NORTH CAROLINA STATE UNIVERSITY
EDWARD P. FITTS DEPARTMENT OF INDUSTRIAL AND SYSTEMS ENGINEERING
ISE 601/801 – Departmental Seminar

Friday, February 22, 2019
434 Daniels Hall
11:00 a.m. to 12:00 p.m.

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Design for Additive Manufacturing for Automotive Industry

Abstract

The additive manufacturing (AM) is regarded as the innovative technology for the next industrial revolution. Because AM can provide solutions to overcome various manufacturing issues in reality, such as design complexity and production variability, it has been widely adopted in numerous industrial cases. To maximize the effectiveness of the AM technology, Design for Additive Manufacturing (DFAM) is widely and frequently used in the design and process analysis stages. DFAM is regarded as a key to enhancing the performance and quality of the AM products with consideration of the reliability, cost, weight and capability of them. However, in reality, DFAM requires a significant amount of knowledge and experience in design and analysis stages to effectively support the manufacturing process. Specifically, topology optimization, multiscale design, multi-material design, part consolidation, and customization are often incorporated together in order to take full advantages of DFAM. In this presentation, practical applications of DFAM in automotive and heavy industries at UNIST are introduced. By illustrating the DFAM applications in manufacturing, the systematic design and engineering processes using DFAM are presented. In addition, two recent research at UNIST to enhance the design and manufacturing capability of AM are briefly introduced. First, a load-specific lattice structure generation using topology optimization is presented for the general users of AM who want to utilize the benefits of DFAM easily and quickly without an overall structural design analysis. “Building Blocks” are generated by topologically optimizing unit cells with pre-defined stress conditions. Second, a design of multi-stable 4D printing structure is introduced. A bi-stability to 3D printing to realize highly-controlled, reconfigurable structures can be potentially used for micro actuators and mechanical switches. By computationally model and analyse the dynamics of 3D printed twisting and rotational bi-stable structures, an energy diagram can be generated and precise motion control of them is possible. At the end of the presentation, the potentials and limitations of DFAM are also discussed.

Namhun Kim earned his BSc in 1998 and MSc in 2000 from Mechanical Engineering at Korea Advanced Institute of Science and Technology (KAIST). After that, he worked as a senior researcher in Samsung Corning, Co., LTD for five years. Then, he received his Ph.D. in Industrial and Manufacturing Engineering from Penn State University, University Park, PA, USA in 2010. He joined Ulsan National Institute of Science and Technology (UNIST) in 2010 and is currently working as an associate professor in the School of Mechanical, Aerospace and Nuclear Engineering, acting as the director of 3D printing research center at UNIST, Republic of Korea. His interest covers manufacturing technologies with emphasis on additive manufacturing (3D printing), manufacturing system modelling and agent-based simulation.

Refreshments will be served in Daniels Hall room 428 Student Lounge from 10:30 to 10:50 a.m.