Improvement of Linear Tetrahedral Element Performance by Using Substructuring Method

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Abstract	We apply here a class of substructuring method to improve the performance of linear tetrahedral element used in finite element analysis (FEA). The method is novel and relied on the construction of mesh inside a tetrahedron volume which behaves as an assembly of substructures. The corresponding stiffness matrix of the mesh is assembled using a static condensation procedure which is used further to obtain strain energy from a set of particular displacement vectors. This energy is the key to obtain a so-called energy ratio that will modify the stiffness matrix of a linear tetrahedral element. In the numerical tests, we show that the method can improve the performance of the tetrahedral element to approximate displacement and stress fields from the analytical solutions for cantilever and stress concentration problems, respectively.
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