

Nodal Mesh Quality and ALE Computations for Compressible Fluids Flows

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We focus on numerical simulation of Lagrangian equations for 2D compressible fluids flows. The mesh is formed by inhomogenous element (quadrangles and/or triangles) and nodes may have different degree (number of neighbors).

In the Arbitrary Lagrangian-Eulerian framework, we present some extension of Escobar et al. algorithm for the mesh smoothing process. Here, we take into account explicitly the (arbitrary) mesh connectivity, moreover we extend the nodal quality notion (see multimat 2005) which permits :

1. to control the region where singularity may appear (non convex element or the sinus of angles is too small, big variation of adjacent elements, etc..).
2. to obtain a generic tool to define non-linear mesh relaxation.

In a second step, we expose and show result for the “self-intersection” mapping for the density, speed and internal specific energy for the second order scheme using the approach of VanderHeyden W.B. and Kashiwa B.A.

Key Words:

ALE, Mesh Quality, Conservative Projection, Positivity and maximum principle.