Meshing a Plate

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1. Introduction

In Finite Element Analysis the first thing important is discretizing the given structure. This part is called preprocessing. The information needed for Finite Element Analysis is the coordinates and nodal connectivity of the elements when a structure is discretized. This nodal connectivity and coordinates are used for further analysis. When FEA is done in MATLAB, mostly preprocessing is done, using others preprocessors and the nodal connectivity's and nodal coordinates are given as input to the MATLAB code. Doing this is an extra effort. It will be nice if we discretize the structure in the MATLAB itself and get the nodal connectivity's and nodal coordinates. The present code can be used to discretize the plate of rectangular and circular in shape for FEA.

2. Meshing a Rectangular/Square Plate

In the present code a square or a rectangular plate is discretized or meshed using 4 noded elements. The input required for meshing a plate is; length, breadth of the plate and number of elements required along the length axis and breadth axis.

First the meshing of plate is demonstrated in the file RectangularPlate. After a function MeshRectangularPlate is written to get the nodal coordinates and nodal connectivity's of the elements.

3. About Code RectangularPlate

This is to demonstrate the discretization of the plate. Plate considered is square with unit length. The number of elements along the length is seven. One can change the number of elements and length, breadth in the code according to the requirement. On running the code RectangularPlate a figure window opens showing mesh of the plate. Using the push buttons "Nodes" and "Elements" at the lower left corner of the figure window, one can see the node numbers and element numbers. These buttons can be toggled to display and un-display the node, element numbers. Figure 1 shows the Mesh of the plate with both node numbers and element numbers set to display.

4. About function MeshRectangularPlate

The function MeshRectangularPlate can be used to get nodal coordinates and nodal connectivity's. It needs length, breadth, numbers of elements along length and breadth axis as inputs and the coordinates of the nodes, nodal connectivity's as outputs. These outputs can be used in the finite element analysis of the plates. Plot of the /mesh using this function with the following values is shown in Figure 2.

L = 1; B = 1; Nx = 10; Ny = 10 ;

Call function as: [coordinates, nodes] = MeshRectangularPlate(L,B,Nx,Ny)

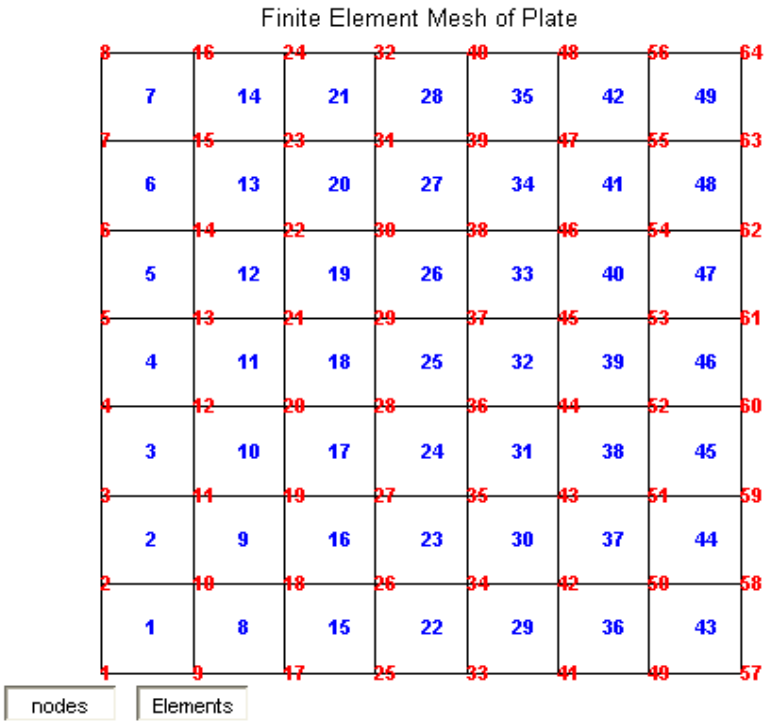

Figure 1: Plate Meshed

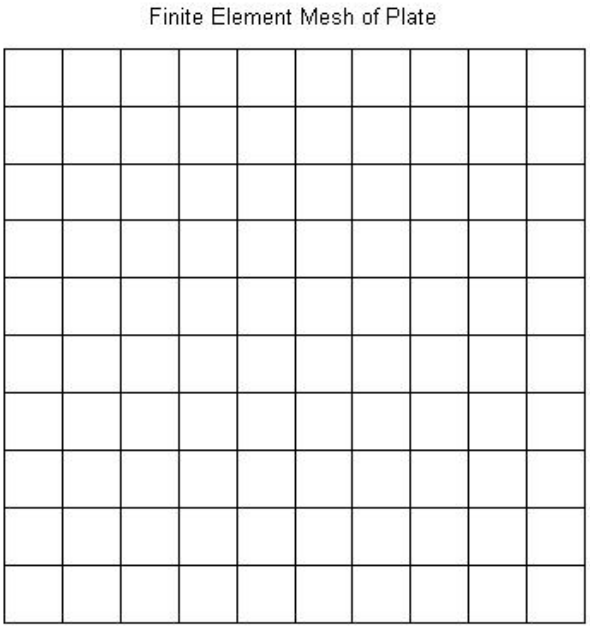

Figure 2: Plate Meshed

5. Meshing a circular/sector of a Plate

Using present code a circular plate or a sector of the plate can be discretized or meshed using 4 noded and 3 noded elements. The input required for meshing a circular plate is; radius, angle of the plate and number of elements required along the radius and angle.

First the meshing of circular plate is demonstrated in the file CircularPlate. After a function MeshCircularPlate is written to get the nodal coordinates and nodal connectivity's of the elements.

3. About Code CircularPlate

This is to demonstrate the discretization of the circular plate. Plate considered is one fourth of full plate with unit radius. The number of elements along the radius is 7 and the number of angular discretization is 10. One can change the number of elements and radius, angle (theta) in the code according to the requirement. On running the code CircularPlate a figure window opens showing mesh of the plate. Using the push buttons "Nodes" and "Elements" at the lower left corner of the figure window, one can see the node numbers and element numbers. These buttons can be toggled to display and un-display the node, element numbers. Figure 3 shows the Mesh of the plate with both node numbers and element numbers set to display.

4. About function MeshCircularPlate

The function MeshCircularPlate can be used to get nodal coordinates and nodal connectivity's. It needs radius, angle, numbers of elements along radius and angle as inputs and the coordinates of the nodes, nodal connectivity's as outputs. These outputs can be used in the finite element analysis of the circular plates. Plot of the /mesh using this function with the following values is shown in Figure 4.

Radius = 1 ; theta = 180; NR = 7 ; NT = 20 ;

Call function as: [coordinates, nodes] = MeshCircularPlate(Radius,theta,NR,NT)

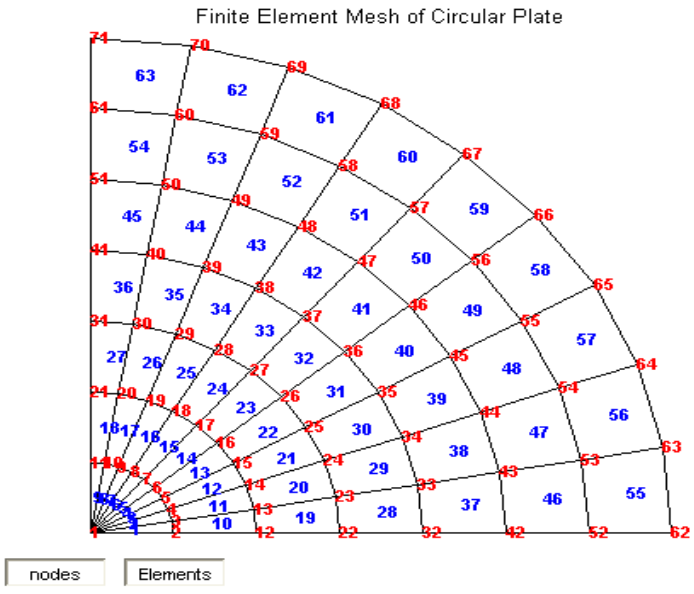

Figure 3: One fourth of the Circular Plate

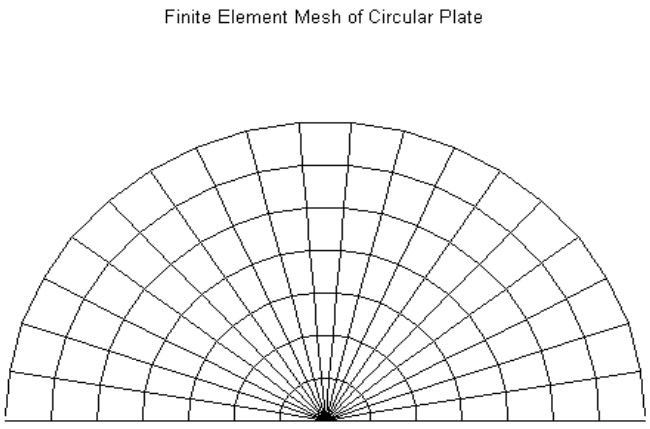

Figure 4: OneHalf Circular Plate Mesh