Centre for Nonlinear Studies
TTÜ Küberneetika Instituut
Tallinn, Estonia

Summer-school:

Scientific Computing

August 7–11, 2010 in Tallinn, Estonia

Overview

Numerical simulations are probably the most well known and oldest category of scientific computing, nevertheless also today they still require detailed expert knowledge to be done in a correct and efficient way. The summer-school will give an overview of modelling in science (physical, mathematical and numerical) and parallel programming and will focus on solving large systems of (sparse) linear systems of equations with iterative methods. These kind of systems arise in many different numerical schemes, i.e. finite element methods and computational fluid dynamics are popular examples.

Topics

- modelling (physical, mathematical, numerical)
- computer architectures for HPC
- iterative solver
  splitting methods, preconditioners, MINRES, SYMMLQ, CG, BiCG, BiCGStab, GMRES, multigrid methods
- parallel programming
  MPI, OpenMP, OpenCL

The Lecturers

The invited lecturers are well known in their fields. Prof. A. Meister (University of Kassel, AG analysis and applied mathematics) and B. Fischer (University of Lübeck, insitute of mathematics) are lecturers at parallel programming courses and workshops on a regular basis. Both are authors of well received books in the field of iterative solvers, they have excellent didactic skills and will bring a unique contribution to this summer-school. Prof. E. Vainikko gives classes on scientific computing, including parallel programming, regularly at University of Tartu.

Evening Lectures

Possible talks are:

- Some things that went wrong due to bad numerical computing
- 3D visualisation of scientific data, example ”Baltic Way” project
- Open-source software in science: means of making numerical research transparent and reduce costs of teaching and research

About Tallinn

The summer-school will be held in the beautiful medieval city of Tallinn, an old hanseatic town known also as Reval. Tallinn will be Europe’s cultural capital in 2011.

Kiek in de Kök

TTÜ Küberneetika Instituut

Location	TTÜ Küberneetika Instituut Akadeemia tee 21 12618 Tallinn, Estonia
Fee	750 EEK (50 Euro) for students 1500 EEK (100 Euro) for others some supported places are available
Accomodation	not included; please arrange yourself; the Academic Hostel is very close (http://www.academichostel.com/)
Contact	Dr. H. Herrmann sc-summer-school@cens.ioc.ee

NB! In case of registered participants not showing up these will be blocked from *all* classes given by the organizer for one year, this includes future seminars, summer/winter-schools and also regular university courses.

Schedule

	Saturday	Sunday	Monday	Tuesday	Wednesday	
09:00 - 09:15	09:00-09:30			09:00-10:00	09:00-10:00	09:00 - 09:15
09:15 - 09:30	Registration		09:00-10:30	Fischer:	Vainikko:	09:15 - 09:30
09:30 - 09:45	09:30-09:45 Opening		Meister:	Polynomial methods	MPI	09:30 - 09:45
09:45 - 10:00	09:45-10:30		Classical splitting methods 1			09:45 - 10:00
10:00 - 10:15	Herrmann:			10:00 – 10:15 break	10:00 – 10:15 break	10:00 - 10:15
10:15 - 10:30	Modelling			10:15-11:15	10:15-11:15	10:15 - 10:30
10:30 - 10:45	10:30 – 10:45 break		10:30 – 10:45 break	Fischer:	Vainikko:	10:30 - 10:45
10:45 - 11:00	10:45-11:30	09:00		Polynomial methods	MPI	10:45 - 11:00
11:00 - 11:15	Herrmann:		10:45-12:00	(computing a basis)		11:00 - 11:15
11:15 - 11:30	Computer architectures	excursion	Meister:	11:15 – 11:30 break	11:15 – 11:30 break	11:15 - 11:30
11:30 - 11:45	11:30 – 11:45 break	to	Classical splitting methods 2	11:30-12:30	11:30-12:30	11:30 - 11:45
11:45 - 12:00	11:45-12:30	Padise		Fischer:	Vainikko:	11:45 - 12:00
12:00 - 12:15	Herrmann:	snd	12:00 – 12:15 break	Polynomial methods	MPI	12:00 - 12:15
12:15 - 12:30	HPC	Haapsalu	12:15-13:15	(CR, CG)		12:15 - 12:30
12:30 - 12:45			exercises			12:30 - 12:45
12:45 - 12:00			(using GNU Octave)	12:30-13:30	12:30-13:30	12:45 - 12:00
13:00 - 13:15				lunch break	lunch break	13:00 - 13:15
13:15 - 13:30						13:15 - 13:30
13:30 - 13:45		(return late at night)	13:15-14:30	13:30-14:30	13:30-14:30	13:30 - 13:45
13:45 - 14:00			lunch break	Fischer:	Herrmann:	13:45 - 14:00
14:00 - 14:15				Indefinite problems	OpenMP	14:00 - 14:15
14:15 - 14:30				(MINRES, SYMMLQ)		14:15 - 14:30
14:30 - 14:45	12:30		14:30-15:30	14:30 – 14:45 break	14:30 – 14:45 break	14:30 - 14:45
14:45 - 15:00			Meister:	14:45-15:45	14:45-15:45	14:45 - 15:00
15:00 - 15:15	sightseeing		classical preconditioners	Fischer: Non-symmetric problems	Herrmann:	15:00 - 15:15
15:15 - 15:30	in		and PCG-method	minimizing methods (GMRES)	OpenMP	15:15 - 15:30
15:30 - 15:45	Tallinn		15:30 – 15:45 break			15:30 - 15:45
15:45 - 16:00			15:45-16:45	15:45-16:30	15:45 – 16:00 break	15:45 - 16:00
16:00 - 16:15			Meister:	Fischer: Non-symmetric problems	16:00-17:00	16:00 - 16:15
16:15 - 16:30			CG method	short recursions (BCG, BiCGStab, QMR)	Herrmann:	16:15 - 16:30
16:30 - 16:45				16:30 – 16:45 break	OpenCL	16:30 - 16:45
16:45 - 17:00			From 16:45			16:45 - 17:00
17:00 - 17:15			exercises	16:45-18:00	Summary and Q&A	17:00 - 17:15
17:15 - 17:30			(using GNU Octave)	Fischer:	Closing	17:15 - 17:30
17:30 - 17:45				Principles of multigrid methods		17:30 - 17:45
17:45 - 18:00						17:45 - 18:00
20:00-	evening lecture		evening lecture	banquet		20:00-

Marie Curie Actions
Human resources and mobility

ESTwave (PERG04-GA-2008-238191)