While sensory monotony is not sensory deprivation or sensory loss, sensory deprivation and sensory loss have been linked to changes in communication and psychosocial skills (e.g. [2] and [3]). Asynchronous (i.e. non-real time) communication technologies are currently limited to email and instant messaging. Communications often go hand-in-hand with tangible objects and environmental contexts. Limiting the persistence of all interactions in telecommunications to text, voice, or video is unnatural, but VR can unleash new dimensions of interaction that allows for shared manipulation of objects and shared experiences, leading to increased shared mental models and social

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connectedness, which facilitate efficient communication. We describe A Network of Social Interactions for Bilateral Life Enhancement (ANSIBLE), a persistent world used in an ongoing experiment at a Mars surface simulation facility involving an international crew of six individuals conducting a twelve month isolation mission [4].

2. Method

We began the design process by performing an extensive literature review of real-world stimulus and experiences that have been shown empirically to improve psychological wellbeing. We then categorized possible content and strategies, and evaluated the feasibility of implementing them in a virtual environment. Sample categories include nature-inspired scenes for combating sensory monotony, virtual agents as actors for combating social monotony, opportunities for calling positive memories and reflecting on gratitude, participating in cultural and familial rituals, creating shared experiences, perceiving work as meaningful, and capabilities for creative pursuits.



Fig. 1. Nature inspired virtual environment implemented in ANSIBLE where subjects can visit independently or with others.



Fig. 2 Simulated Mars astronauts leaving messages for their friends and family around a festive dinner table.

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