Computational methods for blood flows
Associated team “Cardio”
INRIA Project-team REO / CVBRL, Stanford
Jean-Frédéric Gerbeau

Abstract:

This talk will present a selection of the results obtained in the framework of the Associated Team “Cardio”, coordinated by Irène Vignon-Clémentel.

1. Incorporating clinical data into boundary conditions
Interest in the application of computational methods to problems in congenital heart disease has gained increased popularity over the past decade. The use of computational simulation to examine common clinical problems including single ventricle physiology and the associated surgical approaches is now routinely appearing in clinical journals. We will present novel simulation examples of virtual Fontan conversion (from preoperative data to predicted postoperative state) and outcomes of different surgical designs.

2. Medical Image-based fluid structure interaction
We will address the formulation of an adequate model of the external tissue environment when studying a portion of the arterial tree with fluid-structure interaction. Whereas much work has already been accomplished concerning flow and pressure boundary conditions associated with truncations in the fluid domain, very few studies take into account the tissues surrounding the region of interest to derive adequate boundary conditions for the solid domain. We propose to model the effect of external tissues by introducing viscoelastic support conditions along the artery wall, with two -- possibly distributed -- parameters that can be adjusted to mimic the response of various physiological tissues.

Partners:

REO and MACS teams, **INRIA Paris-Rocquencourt**, France :
I Vignon-Clementel (coordination), JF Gerbeau, M Astorino, G Troianowski, P Moireau, D Chapelle
Cardiovascular Biomechanics Research Laboratory, **Stanford University**, USA (and affiliated colleagues):
C Taylor, CA Figueroa, N Xiao, G Troianowski, J Feinstein, A Marsden, S Shadden, J Kim, R Raghu