

SEMINARIO
MATHEMATICAL MECHANICS AND INVERSE PROBLEMS.

ESPOSITOR

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TITULO

Junction of models of different dimension: applications in biology and engineering

ABSTRACT:

The partial differential equations (PDEs) set in thin structures are considered. These domains are some finite unions of thin rectangles (in 2D settings) or cylinders (in 3D settings) depending on small parameter $\epsilon \ll 1$ that is, the ratio of the thickness of the rectangle (cylinder) to its length. An asymptotic analysis of the solutions of these PDEs is applied for justification of the method of asymptotic partial decomposition of domain (MAPDD) introduced in [1] and developed in [2-3]. This method reduces the 2D or 3D model of a structure to some model of hybrid dimension (2-1 or 3-1) conserving the dimension on a small part where the behaviour of solution is singular, and reducing the dimension in the main part of the domain. This approach corresponds to a special dimension reduction procedure with some local zooms. Some applications of this numerical strategy to the blood circulation modelling will be discussed.

1. G. Panasenko "Method of asymptotic partial decomposition of domain", Mathematical Models and Methods in Applied Sciences , v. 8, No 1,1998, 139-156.
2. G.Panasenko. "Multi-Scale Modelling for Structures and Composites », Springer, Dordrecht, 2005
3. Panasenko G., Pileckas K., Asymptotic analysis of the non-steady Navier-Stokes equations in a tube structure.I. The case without boundary layer-in-time. Nonlinear Analysis, Series A, Theory, Methods and Applications, 122, 2015, 125-168, <http://dx.doi.org/10.1016/j.na.2015.03.008>.

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