Announcing the Final Examination of Daniel Barber for the degree of Doctor of Philosophy

Time & Location: October 29, 2012 at 9:00 AM in Partnership II 301
Title: INVESTIGATION OF TACTILE DISPLAYS FOR ROBOT TO HUMAN COMMUNICATION

Improvements in autonomous systems technology and a growing demand within military operations are spurring a revolution in Human-Robot Interaction (HRI). These mixed-initiative human-robot teams are enabled by Multi-Modal Communication (MMC), which supports redundancy and levels of communication that are more robust than single mode interaction. (Bischoff & Graefe, 2002; Partan & Marler, 1999). Tactile communication via vibrotactile displays is an emerging technology, potentially beneficial to advancing HRI. Incorporation of tactile displays within MMC requires developing messages equivalent in communication power to speech and visual signals used in the military. Toward that end, two experiments were performed to investigate the feasibility of a tactile language using a lexicon of standardized tactons (tactile icons) within a sentence structure for communication of messages for robot to human communication. Experiment one evaluated tactons from the literature with standardized parameters grouped into categories (directional, dynamic, and static) based on the nature and meaning of the patterns to inform design of a tactile syntax. Findings of this experiment revealed directional tactons showed better performance than non-directional tactons, therefore syntax for experiment two composed of a non-directional and a directional tacton was more likely to show performance better than chance. Experiment two tested the syntax structure of equally performing tactons identified from experiment one, revealing participants’ ability to interpret tactile sentences better than chance with or without the presence of an independent work imperative task. This finding advanced the state of the art in tactile displays from one to two word phrases facilitating inclusion of the tactile modality within MMC for HRI.

Major: Modeling & Simulation

Educational Career:
Bachelor’s of Computer Engineering, BS, 2004, University of Central Florida
Master's of Computer Engineering, MS, 2006, University of Central Florida

Committee in Charge:
Lauren Reinerman-Jones, Chair, Grad. Studies/M&S
Stephanie Lackey, Grad. Studies/M&S
Florian Jentsch, College of Sciences/Psychology
Alexander Leonessa, ME/Virginia Tech

Approved for distribution by Lauren Reinerman-Jones, Committee Chair, on October 14, 2012.

The public is welcome to attend.