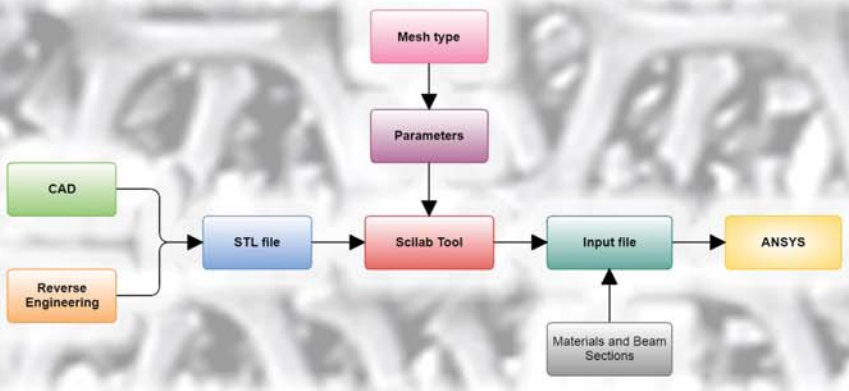
A Method to Create Meshes of 3D Printed Structures

Stefano Carrino*, Vito Primavera**, Marco Spagnolo**

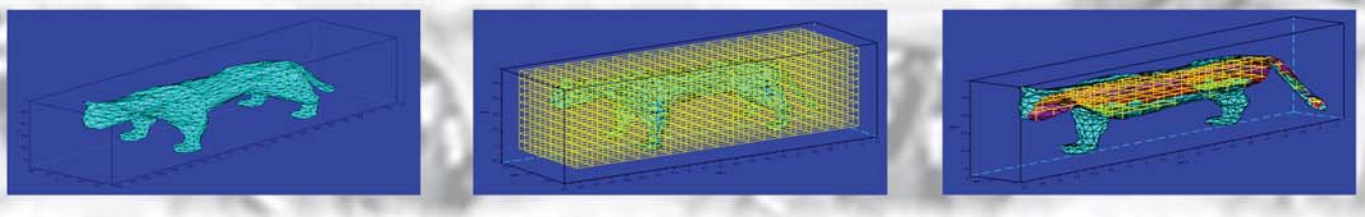
*DTA scarl, **EnginSoft SpA

Issue: The creation of meshes for 3D printed structures is a complex aspect in the design process which must be addressed if a FEM analysis is required. In the following a method enabling an automated tool for the fast mesh generation of 3D printed structures is explained.

Methodology for Solution: a methodology has been implemented to create the network structure within the printed object using a Scilab tool based on the Ray Tracing Technique and starting from STL (STereo Lithography interface format) file produced by CAD software or 3D scanning technologies. The stereolithography format is a list of the triangular surfaces that describe a computer generated solid model. Ray tracing is a technique to render images approximating a surface from point samples interrogating it by means of fast ray-surface intersection.



The tool implemented in Scilab allows to read the STL file and, choosing the parameters for the definition of the elementary cell, generates the array of the structure. Then the intersections between a surface and the array are calculated by the ray tracing technique and is written an input file for Ansys with the information to be used in FEM analyses.



Results: The methodology developed is an efficient and automatic process by which simulate 3D printed structures in several fields of application such as industrial, biomedical and sports. This Scilab tool runs smoothly with complex geometries also characterized by double-curved surfaces, holes and cavities. The definition of new types of elements allows the creation of different geometries for which it is possible to choose the regularity degree of the network structures by setting randomized parameters. A file of several MB can be read efficiently in a short time of calculation. Furthermore, it is possible in design process to carry out an optimization both in terms of geometry and used materials in order to obtain efficient and advanced products.

APPLICATIONS