

3D Base Force Element Method on Complementary Energy Principle

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Based on the concept of the base forces by Gao, the base force element method (BFEM) on complementary energy principle for three-dimensional elasticity problems is presented. A 3D model of the BFEM for elasticity problem is derived by assuming that the stress is uniformly distributed on each sides of an element. The explicit formulations of the control equations for the BFEM are derived using a modified complementary energy principle. A number of example problems are solved using the BFEM and the results are compared with corresponding analytical solutions and those obtained from the standard displacement finite element method. A good agreement of the results and better performance of the BFEM compared to the displacement model are observed.

Keywords: base forces, elasticity problem, complementary energy principle, finite element method, base force element method, Lagrange multiplier method, compliance matrix