

Special Issue on Digital Engineering for Complex Shapes



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Shape dominantly determines function. The performance of engineering products heavily depends on their shapes. Since CAD technology has advanced enough, we can create digital models of complex shapes. To manufacture products, the goal of digital engineering is not just to generate and visualize the shapes, but also to perform other value adding activities, i.e., scientific analysis, rapid prototyping, finished parts making and simulation. Sometimes the nature of the shape (self-similarity), the origin of the shape (shapes found in living organisms), the appearances of the shape (aesthetic value), and the nature of the underlying materials (softness, porosity) challenge the modeling building processes. At the same time, the constraints of other systems (e.g., CAE, CAM, Additive Manufacturing Systems [e.g., 3D Printer] and Virtual Reality Systems) dictate what must be done while creating the digital models so that the models do not make any problems in the downstream.

In this special issue fifteen technical papers propose solutions and strategies to various problems related to digital engineering. Some of them deal with CAD and its philosophical background. Others describe methods to register and reconstruct complex shapes from point clouds in the macroscopic and microscopic spaces. Simulation to identify mechanical and electrical properties are discussed in several papers. The shape of grain texture is very complicated and two papers challenge how to generate it on products' surfaces. Additive manufacturing is very promising and two papers propose new fabrication methods for complex shapes based on it.

The editors deeply appreciate all the authors and anonymous reviewers for their excellent work to make this special issue very unique. We hope that further researches on digital engineering for complex shapes initiated by this special issue will advance our society as well as digital engineering in the future.