Design for Additive Manufacturing – New Frontiers and Challenges

Serena Graziosi, Politecnico di Milano

Abstract:
Additive manufacturing (AM) is delineating new design and manufacturing pathways, and the continuous innovations of AM processes and materials are constantly unlocking new destinations. The multiple DFAM frontiers available nowadays are inspiring transformations in industry and education at various levels. By continuing to explore and set these new frontiers, researchers in DFAM are pushing the boundaries of what can be created. They are unlocking the full potential of this technology to face some of the world’s biggest challenges. These possibilities also open new scenarios that must be explored deeply to ensure a successful, sustainable, and wide adoption of AM technologies. Design engineers can indeed now develop complex, porous, nature-inspired multifunctional shapes that can lead to solutions not achievable using conventional manufacturing technologies. They can select materials and contribute to designing them and their properties at different scales. Even the possibility of conceiving multi-material solutions opens new prospects for fabricating parts that combine heterogeneous properties and functions. Properly exploiting these opportunities requires a Design for AM (DFAM) mindset prepared to tackle and navigate this enlarged design space and appropriate design methods and tools to deal with this increased design complexity to guarantee the viability of the designed solution. Data- and algorithm-driven strategies are now emerging to support design engineers in mastering that complexity and making it easier to take advantage of the full potential of AM. These intelligent approaches and tools are promising. Combining them with an in-depth understanding of the strong interlink between the digital model, the material, and the fabrication process is still paramount for design engineers to make informed decisions.

The speech will overview some of these DFAM frontiers, showcasing applications and case studies spanning multiple fields with a focus on the potential of architected materials and the main challenges to designing and fabricating them adequately. The talk will also emphasize the ongoing innovations in AM materials and processes and their role in expanding the DFAM horizon. It will end by discussing the growing interest in design methods and tools to support design engineers taking full advantage of AM design potential.

Reading list


