2nd International Conference on Mathematical and Computational Biomedical Engineering – CMBE2011
March 30 – April 1, 2011, Washington D.C., USA
P. Nithiarasu and R. Löhner (eds)

INVERSE VASCULAR MATHEMATICS

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PROPOSAL

Key Words: *Inverse Problems, Blood flow, Data Driven Simulation, Optimization, Image Processing.*

As for other engineering fields, new emerging problems in numerical modeling of the vascular system require the solution of inverse problems. Among the others, we mention the assimilation of data and measures provided by recent devices (see e.g. [1]); the shape optimization of surgical interventions (see e.g. [2]); the estimation of physical parameters based on images and measures; the registration of images of vessels and heart. Although some of these problems have been investigated in other fields (see e.g. [3]), specific issues arise in the context of hemodynamics. The interplay between the features of the blood-vessel interaction and the nature of available data - given both by measures and images - opens new challenging numerical problems. Different approaches can be pursued. For instance, assimilation of velocity measures in numerical simulations can be performed following either Kalman filter strategies or classical constrained optimization problems. Similarly, different methods can be pursued for registering medical images. Relevant issues in this scenario include computational efficiency, filtering of the noise affecting measures and more in general uncertainty quantification.
Setting up effective numerical methods for this kind of problems is an up-to-date relevant research. This minisymposium aims at gathering researchers working on different inverse problems for hemodynamics. The purpose is to compare different strategies for inverse problems in vascular mathematics, to find possible common threads coming from the specific features of numerical hemodynamics and to enhance the discussion on effective methods for improving the reliability of the numerical results by data assimilation.

REFERENCES

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