Human Robot Interactions Advanced Topics

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Date and Time: October 13, 2010 - 11:00am-12:00pm

Location: SEC 3437

Abstract:

Lockheed Martin's Advance Technology Laboratory (ATL) Human Robot Interaction (HRI) group specializes in technologies addressing unique problems in the use, control, and interaction between humans and unmanned systems. Key research topics include human-robot teaming, shared control of unmanned systems, operator span of control, organic robot interaction capabilities, and mechanisms to support human trust in autonomous systems. This talk will focus on our research in shareable world models, teleoperation and cooperative management of multiple unmanned vehicles (UxV).

Teleoperation still remains the primary method of control for many of today's military UxV's. The focus of this research is to improve teleoperation through the development of exocentric views that can be used in real world environments. Previous work has noted the benefits in using a virtual exocentric camera however; this work is incompatible with use in real world environments. Our objective with this work is to start addressing these issues.

There will be times when multiple humans need to control multiple UxV's. To accommodate these situations we have developed a control technology that provides operators with a collaborative, mission-centric Command and Control (C2) environment that facilitates cooperative management of multiple UxVs. This technology has focused on a paradigm shift in multi-vehicle operations from vehicle-centric, in which operators are tied to specific vehicles, to mission-centric, in which operator tasks are assigned based on mission needs.

The previous two research topics have focused on UxV's as tools which works well within certain mission parameters. However, there will be missions where the preference will be for UxV's to perform more as a team member and not as a tool. We have begun to explore this area looking at how a human-robot team will be able to collaborate during a mission. This work is currently focused on creating a shareable world representation. We have noticed that incompatible world representations are a key obstacle to the goal of sharable, actionable situational awareness across a heterogeneous team of agents. In this research we are developing an approach that will facilitate the sharing of information between heterogeneous robots and between humans and robots. The ultimate aim of this research is to enable robots to maintain an "actionable awareness" of the environment.

Biography:

Dr. E. Vincent Cross, II is a Senior Research Scientist at Lockheed Martin's Advanced Technology Laboratories where he is a part of the Intelligent Robotics Lab: Human Robot Interaction group. Dr. Cross's research is in improving human-robot tele-operation for ground vehicles and unmanned air vehicles, exploring novel techniques for improving communication between humans and robots working as a team and in improving the operator to robot ratio through multimodal interface design. He is the principal investigator for the Intelligent Robotics Lab Augmented Robotic Operator Situational Awareness project which is researching improvements to situational awareness through alternative views for human robot tele-operation and is Co-PI on the Actionable Shared Situational Awareness project. Dr. Cross received his Ph.D. in Computer Science from Auburn University and has over 10 peer-reviewed articles and has obtained more than $500k in funding.