

S&T Campaign: Human Sciences
Integration of Humans and Systems
Humans in Multi-Agent Systems

Jessie Y.C. Chen, PhD
(407) 384-5435
yun-sheng.c.chen.civ@mail.mil

Research Objective

- Investigate the effects of agent transparency on human-autonomy teaming effectiveness
- Develop human-autonomy teaming principles, based on the *Situation awareness-based Agent Transparency (SAT)* model (Chen et al. 2014), to enable effective mixed-initiative team performance and decision making



Situation awareness-based Agent Transparency Model
(Chen et al., 2014, ARL Tech Report ARL-TR-6905)

Challenges

- Understand the elements of each level of SAT and the interconnections among the levels
- Identify effective ways to present SAT information dynamically to human operators
- Perform research on technology that does not yet exist, using simulation and surrogates



Soldier-machine interface developed based on the SAT model
(Autonomous Squad Member project)

ARL Facilities and Capabilities Available to Support Collaborative Research

- ARL-HRED Human-Agent Teaming Laboratory (Orlando, FL)
- Simulation testbeds for human-in-the-loop experimentation:
 - Mixed-Initiative eXperimental (MIX) Testbed (developed by Institute for Simulation & Training – University of Central Florida)
 - FUSION Testbed (developed by US Air Force Research Laboratory)
- State-of-the-art multi-screen eye-tracking capabilities
- ARL expertise: human factors, human performance assessment, evaluations with Soldiers, human-agent teaming, trust and transparency research

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- Expertise in
 - Team processes with autonomous systems
 - Human-robot bidirectional communications
 - Mixed-initiative decision making
 - Information visualization
- Testbeds to evaluate human-robot/agent interactions, including:
 - Multimodal and natural language interfaces
 - Team processes
- Innovative solutions for human-robot/agent teaming challenges
- Create a human-agent communication framework that can be dynamically tailored to real-time user needs to convey agent status, plans, reasoning process, and projected outcomes.

References

- Chen, J.Y.C., & Barnes, M.J. (2014). Human-agent teaming for multi-robot control: A review of human factors issues. *IEEE Transactions on Human-Machine Systems*, 44(1), 13-29.
- Chen, J., Procci, K., Boyce, M., Wright, J., Garcia, A., & Barnes, M. (2014). *Situation Awareness-based Agent Transparency* (Tech Rep. ARL-TR-6905). Aberdeen Proving Ground, MD: U.S. Army Research Laboratory.
- Mercado, J. Rupp, M., Chen, J., Barber, D., Procci, K., & Barnes, M. (in press). Intelligent agent transparency in human-agent teaming for multi-UxV management. *Human Factors*.