NUMERICAL METHODS FOR STRUCTURAL ANALYSIS

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KEYWORDS: finite element method, time integration methods, structural dynamics, meshless method, error estimation.

This research line encompasses the development and application of new and effective numerical methods and computational techniques for the solution of structural engineering problems.

The current research activities address a wide range of structural issues, including:

- finite element formulations for arches, plates and shells,
- stress recovery techniques in finite element analysis,
- a posteriori error estimation in finite element analysis,
- time integration methods for transient analyses,
- finite element approaches for structural dynamics,
- discontinuous Galerkin methods,
- flexible multi-body systems,
- finite element formulations for the dynamic analysis of damaged structures,
- meshless methods for the analysis of vibrations of spherical and parabolic shells,
- nonconservative stability problems,
- finite element and boundary element formulations for modeling bulk, guided and leaky guided waves in solids,
- cell method formulations for crack paths analysis in brittle materials,
- special finite elements for stress concentration problems,
- image-based finite element modelling,
- Differential Quadrature (DQ) and Differential Quadrature-based methods,
- Strong Formulation Finite Element method (SFEM),
- isogeometric analysis,
- laminated composite plates and shells with discontinuities.

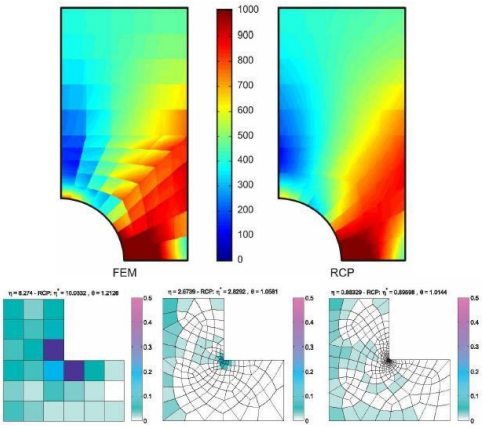

Fig. 1. RCP stress recovery and adaptive mesh refinement (de Miranda).

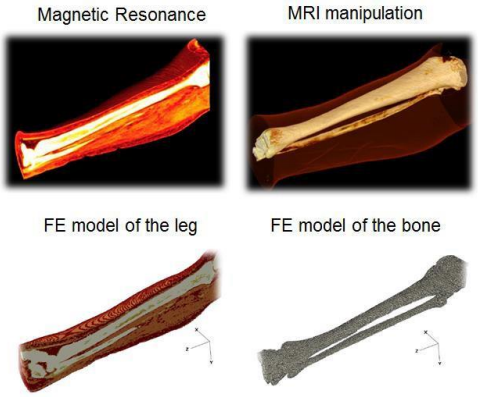

Fig. 2. From magnetic resonance to finite element modeling (Castellazzi).

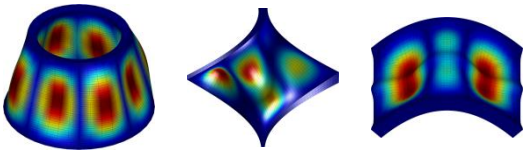

Fig. 3. Mode shapes of different shell structures (Tornabene).

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Verification in computational structural mechanics, PRIN2007 – Research Unit of Bologna, coordinator: Prof. F. Ubertini.

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