

## 4570616721 : MAJOR CIVIL ENGINEERING

KEYWORD : PILE FOUNDATION/ADAPTIVE FINITE ELEMENT/3D FINITE ELEMENT METHOD/  
ENRICHMENT/MESH REFINEMENT/H-ADAPTIVE

SURIYAN KAENPUKDEE : ADAPTIVE FINITE ELEMENT METHOD FOR PILE  
SETTLEMENT ANALYSIS. THESIS ADVISOR : ASST. PROF. DR.TIRAWAT  
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The objective of thesis is to develop a 3D adaptive finite element code for the settlement analysis of single pile. Developed program adapts the h-adaptive enrichment scheme on 8-node hexahedron element for accuracy improvement. It can be used for static analysis of single elastic pile under vertical load. The ground is also treated as elastic material.

The implementation of program are consisted of, the extrapolation of nodal stresses from those at the gauss point using Superconvergence Patch Recovery method (Zeinkiewics and Zhu, 1992), the error estimation for mesh adaptation, the h-adaptive enrichment algorithm.

Since the non-conforming mesh is obtained from the enrichment algorithm, therefore, it is necessary to constrain the movement and to redistribute the internal forces at non-conforming nodes accordingly to the neighbor elements. To cope with these aspects, the two kinds of constrained nodes are considered, which are the node-on-edge and the node-on-face types.

To verify the correctness of developed program, the comparisons are made with closed-form solutions of the strip and rectangular footings. The results agree well with analytical solutions. It is also found that the error decreases as the mesh is more refined. For analyses of friction pile and end bearing pile, the results also agree with the analytical solutions where the error is contained in 3 %.

Department.....Civil Engineering..... Student's signature .....  
Field of study .....Civil Engineering..... Advisor's signature .....  
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