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Task Description:	This task is part of the Human Capabilities Assessments for Autonomous Missions (HCAAM) Virtual NASA Specialized Center of Research (VNSCOR). The research objective of this proposal is to investigate the impact of using Virtual Assistants (VA) to support crew members in the context of anomaly treatment during Long Duration Exploration Missions (LDEM), when ground support will be limited. A VA will be developed building upon the software architecture from existing VAs developed by the Principal Investigator (PI) for similar purposes. The VA will provide support for various aspects of anomaly treatment, including detecting and diagnosing the anomaly, as well as recommending a course of action. It will also have the ability to take initiative in the dialog with the user (mixed-initiative mode), and the ability to provide explanations for its actions. The impact of the VA on performance, cognitive workload, situational awareness, and trust, will be assessed through a set of three experiments with human subjects in a laboratory environment. The first experiment will establish the baseline impact (master-slave, no explanations), and subsequent experiments will study the effect of switching to the mixed-initiative mode and adding explanations. The system will also be deployed and tested in the Human Exploration Research Analog (HERA) analog environment.
Rationale for HRP Directed Research	h:
Research Impact/Earth Benefits:	This project will provide standards and guidelines that will help NASA design similar virtual assistants to support astronauts during future long duration exploration missions. Such standards and guidelines will concern both the functionality and the user interface of the virtual assistant.
Task Progress:	This project is one of seven projects in the Virtual NASA Specialized Center of Research (VNSCOR) for Human Capabilities Assessments for Autonomous Missions (HCAAM). The goal of our project is to develop a virtual assistant to help astronauts with anomaly resolution in long duration exploration missions. In the first year of this project, we have completed a project definition phase in which we have more crisply defined the scientific objectives and the technical approach to design the virtual assistant. We started by selecting the Environmental Control and Life Support Subsystem (ECLSS) as the technical scope for the virtual assistant. Which we are getting ready to test in our laboratory at Texas A&M University in the next month. Specifically, in this first year, we have accomplished the following: 1) We have defined the high-level requirements and overall software architecture of the virtual assistant. 2) We have defined how the virtual assistant will interface with the Human Exploration Research Analog (HERA) infrastructure. 3) We have developed the first very basic prototype of the virtual assistant which includes: a) a simple anomaly database; b) a simple database containing knowledge about how the ECLSS system works in HERA and how to perform some maintenance and repair operations; c) an interface with the HERA simulated telemetry feed, which provides a data stream with all the measurements of the ECLSS subsystem; d) a web-based graphical user interface containing a main plot window displaying the telemetry feed and a chat box to chat with the virtual assistant, i.e., the one that knows how to answer it; f) the first version of the back and of the software, which is precisely the part of the software that performs the calculations needed to answer the questions and requests from the user. While this first prototype is not sophisticated in terms of the beccabe and a chat box to chat with the virtual assistant were containing a not window displaying that develop and a chat box to chat us the neastive which
	In the next few months, we will keep adding functionality to the assistant so that it can answer more questions better and provide more useful information to the user. We anticipate that some rework of the telemetry feed interface will be necessary to adapt to some changes on the HERA side. We will also refine the user interface with the results from the pilot. We are getting ready to conduct a preliminary design review in March before delivery to HERA. Between March and August 2020 we will work on integrating our software with HERA. We will conduct a Critical Design Review in June 2020 and an Operational Readiness Review in August 2020, right before ingress. Between August 2020 and September 2021 we will support the 4 missions of the C6 HERA campaign.
Bibliography Type:	Description: (Last Updated: 02/21/2025)

Papers from Meeting Proceedings	<ul> <li>Dutta P, Balcells Quintana O, Viros A, Whittle RS, Poonampreet KJ, Beebe N, Dunbar BJ, Wong RK, Diaz-Artiles A, Diaz-Artiles SD, Ana Selva D. "Virtual Assistant for Anomaly Treatment in Long Duration Exploration Missions."</li> <li>Presented at the 2020 AIAA SciTech Forum, Orlando, FL, January 6-10, 2020.</li> <li>Paper AIAA 2020-2255. 2020 AIAA SciTech Forum, Orlando, FL, January 6-10, 2020.</li> <li><u>https://doi.org/10.2514/6.2020-2255</u>, Jan-2020</li> </ul>
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