Contribution ID: **39** Type: **Talk**

GPU-parallelized Levenberg-Marquardt model fitting towards real-time automated parametric diffusion NMR imaging

Friday, 12 September 2014 15:15 (30 minutes)

In this contribution we report one of the main goals of the GAP project, which aims to investigate the deployment of Graphic Processing Units (GPU) in different context of realtime scientific applications. In particular we focused on the application of GPUs in reconstruction of diffusion weighted nuclear magnetic resonance (DW-NMR) images by using non-Gaussian diffusion models. This application can benefit from the implementation on the massively parallel architecture of GPUs, optimizing different aspects and enabling online imaging.
In this work the stretched exponential model [1] was used to be fitted to DW-NMR biomedical images, obtained from an excised (in vitro) and a healthy (in vivo) mouse brain at 7.0T, in order to extract quantitative non-Gaussian diffusion parametric maps. A pixel-wise approach [2] by using a fast, accurate and robust parallel Levenberg-Marquardt minimization optimizer [3], was implemented on a Nvidia Quadro K2000 GPU. A dramatic speed-up (~250x) in massive model fitting analysis was obtained with respect to a multi-core Intel Xeon E5430 processor @2.66GHz. This results suggest that real-time automated pixel-wise parametric DW-NMR imaging is a promising application of GPUs.

[1] Palombo, M., et al. JCP2011, 135(3),034504.

[2] Capuani, et al.MRI 2013, 31(3),359-365.

[3] Zhu, X., Zhang, D. PloSone 2013, 8(10),e76665.

Primary author: Dr PALOMBO, Marco (MIRcen, I2BM, DSV, CEA, Fontenay-aux-Roses, France; CNR-IPCF UOS ROMA, Physics Department, Sapienza University of Rome, Rome, Italy)

Co-authors: LAMANNA, Gianluca (PI); Dr BAUCE, Matteo (ROMA1); Dr CAPUANI, Silvia (CNR-IPCF UOS Roma, Physics Department, Sapienza University of Rome, Rome, Italy); Mr MESSINA, andrea (roma1)

Presenter: Dr PALOMBO, Marco (MIRcen, I2BM, DSV, CEA, Fontenay-aux-Roses, France; CNR-IPCF UOS ROMA, Physics Department, Sapienza University of Rome, Rome, Italy)

Session Classification: GPU in Other Applications (2/2)