

TOWARDS LARGE SCALE hp-ADAPTIVE SIMULATIONS

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This publication relates to recent developments three-dimensional hp-adaptive finite element software. The following points will be emphasized: qualification of the correctness of the implemented hp-adaptive finite elements (the software includes the full family of finite elements in an hp-adaptive framework), template oriented implementation of the different elements, condensation of the datastructure to accommodate large meshes.

The qualification of the program includes the necessary steps to ensure the results of the finite element program are reliable. The tests proposed maybe useful to authors implementing hp-adaptive finite element software.

Using C++ templates adaptive finite elements have been implemented in a single template finite element class. This template implementation ensures that all elements have a consistent interface, dramatically reduces the size of the code and makes the program more extensible.

Three dimensional finite element simulations require very large sets of data. Particularly, when using h-adaptive finite elements, the number of elements and nodes can become very large. In these cases, a detailed study of the amount of date required to implement hp-adaptively is very relevant. It is shown that within an hp-adaptive finite element program it is possible to approximate the amount of data used in regular (non-adaptive) finite element software.