

CAD BASED PARAMETERIZATION FOR ADJOINT OPTIMIZATION

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Manipulating CAD geometry using primitive components rather than the originating software is typically a challenging prospect. The parameterisation used to define the geometry of a model is often integral to the efficiency of the design. Even more crucial are the relations (constraints) between those parameters that do not allow the model to be under-defined. However, access to these parameters is lost when making the CAD model portable. Importing a standard CAD file gives access to the Boundary Representation (BRep) of the model and consequently its boundary surfaces which are usually trimmed patches.

Parameterising these surfaces in a way that allows the re-definition of the above mentioned constraints is pursued in this study. Firstly, the geometry of each surface of the model is acquired in the form of NURBS. Then, volumetric NURBS, an often used mesh morpher, is implemented to act on each patch. The patch is initially triangulated in order to acquire its representation in discrete form. The V-NURBS complexity is chosen so that it is not greater than the complexity of the patches it controls thus ensuring the re-fitting of the patches after the morphing procedure, by their initial surfaces. Maintaining geometric relationships between the multiple V-NURBS lattices allows us to constrain each patch with respect to position – orientation, as well as to ensure continuity between neighbour patches.

The effectiveness of the method is demonstrated by optimizing various CAD models with respect to a range of flow criteria using the adjoint technique to provide the sensitivity gradients. Multiple constraints and parameterizations are employed and efficiency comparisons are made with equivalent mesh based morphing.

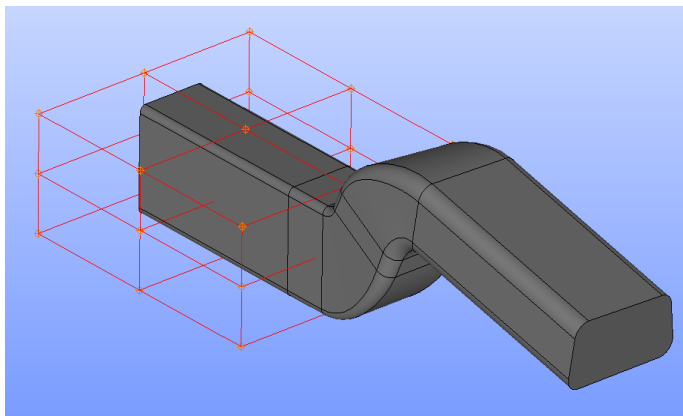


Figure 1: A climate duct and the lattice controlling the rear part.

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