Objectives

Engineering applications involving biological fluids have highly transversal requirements in terms of domain definition, flow conditions, fluid rheological properties, structure motion, visualization and post-processing of the results. For these reasons, and thanks to the enormous developments of computational sciences, a computer-aided–engineering workflow seems to be a possible elective environment where to perform hemodynamics studies and medical device design.

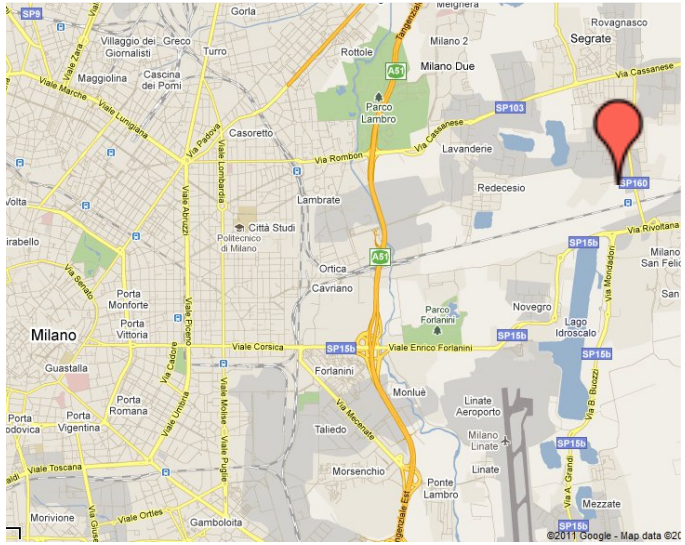
Today a large part of the technological requirements needed to tackle these problems in a computational environment are already available in open source and/or commercial software. Nevertheless, success still strongly depends on technical knowledge and practice.

This four days course, focused on the technical aspects of this field of application and structured as an extended hands-on tutorial, is intended to walk the attendants through a complete analysis of a sample hemodynamic application, providing technical insights on each phase of the workflow.

The main expected benefits for the course attendant are:
- enlarge their knowledge on state of art methods and algorithms;
- apply best practices on state-of-the-art software deployment;
- experience technical tips-and-tricks throughout the different phases of the tutorial;
- learn from case history and practical applications told by ANSYS experts.

The course will therefore facilitate and speed-up in silico healthcare research and Computational Fluid Dynamics driven medical device design.

Directions



By train
S5 and S6 city rail link, stop Segrate
www.trenitalia.it

By bus
Line 924, ATM public transport company, stop Modigliani/Morandi
www.atm-mi.it

By plane
From Malpensa airport S1 & S6 city rail link
From Linate airport bus lines 73 & 925
From Orio Al Serio airport bus to Milano

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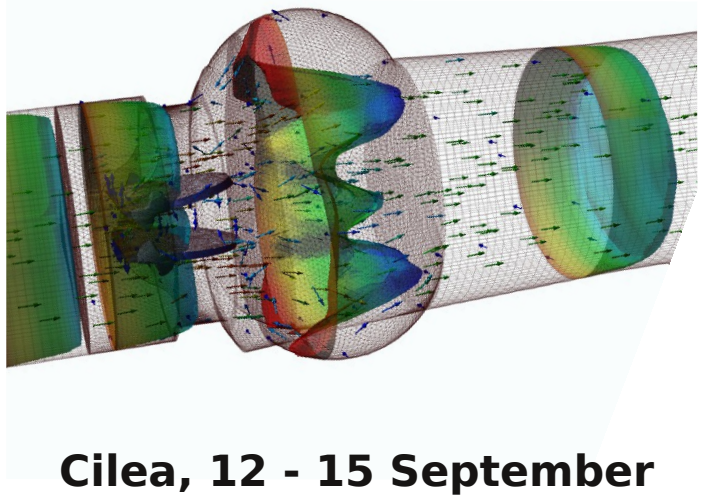
Email: summerschool2011@cilea.it
www.cilea.it/summerschool2011

Summer school on

VMTK - Fluent - Paraview

computational tools for hemodynamics applications



Cilea, 12 - 15 September

Luca Antiga, Ph.D.
Orobix S.r.l.

Raffaele Ponzini, Ph.D.
CILEA

Marco E. Biancolini, Ph.D.
Tor Vergata University
RBFMorph

CILEA Consorzio Interuniversitario

In collaboration with Ansys Italia - Milano and Hewlett - Packard Italia

Program

	Theme	Time	Lecturer	Lecture	Tutorial	Tools
day 1	**GEOMETRIC MODELING**	9:30 13	Antiga	Image processing	Carotid bifurcation: segmentation and geometry	VMTK
		14:30 18	Antiga	Vascular domain generation		
day 2	**MESH GENERATION AND CFD**	9:30 13	Ponzini	CFD – basics	Carotid bifurcation: meshing and CFD	VMTK, Fluent
		14:30 18	Antiga, Ponzini	Meshing and CFD		
day 3	**CFD AND POST-PROCESSING**	9:30 13	Biancolini, Antiga	CFD – morphing	Carotid bifurcation: parametric CFD, advanced BC and rheology	RBF Morph, VMTK, Fluent, Paraview
		14:30 18	Antiga, Ponzini	CFD – post-processing	Carotid bifurcation: post-processing	
day 4	**HPC COMPUTING, Q&A**	9:30 13	Invited	Case studies	Q&A	RBF Morph, VMTK, Fluent, Paraview
		14:30 18	Antiga, Ponzini	HPC-server, Q&A		

Audience

The summer school is aimed to junior and senior engineers, scientists and PhD or postdoctoral students in the area of bio fluid mechanics.

Computational tools

VMTK The Vascular Modeling Toolkit is a collection of open-source libraries and tools for 3D reconstruction, geometric analysis, mesh generation and surface data analysis for image-based modeling of blood vessels.
Ansys CFD Suite ANSYS fluid dynamics solutions is a comprehensive commercial product suite for modeling fluid flow.
RBF Morph RBF Morph is a unique morpher that combines a very accurate control of the geometrical parameters with an extremely fast mesh deformation.
Paraview ParaView is an open-source, multi-platform data analysis and visualization application.

Registration

The registration fee is 500 € for academic participants and 800 € for others.
The maximum number of participants is set to twenty. The fee covers the participation to all the lectures and tutorials, a printed version of lecture notes and a digital version of the tutorial solutions.
A trial license (one month) of Ansys products and RBF Morph will also be availables for participants.
Payment is required by June 10, 2011. After this date an extra fee of 150 € will be charged.
Participants are asked to make their own Hotel reservations.
Launch voucher is included.
For any further information please contact the school secretariat at summerschool2011@cilea.it

Luca Antiga

Luca Antiga obtained his PhD degree in Biomedical Engineering from Politecnico di Milano in 2002, and was Head of the Medical Imaging Unit at the Mario Negri Institute in Bergamo up until 2009. Since 2009 he is Co-founder and Principal Scientist at Orobix Srl. He co-authored 30 peer-reviewed papers in the fields of medical imaging, image analysis, numerical simulation and bioengineering, and is lead developer of the Vascular Modeling Toolkit.

Raffaele Ponzini

Master degree in Bioengineering from the Politecnico di Milano (2002). Since 2003 he is working as a member of the High Perfomance Computing group of CILEA, where is in charge of the management of computational fluid dynamics codes. In 2007 he finished his PhD program in Bioengineering at the Politecnico di Milano. His research interests include multiscale models in hemodynamics, and scientific visualization. He is author of 15 peer reviewed international papers in the field of biomechanics and computational fluid dynamics

Marco E. Biancolini

Education and Academic Career in Mechanical Engineering at the University Tor Vergata. Graduated in 1997, PhD in 2001. Full time researcher since 2000, lecturer in Machine Design since 2002. Author of 90 scientific papers. Author of RBF Morph, awarded for the Most Advanced Approach using integrated and combined simulation methods at the European Automotive Simulation Conference (EASC 2009). Winner of the Fluent award CFD User of the Year 2005 for the most innovative use of CFD with the work Modeling FSI Problems in Fluent using UDFs.