Computational Structural Mechanics and Dynamics

Assignment 9: Revolution Shells

by

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Exercise 1: Describe in extension how can be applied a non symmetric load on this formulation

1. When structures of revolution are submitted to a non-axisymmetric loading, these loading can be treated using a Fourier decomposition method. This involves decomposing the load into a Fourier series in a circumferential direction, calculating the response of the structure to each harmonic term retained in the series, and superposing the results. For each Fourier component the solution is obtained and summing up to the solution with appropriate symmetric and anti-symmetric component multiplication. Since the load is expressed in the form Fourier series then the displacement field with in the body also has to be expressed in the series form consisting of cosine and sine terms. This superposition technique, however, is limited to linear problems.

Exercise 2: Using thin beams formulation, describe the shape of the B(e) matrix and comment the integration rule

1. Several remark can be said: First, when radius of revolution solid goes from zero to some value, the Lobato integration rule can not be used because its integration point lies on revolution axis, and some compoenents of B matrix will tend to infinite. In this case is strongly recomended to use Gauss integration rule, due to integration points are inside of elements. This can be seen in Figure 1.

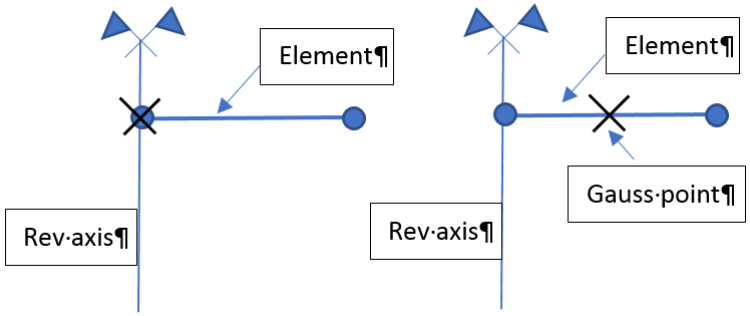

Figure 1: Left: Lobato int rule, right: Gauss int rule.

In order to avoid the shear locking problem, it will be necesary to use one Gauss point. However, membrane and bending forces can be lost some accuracy using it. Therefore full integration will be used.