EdgeRobot Summer Research Seminar #3

Time: Friday 8/12 1:30pm - 3:00pm PST (Pacific Standard Time)

Zoom Link: https://csudh.zoom.us/j/2187602128

Title: "*A Leadership Framework for Heterogeneous Autonomous Robots Teamed with a Human Collaborator"*

Abstract: Lowering costs, combined with technological breakthroughs, has allowed for larger-sized teams of robots with dissimilar capabilities to realize greater sensing precision and to cover larger spatial distances in search missions. Furthermore, they can conduct more complex tasks through strategies such as sub-team formation. Scaling up the size of this autonomy amplifies the challenge of maintaining the robustness and effective collaboration with the autonomy when teamed with a human remotely. Additionally, the joint cybernetic system of humans and autonomy needs to compensate for uncertainty and the divergence between the reality of a dynamic environment and the autonomy's control model (system knowledge). New strategies for resilient bi-directional communication under uncertainty are required to facilitate this teaming. In this talk, I will discuss a proposed framework for leadership within automation that persists and is risk aware.

Leadership is defined as individual behavior that influences the type of, time of occurrence, and duration of a group's activities and exists to solve social coordination problems. It is a universal feature of human societies. Our position is that any social model of collaborating robots would necessarily benefit from a similar structure as exhibited in human social dynamics. The similarity extends from the need for collective action whereby the decision-making model requires an individual to initiate some direction and others acquiesce to that leader.

The design concerns for the leader-followers concept are guided by the challenges of autonomic computing, whereby the system should be self-configuring, self-healing, self-optimizing, and self-protecting. It will be implemented by probabilistic runtime models to prescribe the emergence of our desired behavior.

Biography: Dr. Mark Allison is an Associate Professor of Computer Science at the University of Michigan at Flint where he directs *the laboratory for intelligent software systems*. He received his Ph.D. in Computer Science from Florida International University, specializing in Software Engineering and Artificial Intelligence. He conducted his sabbatical year at Carnegie Mellon's Robotics Institute within the reliable autonomous systems lab. Mark's research interests span model-driven software engineering, reinforcement machine learning, and autonomous systems, with focused work in human-robotic teaming. Complementary, he seeks to understand effective strategies for inclusive computer science education.

This work has resulted in 28 peer-reviewed publications with one best paper award. His research has been supported by funding agencies such as the National Science Foundation (NSF) and the Department of Education (US DoE). Mark has served on numerous review panels for the NSF, US

Department of Energy's Advanced Research Projects Agency (ARPA-e), and the Canadian Foundation for Innovation. His work also extends outwards into the community; most notably in the role of principal investigator for a collaborative project with Google, successfully developing `MyWater-Flint` a software platform with predictive analytics to address the Flint water crisis. He was the faculty advisor for UM-Flint's ACM and UPE student chapters and is co-vice president of the Southeast Michigan chapter of MENSA International.