Mechanical Engineering Thesis Defense

"3D printing of micro-bots for Biomedical applications
Using micro-Continuous liquid Interface production "

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Abstract

Advancements in three-dimensional (3D) additive manufacturing techniques have opened up new possibilities for healthcare systems and the medical industry, allowing for the realization of concepts that were once confined to theoretical discussions. Among these groundbreaking research endeavors is the creation of micro-robots that can be actuated through non-invasive methods, including electromagnetic, light, sound, and magnetic actuation. Magnetic actuation, in particular, offers the advantage of untethered operation. In this study, a photopolymerizable resin infused with Fe3O4 oxide nanoparticles is employed in the printing process using the micro-continuous liquid interface production technique. The objective is to optimize the manufacturing process to produce microstructures characterized by smooth surfaces and reduced surface porosity, resulting in enhanced structural rigidity. Various intricate structures are fabricated to validate the printing process's capabilities. Additionally, the bending stiffness of these 3D-printed structures is evaluated in the presence of an external magnetic field, facilitating the characterization of these structures. This research serves as a foundation for the future design and development of micro-robots using micro-continuous liquid interface production technique

October 30, 2023; 11 AM; ERC 490;
Zoom Link: https://asu.zoom.us/j/85174032447