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HYBRID HIGH ORDER GRID GENERATION APPLIED FOR 3D GEOMETRIES

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In this paper authors present algorithm which allows to generate of high order hybrid grids on 3D geometries. The main problem for such cases is a generation of valid (positive) elements in boundary layer region. In standard approach the grid for boundary layer is generated at linear surface mesh and then elements are deformed to curvilinear form. Due to hight aspect ratio of boundary layer cells, it is very difficult to obtain a valid elements with positive volume. In presented work a different and more reliably approach has been applied.

The proposed algorithm relies on generation of boundary layer elements (prisms or quads in 2D) directly from the curvilinear surface grid. The BL elements are generated using frontal algebraic method [2]. An example high order BL grid is shown on Figure 1. The next step of the generation process is to fill the remaining domain using unstructured grid generator [3]. The unstructured grid at this step is not conforming the outer bound of BL grid. In order to obtain a valid hybrid grid, a deformation of unstructured elements needs to be applied. A deformation algorithm is based on elastic analogy. A standard linear elastic problem with small deformation assumption is solved [1]. The unstructured grid is generated far from the solid body. Therefore resulting elements could have relatively small aspect ratio. For such case it is much easier to obtain positive defined elements in the deformation process.

The example of the hybrid high order grid is shown on Figure 2. The grids generateed with the presented method will be shown for 2D and 3D geometries.

Most work presented here and related to hybrid higher order grid generation was done in frame of IDIHIOM project.

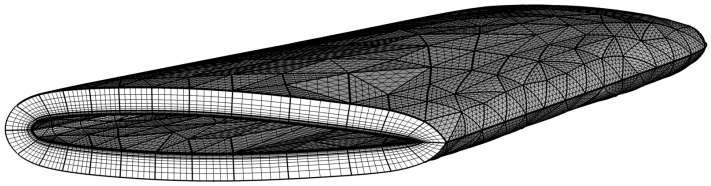

Figure 1: The boundary layer high order (P6) mesh for Onera m6 wing

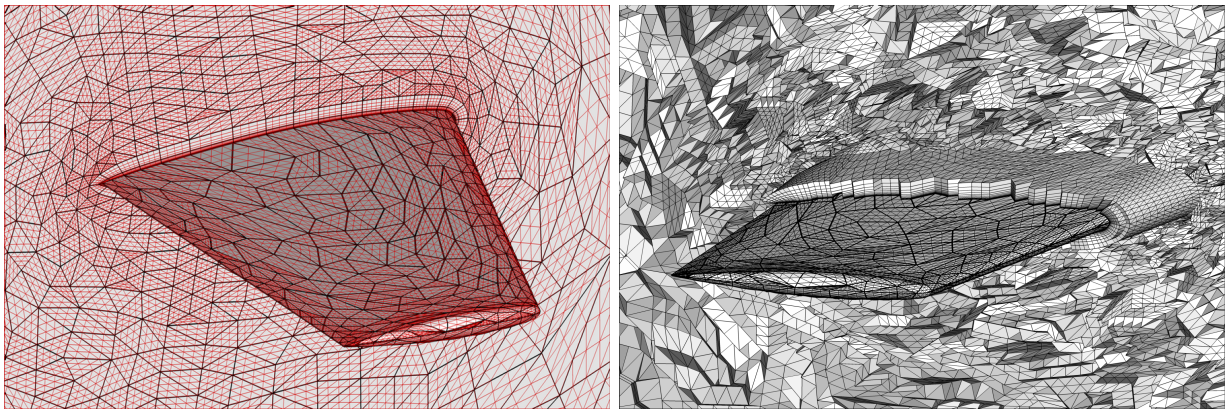

Figure 2: The hybrid high order (P4) grid for Onera m6 wing

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