Hybrid Representation of the Shape of Ship Hulls

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ABSTRACT

This paper proposes a new geometric modeling technique, called hybrid representation (H-rep), for modeling ship hulls. The novelty of H-rep is in the integration of wireframe, surface and solid representation in one common data structure, and in providing topological support to surface modeling as well as an enhanced technique for curve fairing. The primary goal is to achieve topological integrity and generality of the new model. After an introduction into geometric modeling, the authors discuss some problems of direct application of single-patch B-spline and NURBS surface representations in ship hull design. They claim that even if multi-patch extensions of these techniques are applied, the user may find difficulties in terms of the intuitive and straightforward externalisation of the form of ship hulls as well as of the exact modeling of the shape singularities. H-rep lends itself to a more intuitive and robust ship hull design methodology, and allows designers to follow their conventional line-oriented thinking in designing. The authors demonstrate the advantages of the hybrid representation by two examples of ship hull design.