WHITAKER BIOMEDICAL ENGINEERING INSTITUTE

DEPARTMENT OF BIOMEDICAL ENGINEERING SPECIAL SEMINAR

Jean-Marc Peyrat

Asclepios Research Project
INRIA - Sophia Antipolis

"A Computational Framework for the Statistical Analysis of Cardiac Diffusion Tensors."

DATE:	October 19, 2007
TIME:	1:00p.m. – 2:00p.m.
PLACE:	Clark Hall, 110
HOST:	Elliot McVeigh, PhD

ABSTRACT:
Cardiac fiber architecture, a complex arrangement of myofibers bounded to each other to form laminar sheets, plays an essential role in defining the electrical and mechanical behavior of the heart. The study of the cardiac fiber architecture and its variability is important to better understand physiological principles and to construct computational models of the heart. A unified computational framework is proposed to build a statistical atlas of the cardiac fiber architecture from diffusion tensor magnetic resonance images (DT-MRIs). An average cardiac fiber architecture and a measure of its variability are computed using novel advances in diffusion tensor statistics. This framework is applied to a small database of nine ex vivo canine hearts. The resulting statistical analysis confirms the already established good stability of the fiber orientations and a higher variability of the laminar sheet orientations within a given species. The statistical comparison between the canine atlas and a standard human cardiac DT-MRI shows a better stability of the fiber orientations than their laminar sheet orientations between the two species. The proposed computational framework can be applied to larger databases of cardiac DT-MRIs from various species to better establish intra- and inter-species statistics on the anatomical structure of cardiac fibers. This information will be useful to guide the adjustment of average fiber models onto specific patients from in vivo anatomical imaging modalities.