#### ABSTRACT

Improved implementation of multi-agent robot assisted additive manufacturing (RA-AM) could significantly reduce the production time of a given part whilst economically facilitating indefinite print volumes. Currently, the material extrusion (MEX) process utilizes cartesian printers with fixed axes defined by a gantry system. By contrast, proposed RA-AM using dual SCARA robots i) increases mobility enabling a theoretically infinite x-y plane at the cost of increased computational complexity, and ii) provides for heightened likelihood of error. This necessitates a more intelligent control scheme and a cyber-physical platform with sufficiently advanced infrastructure and modularity. This thesis study describes research towards developing a “Just-in-Time” (JiT) schema which uses controlled segmentation of command execution and timed client-to-printer server network requests as a trigger to poll external sensor systems for data of variation across micro, meso-to-macro scale, while minimizing overhead. The effectiveness of the system was measured using sensory perception tracking positional resolution and error of RA-AM agent movements made during extrusion, allowing for optimization of printing parameters and an improvement of print part dimensionality by as much as 500%. Analysis of comprehensive logs of timing data indicate implementation of JiT incurs no significant overhead, while offering precise control over printing processes and in-situ monitoring that will significantly aid future RA-AM system development.