An indirect approach to hex mesh generation

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The aim of this seminar is to present a method that enables to build 3D finite element meshes only composed of hexahedra.

The problem of three dimensional mesh generation is a very hard problem, probably ill posed. After 15 years of continuous efforts, we are now able to generate meshes made of triangles (2D) and tetrahedra in most of the cases (> 99.9%).

The problem of direct generation of hexaedral meshes is very hard, maybe too hard. Our approach is indirect: it consist in recombining tetrahedra into hexahedra. While the 2D version of problem can be solved in polynomial time, the 3D problem is NP-hard. We present some simple heuristics that allow to achieve hex-dominant meshes with about 90% of hexahedra in volume. Then, full hex meshes can be constructed by subdivision. Some computational examples will be done with a spectral finite element code developped in Pr. T. Warburton’s group.

References