

MAE Seminar SERIES

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QIN'S 'MACHINE SHOP' FOR ADVANCED MANUFACTURING: ONGOING PROJECTS, CHALLENGES AND COLLABORATIONS

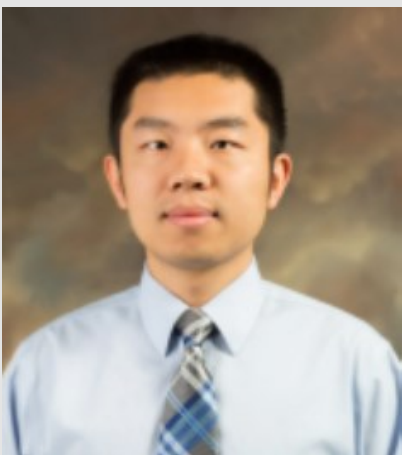
ABSTRACT

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. As a researcher, Dr. Qin's goal is to advance knowledge of using data-driven methods to enhance in-process quality assurance for future manufacturing systems.

After the grand opening of his machine shop, Dr. Qin's work has drawn some attentions; for example, NASA has selected him to investigate how to integrate his electrohydrodynamic technique for NASA's in-space printer to make on-body wearable sensors. Some other highlights are 'in-situ NDE for additive manufacturing and data fusion', 'digital twin for micro/nano manufacturing systems, and 'origami design for manufacturing'. In this seminar, Dr. Qin will introduce some of his ongoing 3D printing projects, including 1) 3D printing of flexible electronics for In-space Manufacturing, 2) 3D concrete printing for civil infrastructures, 3) 3D biomaterial printing for pharmaceutical and medical applications, 4) 3D metal printing and in-process quality assurance. Some challenges, current limitations, future work and possible collaborations will be discussed. If time allows, Dr. Qin will provide a demo of his education innovation – Virtual Reality engineering education laboratory (VReel) – to show his virtual machine shop.

BIO SKETCH

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 .



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