

Post-Doc position : Image analysis of micro-vascular network

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Context and Motivation

Micro-vascularisation is important for the functionality of healthy or pathological tissues. It plays a fundamental role in the growth and the development of tumors, and it is a very important aspect of many clinical issues. Beside this important applied implication, there has been relatively few fundamental studies to quantitatively investigate the 3D spatial organization and the temporal evolution of the micro-vasculature of tumors. The aim of this post-doctoral study is to develop some automatic image analysis of the 3D structure of normal and tumoral vascular networks.

Scientific milestones

This post-doc takes place in the framework of the project ANR Blanc 1 142915 “Micro-réseau” where we develop new imaging methods for micro-vascular networks [1, 2] using synchrotron tomography.

Different imaging modes will be investigated in the context of this post-doctoral study. First, absorption imaging mode associated with the injection of a contrast agent in vessels will be analyzed. The contrast that we have already obtained with this imaging mode is very high, so that many automatic treatments are possibles as testified by the expertise that we have developed for the vessel skeletonization [3, 4].

Furthermore, other imaging mode such as the phase holotomographie will also be investigated. Those mode permits the imaging of vessels that have not been injected with a contrast agent, but the resulting images are very noisy. A first test have shown the existence of multi-scaled textured artifacts on these

images that will have to be handled for extracting optimal vessels skeletonization.

One key aspect of the problematic, is the size of the images that can be as large as 4 Giga-Octet. Hence the algorithmic cost of the chosen methods is crucial. We will try to find a compromise between fast methods and the robustness of stochastic methods.

In a second step, some complementary analysis will be performed on the same samples imaged on synchrotron, cutting them and extracting 3D images with confocal microscopy with the aim of identifying some interesting biological information. We would like to develop the best matching procedures for the 3D images that will be obtained with the two imaging methods.

expected skills

The candidate should have a PhD degree in computer vision or related field. It should be ready to evolve in a multi-disciplinary framework. C or C++ programming expertise are required. **Practical issues**

The post-doc will take place at the Institut de Mécanique des Fluides de Toulouse UMR CNRS-INPT-UPS 5502 (www.imft.fr). This is a 12 month contract starting the October 2008. Application (CV+motivation letter+recommandation letter) must be send to plourab@imft.fr.

References

- [1] F. Plouraboué, P. Cloetens, C. Fonta, A. Steyer, F. Lauwers, and J. P. Marc-Vergnes, *J. Microscopy* **215**, 139 (2004).
- [2] L. Risser, F. Plouraboué, A. Steyer, P. Cloetens, G. L. Duc, and C. Fonta, *J. Cereb. Blood flow and Metabolism* **27**, 293 (2007).
- [3] L. Risser, *Analyse quantitative de réseaux micro-vasculaires intra-corticaux*, PhD thesis, Université Paul Sabatier, 2007.
- [4] L. Risser, F. Plouraboué, and X. Descombes, *IEEE Transactions in Medical imaging* **27**, 674 (2007).