

NUMERICAL METHODS FOR STRUCTURAL ANALYSIS

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KEYWORDS: structural analysis, finite element method, time integration methods, structural dynamics, meshless method

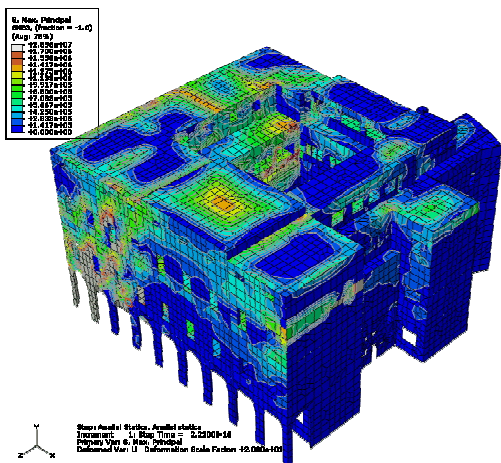


Fig.1 Finite element modelling in civil structures

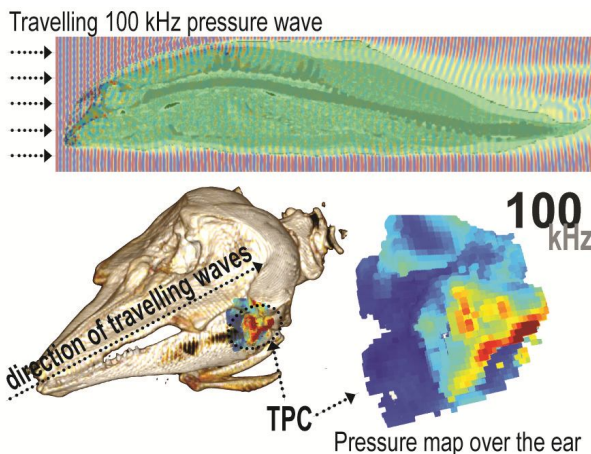


Fig.2 Sound pressure analysis for a toothed whale

Links

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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 activity address a wide range of structural issues, including:

- finite element formulations for arches, plates and shells,
- special finite elements for stress concentration problems,
- 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,
- spectral finite element formulation for modeling stress wave propagation,
- cell method formulations for crack paths analysis in brittle materials,
- fluid-structure interaction.

These issues have advanced broad applications in the engineering practice of modern structural analysis, design and construction of buildings and other structures.

MAIN PUBLICATIONS

- S. de Miranda, M. Mancuso, F. Ubertini. (2010). Time discontinuous Galerkin methods with energy decaying correction for non-linear elastodynamics. *INTERNATIONAL JOURNAL FOR NUMERICAL METHODS IN ENGINEERING*. Vol. 83, pp. 323-346.
- G. Castellazzi, P. Krysl, L. Rojas, T. Cranford. (2010). Assessment of the effect of natural and anthropogenic aquatic noise on vaquita through a numerical simulation. 2nd International Conference on the Effects of Noise on Aquatic Life, Cork Ireland, August 15-20, 2010. In: *The Effects of Noise on Aquatic Life*. Anthony Hawkins (Ed.) - ISBN: 978-1-4419-7310-8.
- C. Gentilini, L. Nobile, K.A. Seffen. (2009). Numerical analysis of morphing corrugated plates. *PROCEDIA ENGINEERING*. Vol. 1, pp. 79-82.
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- S. de Miranda, F. Ubertini. (2006). A simple hybrid stress element for shear deformable plates. *INTERNATIONAL JOURNAL FOR NUMERICAL METHODS IN ENGINEERING*. Vol. 65, pp. 808-833.
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- S. de Miranda, F. Ubertini. (2006). Stress analysis around holes or notches by special finite elements. *INTERNATIONAL JOURNAL FOR NUMERICAL METHODS IN ENGINEERING*. Vol. 66, pp. 85-116.
- E. Ferretti. (2003). Crack propagation modeling by remeshing using the Cell Method (CM). *COMPUTER MODELING IN ENGINEERING & SCIENCES*. Vol. 4, pp. 51-72.

RESEARCH PROJECTS

- ❖ SMooHS - Smart Monitoring of Historical Structures, UniBO, European Research project ENV.2007.3.2.1.1.
- ❖ Verification in computational structural mechanics, PRIN2007 - Research Unit of Bologna, coordinator: Prof. F. Ubertini.
- ❖ Models and numerical algorithms for the analysis of the degradation and vulnerability of civil and industrial structures under mechanical and thermochemical actions, PRIN2007 - Research Unit of Bologna, coordinator: Prof. E. Viola.