



SEMINARIO DE ANÁLISIS NUMÉRICO Y MODELACIÓN MATEMÁTICA

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Título de la Charla:

***Locking-free finite element method for a
bending moment formulation of Timoshenko beams***

Fecha y Hora:

Martes 20 de Noviembre de 2012, 16:00 Horas.

Lugar:

Sala Seminario, Facultad de Ciencias, Universidad del Bío-Bío.

Resumen

In the present work we study a finite element formulation for Timoshenko beams. It is known that standard finite elements applied to this model lead to wrong results when the thickness of the beam t is small. Here, we consider a mixed formulation in terms of the transverse displacement, rotation, shear stress and bending moment. By using the classical Babuška-Brezzi theory it is proved that the resulting variational formulation is well posed. We discretize it by continuous piecewise linear finite elements for the shear stress and bending moment, and discontinuous piecewise constant finite elements for the displacement and rotation. We prove an optimal (linear) order of convergence in terms of the mesh size h for the natural norms and a double order (quadratic) in L^2 -norms for the shear stress and bending moment, all with constants independent of the beam thickness. Moreover, these constants depend on norms of the solution that can be a priori bounded independently of the beam thickness, which leads to the conclusion that the method is locking-free. Numerical tests are reported in order to support our theoretical results.

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