APPLICATION OF SUBSTRUCTURING TECHNIQUE TO A GENERAL PURPOSE FINITE ELEMENT PROGRAM

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Dealing with large structural systems it is convenient and often almost necessary to employ a substructure technique in order not to exceed the available computer capacity. The method of substructuring for structural analysis is based on subdividing the large structure into smaller parts or substructures. Then the stiffness matrix for each substructure is detemined by (a) subdividing the substructure into a number of smaller, simple finite elements; (b) computing the simplest element stiffnesses and assembling the global stiffnesses and assembling the global stiffness for the substructure (c) eliminating the terms associated with the internal nodal points (i.e. nodes not on the boundary) of the substructure which is known as condensation. Then the solution of the system of resulting simultaneous equations obtained by assembling all the individual substructures gives the nodal displacements and reactions for all nodal points on interfaces between substructures. By returning to individual substructures, displacement at the internal nodes and stresses in the element can be evaluated.

A general purpose program has been developed to incorporate substructure facility. This is based on the Finite Element Analysis Program (FEAP). The program helps to analyse large structural systems using substructure technique, without which handling this type of systems under the memory capacity of the computers available to us is impossible. Some examples are presented to demonstrate the capability of the program.