

Coupling CAD and simulation software

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ABSTRACT

Numerical simulation on industrial scale usually involves the generation of a mesh from a Computer Aided Design (CAD) model describing the geometry of the problem. Data from CAD programs are supplied in many formats, which can be read by mesh generation software. Although excellent software is available, that can generate large meshes in a very short time there are a number of drawbacks. Firstly, the mesh is only an approximation of the CAD geometry and secondly and most importantly, for complex geometries often elements with bad aspect ratios are generated and need to be repaired.

Some time ago isogeometric methods were introduced [1], with the aim to use geometrical description from the CAD data directly without need to generate a mesh. The advantage of this approach is obvious: no approximation of the CAD geometry via a mesh is necessary thereby solving the mentioned problems. An additional benefit can be gained in the simulation because functions used by the CAD programs to describe the geometry (NURBS) are also ideally suited for approximating the unknown.

The community working on isogeometric methods is growing fast and great advances have been made, but a seamless integration of CAD and simulation has not yet been achieved. The aim of the paper is to present the state of the art and on-going work towards achieving the goal. We start with a look at the structure of CAD data and the type of geometrical information that is supplied. Next, methods will be discussed on how one can use this information in a simulation program. Finally, we show on an example of a branched tunnel, how a simulation can be achieved without the intermittent step of mesh generation [2]. This example also demonstrates that, compared with the conventional analysis, much better results with fewer degrees of freedom can be obtained. Finally a possible road-map towards achieving the goal of a simulation without mesh generation is presented [3].

REFERENCES

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