Course Outline

Lattice Boltzmann theory
- Background
- Fundamental LB equations
- Boundary conditions
- Advanced collisions and entropic LB
- Turbulence modelling
- LB for Multi-phase flows
- LB for Non-Ideal fluids
- LB model for micro and nano fluid

Basic Applications
- Grid refinement
- Advanced boundary cond's
- Irregular grids
- Volumetric formulation
- Hands on

Advanced Applications
- Adaptive methods
- CFD applications in automotive design
- Micro and nano applications
- LB and high performance computing
- LBM commercial software (PowerFLOW) for hands on applications

Software

The material will presented on multifold support, from conventional blackboard, glossy transparency as well as pdf and ppt files. Both Windows and UNIX

Course Language

All lectures and presentations shall be conducted in English Language. Thus, a good command of English Language is required.

Fellowship Awards

A limited number of fellowship awards to cover 50 % of the advanced full course fee are available for graduate and undergraduate students. To be eligible for a fellowship award the applicants should send a curriculum vitae, a 1-page letter of application to explain why the fellowship is needed and two recommendation letters before November, 1.

Class Schedule

	9.00 11.00	11.00 11.30	11.30 13.30	13.30 14.30	14.30 16.00	16.00 16.30	16.30 18.00
Monday	×	Coffee break	×	Lunch		Coffee break	
Tuesday	×		×		×		×
Wednesday	×		×		×		×
Tuesday	×		×		×		×
Friday	×		×		×		×
Saturday	×		×				

Full Course Fee

	Advanced (*)	Late
Regular	1500 €	1800 €
Students	900 €	1200 €

(Any) Three-days Fee

	Advanced (*)	Late
Regular	900 €	1100 €
Students	550 €	700 €

(*) before 1 December 2007. Parties of three or more from the same institution will get a 25 % discount.

Advanced registration is strongly advised. Due to the hands-on nature of this Course (demonstrations and lectures), enrolment is limited and applications will be accepted on a first come first served basis.

Registration fees include all course, demonstrations, didactic material, coffee breaks (2/day) and the final banquet.

To register please complete the registration form available at
http://www.h2cu.com/custom.asp?inAct=V&inObj=7
and send it to:
by e-mail: stefano.ubertini@uniroma2.it
by fax: +39 06 2331 0028

An introduction to Lattice Boltzmann Methods for complex flow simulations

March, 3-8 2008

ORGANIZED by

S.C.I.R.E. Scientific Consortium for the Industrial Research and Engineering

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Università di Roma Tor Vergata

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Introduction

The lattice Boltzmann method is a highly innovative approach to fluid dynamics, which is based on the solution of a minimal Boltzmann kinetic equation, rather than on the discretization of the Navier-Stokes equations of continuum mechanics.

This minimal Boltzmann equation, known as Lattice Boltzmann equation (LBe), was developed in the late 80's and early 90's, in response to the major drawbacks of its ancestor, the Lattice Gas Cellular Automata method.

Ever since, LBE research has known a burgeoning growth, which has led to an extremely elegant and computationally efficient approach to the most complex problems in fluid dynamics.

These range from low-Reynolds single and multiphase flows in highly heterogeneous (porous) media, all the way to fully turbulent flows in complex geometries of direct industrial relevance, such as real-life cars and airplanes.

In hindsight, the most fundamental asset of LBe rests with its mesoscopic nature, lying in between the atomistic and continuum descriptions of fluid flows. This allows LBe to combine the best of the two worlds: the geometrical flexibility of atomistic methods with the large-scale resolution of continuum methods.

Objectives

The objective of this course is to present the theory and the applications of the lattice Boltzmann method for fluid dynamics. Besides the theoretical explanation of the method, the course will feature several hours of practice which will permit the students to develop their own warm-up computer code to simulate fluid dynamics with the lattice Boltzmann models.

Venue Information

The one-week course will be held at: The Consiglio Nazionale delle Ricerche (CNR), Piazzale Aldo Moro 7, Rome, Italy.

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Exa Corporation, USA

Addressing Speech

Di Giusto, Nevio
Managing Director
ELASIS – FIAT GROUP

Opening Lecture

Orszag, Steven A.
Yale University, Mathematics Department, USA

Lecturers

Asinari, Pietro
Politecnico di Torino, Italy

Amati, Giorgio
CASPUR, Italy

Benzi, Roberto
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