CSC/UdL Ph.D Project

Title:
High Angular Resolution Diffusion Imaging of the Hearts

Description:
Heart diseases are a leading cause of death and disability in the world. Despite decades of intensive research on such diseases, many things remain unknown. Recently, diffusion tensor imaging (DTI) has appeared as a new non-invasive technique to study the microscopic structures of the myocardium. However, DTI can only provide dominant orientation information of cardiac fibers at a voxel. When, inside a voxel, the myocytes (or fibers) have different orientations, DTI only indicates one orientation. To get rid of such problem, we try to develop high angular resolution diffusion imaging (HARDI).

The Ph.D project aims to simulate HARDI sequences imaging experiments suitable for studying the fiber complexity of the myocardium. To do that, the work consists in getting familiar with magnetic resonance imaging (MRI) sequences on an experimental MRI spectrometer (4.7T) and get also familiar with a simulator environment (Odin) to simulate HARDI sequences suitable for the study of the heart organ. Our goal is to make realistic simulations taking into account at the same time the heart fiber NMR and physiological properties and also the NMR sequences generic properties and imperfections.

This project is based on the work previously developed by our laboratory, and will be undertaken in strong collaboration with other experienced people and teams in France, in China and in USA.

A strong background on physics and programming in C++ is expected from the candidate.

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References: