Matlab Guide To Finite Elements

" 1 Introduction (p. 1-5) This short introductory chapter is divided into two parts. In the ?rst part there is a summary of the steps of the ?nite element method. The second part includes a short tutorial on MATLAB. 1.1 Steps of the Finite Element Method There are many excellent textbooks available on ?nite element analysis like those in [118]. Therefore this book will not present any theoretical formulations or derivations of ?nite element equations. Only the main equations are summarized for each chapter followed by examples. In addition only problems from linear elastic structural mechanics are used throughout the book. The ?nite element method is a numerical procedure for solving engineering problems. Linear elastic behavior is assumed throughout this book. The problems in this book are taken from structural engineering but the method can be applied to other ?elds of engineering as well. In this book six steps are used to solve each problem using ?nite elements. The six steps of ?nite element analysis are summarized as follows: 1. Discretizing the domain this step involves subdividing the domain into elements and nodes. For discrete systems like trusses and frames the system is already discretized and this step is unnecessary. In this case the answers obtained are exact. However, for continuous systems like plates and shells this step becomes very important and the answers obtained are only approximate. In this case, the accuracy of the solution depends on the discretization used. In this book this step will be performed manually (for continuous systems). 2. Writing the element stiffness matrices the element stiffness equations need to be written for each element in the domain. In this book this step will be performed using MATLAB. 3. Assembling the global stiffness matrix this will be done using the direct stiffness approach. In this book this step will be performed using MATLAB. 4. Applying the boundary conditions like supports and applied loads and displacements. In this book this step will be performed manually. 5. Solving the equations this will be done by partitioning the global stiffness matrix and then solving the resulting equations using Gaussian elimination. In this book the partitioning process will be performed manually while the solution part will be performed using MATLAB with Gaussian elimination. 6. Post-processing to obtain additional information like the reactions and element forces and stresses. In this book this step will be performed using MATLAB. It is seen from the above steps that the solution

process involves using a combination of MATLAB and some limited manual operations. The manual operations employed are very simple dealing only with discretization (step 1), applying boundary conditions (step 4) and partitioning the global stiffness matrix (part of step 5)." EAN/ISBN : 9783540706984 Publisher(s): Springer, Berlin Discussed keywords: Finite-Elemente-Methode, MATLAB (Software) Format: ePub/PDF Author(s): Kattan, Peter I.