Carleton University

Department of Mechanical and Aerospace Engineering

Graduate Webinar Series

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Addressing Current Challenges in 3D Printing for Industrial Applications

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Abstract

Fused Filament Fabrication (FFF) also called Material Extrusion (MEX) is a 3D printing technique that can process a wide range of materials. Currently, there are major challenges for the widespread application of FFF 3D printing. They include the following: low structural performance of 3D printed polymer parts; limited simulation and predictive capabilities; underexploited manufacturing flexibility; traditionally small build volume; immature quality inspection; low interlayer properties, and lack of material characterization data. In the Facility for Research on Aerospace Materials and Engineered Structures (FRAMES) in Aerospace Engineering Department at Ryerson University, we investigate the complete cycle of 3D printing to address these challenges. In this presentation, our work on robotic 3D printing of continuous carbon fiber composites, variable stiffness 3D printing, laser line inspection, and in-process warping detection using machine learning will be discussed.

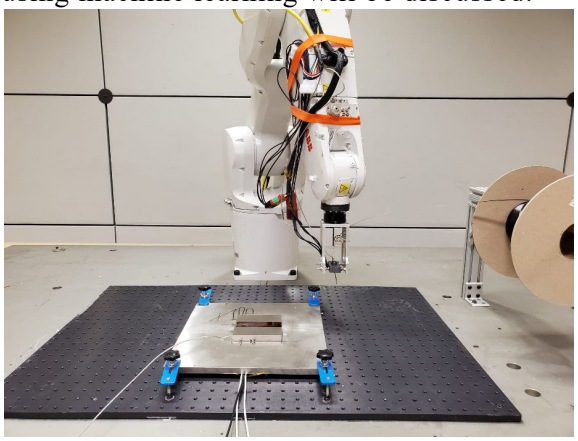

Figure 1. A robotic 3D printer with custom-built head for processing PAEK-CF.

Bio

Dr. Kazem Fayazbakhsh is an Assistant Professor in the Aerospace Engineering Department at Ryerson University. He is the Principal Investigator of the Facility for Research on Aerospace Materials and Engineered Structured (FRAMES). His research focus is on the complete cycle of 3D printing: design, analysis, manufacturing, quality inspection, and testing. Large-scale robotic 3D printing of composites and automatic process monitoring using machine learning are two examples of his active projects. Previously, he was a development and methods analyst at STELIA North America Inc. and managed R&D projects in aerospace composite structures. He was also an industrial representative for composites research theme projects with the Consortium for Research and Innovation in Aerospace in Quebec (CRIAQ). He received degrees of B.Sc. and M.Sc. in Aerospace Engineering from Sharif University of Technology, and a Ph.D. in Mechanical Engineering from McGill University.