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COMBINATION OF BODY-FITTED AND EMBEDDED/IMMERSED METHODS FOR COMPLEX CFD APPLICATIONS

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ABSTRACT

The transition from an arbitrary surface description to a proper mesh still represents a difficult task. This is particularly so when the surface description is based on data that does not originate from CAD-systems, such as data from remote sensing, medical imaging or fluid-structure interaction problems. Considering the rapid advance of computer power, together with the perceived maturity of field solvers, an automatic transition from arbitrary surface description to mesh becomes mandatory.

To date, most of the field solvers based on unstructured grids have only considered body-conforming grids. After all, one the perceived strengths of field solvers based on unstructured grids is precisely the ability to mesh arbitrary domains.

For structured grids so-called embedded mesh, immersed body or ficticious domain techniques have been used for many years as a way to discretize geometrically complex domains. The use of such techniques within adaptive, unstructured grid solvers is relatively recent.

The combination of body-fitted functionality for some portion of the domain, together with embedded mesh or immersed body functionality for another portion of the domain offers great advantages, which are increasingly being exploited.

The paper reviews the methodologies pursued so far, addresses implementational issues and shows the possibilities such techniques offer.