Abstract: This paper intends to encourage a discussion on the geometrical and topological description of 3D computational models, and on the embedding of these models into the engineering design process. In the first part, we will report on the development of a mesh generator which tries to overcome some of the present problems of FEM meshers for thin-walled structures and is capable of generating hexahedral meshes for thin, curved geometries as they often appear in civil and mechanical engineering. The second part of the presentation will focus on the recently proposed Finite Cell Method (FCM), a fictitious domain approach, where even very complex geometries of the physical domain can be taken into account without any mesh generation. This new numerical method can be embedded in a computational steering environment for interactive computation, yielding an analysis and design environment, which is far more flexible and intuitive than classical finite elements in civil engineering.

Stichworte: Geometric models, hexahedral mesh generation, thin walled structures, fictitious domain methods, Finite Cell Method, computational steering