

PARAMETRIC AND NON-PARAMETRIC METHODS OF DATA ANALYSIS AT MULTISCALE MODELING

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ABSTRACT

With the rapid development of computer hardware – increase processing speed and the size of the memory available – there has been a rapid development of data analysis methods that previously were not possible for practical use due to the required computing power. At the crossroads of three disciplines: materials science, image analysis and statistical data analysis, new research possibilities have appeared. First of all, it is the use of nano- and micro-CT scanners for non-destructive testing of the material structure, even inside of a human body like e.g. bones. The analysis of obtained 2D images [1] provides rich information for statistical analysis. The reconstruction of the 3D structures from 2D tomographic images [2] allows one to construct meshes and build models for finite elements analysis, the use of directional statistics [3,4] or to involve non-classical methods of statistical analysis [5] and optimization from the area of artificial intelligence and data mining [6]. Mentioned methods, combining design optimization and inverse problems, image analysis and data analysis, are also specific enough that it is appropriate to show them separately, outside the areas for which they are only usable tools.

The aim of the session is to present the latest theoretical and computational solutions specific to that area of interdisciplinary. In particular, there will be considered 2D image analysis methods, 3D reconstruction methods, parametric and non-parametric statistical methods, directional statistics methods, surface layer analysis using among others stochastic fields, the creation of prediction models using data mining methods. It is desirable to show the difficulties encountered and the methods to solve them.

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