ADDITIVE MANUFACTURING

Session co-chairs: Carolyn Seepersad, University of Texas at Austin, and Michael Siemer, Mydea Technologies Corp.

Additive manufacturing technologies enable layer-wise fabrication of complex parts directly from CAD files without part-specific tooling. Examples of additive manufacturing technologies include stereolithography, fused deposition modeling, 3D printing, selective laser melting, laser engineered net shape processes, ultrasonic consolidation, and selective laser sintering. Selective laser sintering, for example, fabricates parts in a layer-wise manner by selectively fusing powdered material in regions defined by the part's cross-sectional geometry. Additive manufacturing offers many strategic advantages, including increased design freedom for building complex internal and external part geometries that cannot be made in any other way, the ability to rapidly iterate through design permutations, the ability to build functional parts in small lot sizes for end-user customization or bridge manufacturing, and the ability to repair expensive parts for aerospace and other industries.

Our first speaker, Dr. Brent Stucker, will provide an overview of additive manufacturing processes and their impact on industrial practice and academic research. He will help the audience understand the basic principles of additive manufacturing, the frontiers of our capabilities for fabricating functional parts, and the impact that additive manufacturing is having on design and manufacturing.

Our second speaker, Dr. Brett Lyons, will describe some of the aerospace applications of additive manufacturing. Some of its industry-changing capabilities for aerospace include lightweighting via part reduction and honeycomb-like structures and development of flight-ready materials with aerospace levels of repeatability and reliability.

Our third speaker, Dr. Andrew Christensen, will discuss medical applications of additive manufacturing. Additive manufacturing has the potential to revolutionize the medical industry by fabricating implants, prosthetics, orthotics, and other devices that are customized for an individual user's body. For example, Walter Reed Army Medical center is currently fabricating customized cranial implants for injured soldiers, with titanium implants customized for a specific patient's cranial profile and injury.

Our fourth speaker, Dr. Hod Lipson, will discuss the challenges involved in designing parts for additive manufacturing, including the need for advanced design techniques and tools that can tailor not only the shape of additively manufactured objects, but also their composition and functionality. He will also discuss some of the application frontiers of additive manufacturing, including biological, culinary, and mechatronics applications.