Additive Manufacturing (AM)

Session co-chairs:

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Contrary to traditional manufacturing technologies that fabricate parts through the subtraction of material from a workpiece, Additive Manufacturing (AM; commonly referred to as "3D Printing") techniques create parts through the successive creation of an artifact's cross-sectional layers. Each layer is built upon the previously built layer until the part is completed. This layered fabrication approach enables AM to produce geometries that are not possible with traditional manufacturing technologies. In addition, the digital thread of AM production offers many benefits that could transform product distribution in the same way the MP3 did for music.

In its nascent stages, AM was referred to as "Rapid Prototyping" and was primarily marketed as a tool to aid in creating product prototypes (e.g., in order to get a better understanding and feeling about the part or to make first assembly tests). Spurred by recent advances in materials processing and AM process control (e.g., selective melting of metal powders via energy beam control), coupled with increasing demands for individualized products, low-volume production, and a desire for more freedom in product design, these "prototyping" technologies have become a viable manufacturing alternative for certain classes of products.

This first half of the session will focus on providing an overview of the different AM processes and example industrial applications. The second half of the session will highlight the future directions of AM: (i) process modeling approaches to predict material properties from a given set material and process conditions and (ii) merging design methods to fully explore the design freedoms offered by the technology.

The speakers in this session represent both academic and industrial experience. Frank Wöllecke is leading activities at BMW's AM-Center. Following considerable industry experience, Tim Shinbara now works in a government position and has seen the US's leading AM applications and initiatives. Thomas Rechtenwald was working for several years at the scientific orientated Bavarian Laser Center and is now working at an AM system supplier. Carolyn Seepersad, an Associate Professor at the University of Texas, is a leading researcher working at the interface between Additive Manufacturing and design.

The talk by Wöllecke will cover the different processes for Additive Manufacturing and will highlight their specific advantages and disadvantages. Shinbara will then provide an overview of different industrial applications of AM. Rechtenwald will discuss how processing conditions influence resulting part properties. Finally, Seepersad will focus on the exciting new design possibilities offered by AM.