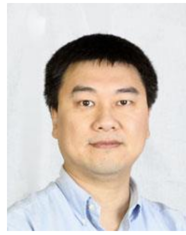
The Department of Mechanical Engineering
College of Engineering and Applied Sciences
Stony Brook University

Mechanical Engineering Seminar



Cheng Sun
Associate Professor, Mechanical Engineering Department
Northwestern University

Lecture Title: High-throughput 3D Printing of Functional Biomedical Devices

Thursday, September 8, 2016 at 1:30 PM, Room 173 Light Engineering Building

Abstract

Advancements in healthcare have opened up the promising opportunities for personalized medicine to improve patient outcomes while decreasing costs. However, widespread adoption remains a major challenge due to the additional time and expense required to individualize treatments to patient-specific conditions. Three-dimensional (3D) printing is an emerging technology with the potential to fabricate personalized biomedical devices at low cost with extremely short lead-time. Recent achievements in the field have utilized 3D printing to manufacture arterial stents, airway tubes, bones, and dental prosthetics with relative large dimensions. However, there remains a knowledge gap for the fabrication of biomedical device with fine feature size without compromising the fabrication speed. I will talk about a highly scalable 3D printing system - continuous liquid interface production microstereolithography (μCLIP) with sub-10 um fabrication precision.

I will present our recent development of fast 3D printing of completely customizable stents using the CLIP process. Stents achieved a lateral resolution of 7.1 x 7.1 mm, with a curing thickness of 20 mm. A 20 mm length stent was printed in approximately 70 minutes and had adequate strength. The mechanical properties of 3D-printed stents with struts of 150 μm and walls thickness of 500 μm were comparable to those of a control bare metal nitinol stent. Furthermore, 3D-printed stents are customizable, could be compressed and self-expanded within a clinically relevant time frame upon deployment, and significantly improve the mechanical properties of a pig artery after deployment. Furthermore, I will discuss the method to fabricate a customized contact lens using 3D printed mold. The biocompatibility and optical performance of the lens has been further characterized experimentally using rat model.

Biography

Professor Cheng Sun is an Associate Professor at Mechanical Engineering Department at Northwestern University, where he has been since 2007. He received his PhD in Industrial Engineering from Pennsylvania State University in 2002. He received his MS and BS in Physics from Nanjing University in 1993 and 1996, respectively. Prior to coming to Northwestern, he was a Chief Operating Officer and Senior Scientist at the NSF Nanoscale Science and Engineering Center for Scalable and Integrated Nanomanufacturing at UC Berkeley. Dr. Sun received a CAREER Award from the National Science Foundation in 2009 and ASME Chao and Trigger Young Manufacturing Engineer Award, 2011.

Dr. Sun's primary research interests are in the fields of advanced manufacturing necessitate developments the emerging applications in the areas of photonics, energy, and biomedical engineering. His research group is engaged in developing novel micro-/nano-scale fabrication techniques and integrated nano-system. He has published more than 70 journal papers including publications in Science, Nature Nanotechnology, Nature Materials, and Nature Communication. http://sun.mech.northwestern.edu.

Directions: Please refer to website: http://www.sunysb.edu or call 631-632-8310 for more information.
Check http://me.eng.sunysb.edu for any changes to location or time.

Stony Brook University