Symbolic Programming of Finite Element Equation Solving for Plane Truss Problem

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ABSTRACT

Due to the significant progress in computer programming technology and finite element method that have been achieved in the recent years, the use of symbolic programming techniques in engineering computational process gain more and more importance. Symbolic programming technology in scientific programming offer easier, faster and compact routine procedure writing as compared the available high-level programming language, such as FORTRAN, which was previously one of the traditional computer languages to program the finite element procedures.

In this paper, a plane truss problem was proposed and solved by finite element via MAPLE 12 software, a symbolic programming language. The whole digital process allows the computer user to appreciate and experience the real-time finite element solution process of the plane truss problem. The plane truss was discretized by the computer user and analyzed by special commands that imitating the human natural instructions. The local and global stiffness matrix, the assembled global stiffness matrix of the plane truss problem can generate and visualized after suitable human-like command entered and executed by the computer. The incorporation of boundary condition on the assembled stiffness matrix needs the user to specify the constrained global degrees of freedom of the problem on the assembled global stiffness matrix. Finally, after imposing the relevant loads on the plane truss nodes, the problem was solved by MAPLE solver to obtain the nodal displacements and element stresses. Verification of those results with the present numerical results and

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LUSAS software was conducted and good agreement was found up to maximum error of 6.2×10^{-3} *percent.*

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