Nexus system: a Multiscale Additive Manufacturing Instrument for Rapid Prototyping.

Andriy Sherehiy[1], Dilan Ratnayake[2], Ruoshi Zhang[1], Alireza Tofangchi[1],
Olalikan Olowo[1], Daniel Sills[1], Cassidy Caid[1], Kevin Walsh[1], Dan Popa[1]
1Louisville Automaton and Robotics Research Institute, University of Louisville, Louisville
[2] Speed School, University of Louisville, Louisville

Abstract

We present Nexus system, an instrument for flexible multiscale manufacturing and rapid prototyping using precision robotic assembly and additive manufacturing. Nexus is a novel robotic platform for multiscale integration of miniature devices and systems, such as wearable MEMS sensor fabrics, microrobots for wafer scale microfactories, and tactile robot skins. Our instrument has the flexibility to fixture, position, transport and assemble components across a wide-spectrum of dimention scales (1 μm to 10 dm), and will provide diverse additive process capabilities such as FDM 3D printing with 6 DOF, aerosol jet and inkjet printing, metal ultrasonic bonding and printing, Intense Pulsed Light sintering, in-situ MEMS packaging and interconnect formation. The Nexus will automate basic processes such as 3D, aerosol and inkjet printing, sintering, assembly, and MEMS packaging leading to better control and consistency in development of mili/micro/nanosystem prototypes.

Andriy Sherehiy received his M.S. and Ph.D. in physics from University of Louisville (UofL), Louisville, KY, in 2010 and 2014 respectively. In 2015 he joined ElectoOptics Research Institute and Nanotechnology Center at UofL where he continued his research on the carbon nanoscale materials for the power storage applications, but also expanded his interest to fabrication of polymer nano and micro scale structures. In 2018 he joined Next Generation Group (NGS) as a Post-doctoral Research Associate, working on the microscale robotics and development of the automated multiscale advanced manufacturing platform. Since 2021 he holds Research Scientist position at Louisville Automation and Robotics Research Institute (LARRI).