

VMTK - Fluent - Paraview: Computational Tools For Hemodynamics Applications

CILEA, 12-15 September 2011

Detailed Program

	School session	Description
	Lecture	Presentation of theoretical and technical background by school teachers
	Tutorial	Practical, interactive walkthrough. Students will sit at workstations, data and solutions will be available
	How-to Q&A	Presentation of techniques, tips and tricks and selected case studies (eventually proposed by the audience), openly discussed by teachers and students
	Break	Coffee or lunch break
	Invited Lecture and Sponsor Presentations	Presentation of case studies and technical achievement by invited lecturers and sponsor personnel

DAY1	Lecturers	Time		Title	Details
Geometric modeling	L. Antiga (Orobix s.r.l.) R. Ponzini (CILEA)	9.30-10.00		School Presentation	Analysis of student background, general info, overview and timing of the school, timing of the day
		10.00-10.30		The image-based modeling workflow for computational hemodynamics	Introduction on image-based hemodynamics, overview on the complete modeling workflow
		10.30-11.15		Image segmentation background	Imaging modalities, standard formats, overview on segmentation techniques
		11.15-11.30		coffe-break	
		11.30-12.30		VMTK: the tool and usage concepts	Overview on VMTK, basic architecture, file formats, vmtk scripts, the PypeS system
		12.30-13.00		Tutorial	VMTK usage: creating pipes, loading images, extracting isosurfaces, visualizing results
		13.00-14.30		lunch break	
		14.30-15.30		Vascular Geometry Generation	Segmentation techniques in vmtk: level sets, initialization, feature images, interactive tube segmentation, merging, smoothing
		15.30-16.30		Tutorial	Segmentation of carotid bifurcations from MRA and CTA
		16.30-17.15		Geometry Analysis	Centerlines, maximal inscribed sphere radius, bifurcation geometry, branch geometry, section areas, curvature, tortuosity, Voronoi diagrams
		17.15-18.00		Tutorial	Analysis of carotid bifurcation geometry, ow to extract data from vmtk output, exploring in Paraview
DAY 2 Mesh generation and CFD	R. Ponzini (CILEA) L. Antiga (Orobix s.r.l.)	9.30-10.00		Introduction to CFD for hemodynamics	Introduction on CFD for hemodynamics
		10.00-10.30		Blood fluid dynamics	Basic theory, examples and issues
		10.30-11.15		Implementation: basic	Ansys Fluent: CFD model setup
		11.15-11.30		coffe-break	
		11.30-12.00		Tutorial	Mesh generation in VMTK: carotid bifurcation
		12.00-13.00		Tutorial	CFD implementation of a carotid bifurcation model in Ansys Fluent
		13.00-14.30		lunch break	
		14.30-15.30		Implementation: advanced	User defined functions (udf) for custom models: boundary conditions and rheology issues
		15.30-16.30		Tutorial	Carotid bifurcation: unsteady boundary conditions and custom rheology using udf
		16.30-17.15			
		17.15-18.00		Post processing in ANSYS Fluent	Introduction to post-processing CFD results in Ansys Fluent with examples
DAY 3 CFD and post-processing	M.E. Biancolini (Univ. Tor Vergata) R. Ponzini (CILEA) L. Antiga (Orobix s.r.l.)	9.30-10.00		Introduction to parametric studies for hemodynamics: mesh morphing	Theory and examples using RBF Morph
		10.00-10.30		Implementation: basic	Morphing of a single vessel and of the carotid bifurcation using RBFMorph
		10.30-10.45		coffe-break	
		10.45-12.00		Tutorial	Carotid bifurcation parametric study: basic techniques using RBFMorph and VMTK data
		12.00-13.00		How-to	Carotid bifurcation parametric study: advanced techniques using RBFMorph
		13.00-14.30		lunch break	
		14.30-15.30		Introduction to visualization data post-processing for hemodynamics	Theory and examples
		15.30-16.30		Tutorial	Post-processing using Ansys-Fluent and Paraview
		16.30-17.15		Post-processing: advanced implementations	Computing derived quantities using VMTK and Paraview
		17.15-18.00		Tutorial	Advanced post-processing and visualization using Paraview
DAY 4 HPC computing, Q&A	L. Antiga (Orobix s.r.l.) R. Ponzini (CILEA)	9.30-10.15		Ansys Presentation and Prof. G. Dubini (PoliMI) Lecture	Case studies and applications
		10.15-10.45		Prof. U. Morbiducci (PoliTO) Lecture	
		10.45-11.30		HP Presentation	
		11.30-11.45		coffe-break	
		11.45-12.15		HPC servers & Job schedulers	From individual models to production using HPC environments: PBS-Professional and Python scripting
		12.15-13.00		Tutorial	Application development on HPC servers
		13.00-14.30		lunch break	
		14.30-15.30		Q&A	Open session. Participants are invited to propose a case study concerning their research area of interest (with data) to be discussed and analyzed with the school team.
		15.30-16.30			
		16.30-17.15			
		17.15-18.00		Conclusions	