Fiscal Year:	FY 2019	**Task Last Updated:**	FY 05/24/2019
PI Name:	Lee, John Ph.D.		
Project Title:	HCAAM VNSCOR: Conversation Analysis to Measure and Manage Trust in Virtual Assistants		
Division Name:	Human Research		
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Program/Discipline--Element/Subdiscipline:			
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **HFBP**:Human Factors & Behavioral Performance (IRP Rev H)		
Human Research Program Risks:	(1) **HSIA**:Risk of Adverse Outcomes Due to Inadequate Human Systems Integration Architecture		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	jdlee@engr.wisc.edu	**Fax:**	FY
PI Organization Type:	UNIVERSITY	**Phone:**	608-890-3168
Organization Name:	University of Wisconsin, Madison		
PI Address 1:	Department of Industrial and Systems Engineering		
PI Address 2:	1513 University Ave		
PI Web Page:			
City:	Madison	**State:**	WI
Zip Code:	53706-1539	**Congressional District:**	2
Comments:			
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Contact Monitor:	Williams, Thomas	**Contact Phone:**	281-483-8773
Contact Email:	thomas.j.will1@nasa.gov		
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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 goal of this research is to develop conversation analysis to measure and mitigate inappropriate trust in virtual assistants. These trust measurements will guide system design, particularly the multimodal interactions and mode switching, as well as how to mitigate over trust and trust recovery. We will use conversation analysis to measure trust at multiple time-scales from real-time interactions to longitudinal monitoring of trust over a long duration exploration mission. Conversation analysis provides a promising, but relatively unexplored approach to measuring trust. We propose a conversation analysis at the micro, meso, and macro levels which includes not just the words, but also pauses and facial expressions. Specifically, at the micro-level, conversation elements include voice inflections, pauses between works and keystrokes, gaze shifts, and facial expressions. The meso-level analysis includes words exchanged during interactions with the virtual assistant along with other team interactions as they relate to the automation. At the macro level, conversational analysis considers interaction time, interaction effort, frequency of interaction, turn-taking, barging in tendency, and whether it is the person or the virtual assistant who initiates the interaction. Additionally, prior research into conversational analysis indicates there are novel ways of managing or calibrating trust through the presentation of information, e.g., manipulating the tone and cadence of the system when using speech and through facial expressions (Nass & Brave, 2005; DeSteno et al., 2012). Due to time delays in communication, long duration exploration missions will require greater crew autonomy and greater reliance on automation. For this approach to work trust calibration needs to be engineered into the system. Trust is a critical construct that mediates how well human operators use automated systems, such as virtual assistants, that provide decision support. Trust affects people's willingness to rely on automated systems in situations that have a degree of uncertainty and risk. Trust strongly affects the effectiveness of human-agent collaboration, particularly in the willingness to accept suggestions from a virtual assistant. Knowing whether or not to trust automation can be further complicated by lack of sleep, workload, task risk, and task complexity. Moreover, as we continue to push the limits of intelligent systems and rely on them more as decision aids trust calibration (i.e., operator trust is at a level which matches the automation's capabilities) becomes essential to mission execution. Appropriate calibration of trust requires matching the operator's trust to the virtual assistant's current capabilities. Calibration of trust is not something that can happen once, but must occur throughout the life cycle of the interaction between operator and automated system (Hoffman et al., 2009). Trust is a dynamic construct that continuously increases and decreases due to a number of factors, primary the performance of the automated system, i.e., higher performance leads to higher trust and vice versa. Although much effort focuses on creating more capable and trustworthy automation, less effort has considered the equally important consideration of creating trustable automation. Trustable automation is automation that is understandable and that naturally promotes calibrated trust. Therefore, we aim to create trustable automation by continuously measuring operators' trust unobtrusively and in real-time, and then use this measure to guide the virtual agent to employ one or more countermeasures to calibrate trust and improve human-system performance. DeSteno D, Breazeal C, Frank RH, Pizarro D, Baumann J, Dickens L, Lee JJ. Detecting the trustworthiness of novel partners in economic exchange. Psychol Sci. 2012 Dec;23(12):1549-56. http://doi.org/ ; PubMed PMID: 23129062 Hoffman RR, Lee JD, Woods DD, Shadbolt N, Miller J, Bradshaw JM. The dynamics of trust in cyberdomains. IEEE Intelligent Systems. 2009 Nov-Dec;24(6):5-11. https:// Nass C, Brave S. Wired for Speech : How Voice Activates and Advances the Human-Computer Relationship. Cambridge, MA: MIT Press, 2005.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2019.
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