Leveraging feature generalization and decomposition to compute a well-connected midsurface

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Abstract

Computer-aided design (CAD) models of thin-walled parts, such as sheet metal or plastic parts, are often represented by their corresponding midsurfaces for computer-aided engineering (CAE) analysis. The reason being, 2D surface elements, such as “shell” elements, which need to be placed on the midsurface, provide fairly accurate results, while requiring far lesser computational resources time compared to the analysis using 3D solid elements. Existing approachesof midsurface computation are not reliable and robust. They result in ill-connected midsurfaces having missing patches, gaps, overlaps, etc. These errors need to be corrected, mostly by a manual and time-consuming process, requiring from hours to even days. Thus, an automatic and robust technique for computation of a well-connected midsurface is the need of the hour. This paper proposes an approachwhich, instead of working on the complex final solid shape, typically represented by B-rep (boundary representation), leverages feature information available in the modern CAD models for techniques such as defeaturing, generalization, and decomposition. Here, first, the model is