INFLUENCE OF MESH SIZE REFINEMENT ON FEM SOLUTION OF SHEAR WALL SYSTEMS

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Abstract

Real structures, are in general very complex, and have to be reduced to a manageable geometry. The geometry is eventually represented by a collection of elements at different shapes, approximated by straight lines or flat surfaces. The accuracy of representation is controlled by the number of elements used. It is obvious that with more elements, the representation would be smoother and more accurate. The more elements, the longer the computational time that is required. The behavior of a real structure depends upon the geometry, the property of the material used, the boundary, initial and loading conditions. In general, it is very difficult to solve the differential equations of the structural model, via analytical means. In practice, most of the problems are solved using numerical methods. Among these, the methods of model discretization, like the FEM are the most popular, due to its practicality. The main principle of FEM is modelling of real physical structure as an assemblage of individual elements. In structural modelling there are three basic element types: displacement elements, equilibrium elements and hybrid elements. The software package SAP2000 used for the structure analysis uses displacement elements. The procedure of computational modelling using the FEM consists of four steps: Modelling of the geometry, Meshing (discretization), Specification of material property, Specification of boundary, initial and loading conditions. The different meshes are created using SAP2000 structural analysis program. Well-shaped quadrilateral and triangular shell elements are graded from original mesh density coarse 1x1, to medium 2x2 and fine 4x4 according to h-refinement procedure. Mesh refinement it is a very important task of the pre-processing. It can be a very time consuming task but an experienced engineer will produce a more credible mesh for a complex problem. The structural model has to be meshed properly into elements of specific shapes such as quadrilaterals, triangles etc., and using as much as possible advantages of automated mesh generators.

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