Electrohydrodynamic Inkjet Printing for In-space Manufacturing

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Abstract: Additive printing (aka 3D printing or additive manufacturing) is one of the advanced manufacturing techniques. It shows great advantages for prototyping and low-volume manufacturing because of high customization, controllability and easy setup. There are plenty of 3D printers available on the market for all kinds of prototypes; however, additive printing has not been thoroughly investigated in several areas, including but not limited to 1) process development for in-space additive manufacturing and assembly, 2) new material characterization, 3) quality assurance and real-time inspection, 4) micro/nano scale prototyping. Dr. Qin built up a ‘machine shop’ trying to address some of those challenges. His group investigate how to integrate his electrohydrodynamic technique (known as EHD printing) for NASA’s in-space 3D printer to manufacture on-body wearable sensors. In this research seminar, Dr. Qin will first introduce his group’s recent NASA parabolic flight test results. Dr. Qin validated and confirmed that EHD printing is a unique gravity-free 3D printing technique. His recent efforts in modeling, in-situ monitoring, data analytics, quality assurance, and control schemes will be introduced. Some other highlights are ‘in-situ NDE for AM and data fusion’, ‘digital twin for micro/nano manufacturing systems, and ‘origami design for manufacturing’.

Biography: Dr. Hantang Qin is an assistant professor in the Department of Industrial and Manufacturing Systems Engineering and Center for Nondestructive Evaluation at Iowa State University, started in August 2017. He received his Ph.D. in Industrial Engineering at North Carolina State University in 2016. Dr. Qin’s expertise covers in-space manufacturing, electrohydrodynamics, micro/nano 3D printing, advanced manufacturing for flexible electronics, biomedical applications, system design, control, and optimization. He recently has been working on engineering education via Virtual Reality (V.R.) pedagogy to train next-generation engineers. He has one U.S. patent, over 30 journal articles, and has been sponsored by NASA, NSF, US Army Corps of Engineers, Department of Energy – REMADE Institute, U.S. Army Research Laboratory – FlexTech Institute, ASNT, Iowa Economic Development, Iowa Department of Transportation, ISU College of Engineering, and industrial collaborators.