

Integrated Design in Additive Manufacturing Based on Design for Manufacturing

Authors : E. Asadollahi-Yazdi, J. Gardan, P. Lafon

Abstract : Nowadays, manufactures are encountered with production of different version of products due to quality, cost and time constraints. On the other hand, Additive Manufacturing (AM) as a production method based on CAD model disrupts the design and manufacturing cycle with new parameters. To consider these issues, the researchers utilized Design For Manufacturing (DFM) approach for AM but until now there is no integrated approach for design and manufacturing of product through the AM. So, this paper aims to provide a general methodology for managing the different production issues, as well as, support the interoperability with AM process and different Product Life Cycle Management tools. The problem is that the models of System Engineering which is used for managing complex systems cannot support the product evolution and its impact on the product life cycle. Therefore, it seems necessary to provide a general methodology for managing the product's diversities which is created by using AM. This methodology must consider manufacture and assembly during product design as early as possible in the design stage. The latest approach of DFM, as a methodology to analyze the system comprehensively, integrates manufacturing constraints in the numerical model in upstream. So, DFM for AM is used to import the characteristics of AM into the design and manufacturing process of a hybrid product to manage the criteria coming from AM. Also, the research presents an integrated design method in order to take into account the knowledge of layers manufacturing technologies. For this purpose, the interface model based on the skin and skeleton concepts is provided, the usage and manufacturing skins are used to show the functional surface of the product. Also, the material flow and link between the skins are demonstrated by usage and manufacturing skeletons. Therefore, this integrated approach is a helpful methodology for designer and manufacturer in different decisions like material and process selection as well as, evaluation of product manufacturability.

Keywords : additive manufacturing, 3D printing, design for manufacturing, integrated design, interoperability

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