Royal Institute of Technology
Department of Numerical Analysis and Computer Science
SE-100 44 Stockholm, Sweden

Uppsala University
Division of Scientific Computing
Department of Information Technology
Box 337
SE-751 05 Uppsala, Sweden

Graduate course "Classic articles in numerical analysis"

In this graduate course we shall together read a number of journal articles with great impact in numerical analysis. A similar course was first given by Nick Trefethen at Cornell University in 1993, and has been given on several occations at TDB in Uppsala and at NADA at KTH since 1996. The course is also this time arranged in a collaboration between Stockholm and Uppsala.

For every article we have

- One *history expert* who gives the historical background to the article and information about the author(s).

- One *mathematician* who gives an overview of the scientific contents without going into too much detail.

- Two *experimentalists* who perform relevant numerical experiments, present them and draw conclusions.

The presentation of a paper is ended by a discussion and the course leaders give some concluding comments.

The course gives 7.5 credit points to everyone who actively participates in the presentations and the discussions and is present at all meetings. We meet four times alternately in Stockholm and in Uppsala. Three or four articles are scheduled per meeting.

The history expert starts with 10 minutes, then the mathematician has 20 minutes, and finally the experimentalists have 20 minutes together. The final discussion takes 10 minutes. All participating students act once as the history expert, once as the mathematician, and twice as experimentalist, see the table at the end of this document.

- Meeting #1: Tuesday 28/2 in Stockholm, room 4523,

- Meeting #2: Tuesday 20/3 in Uppsala, room 2344,

- Meeting #3: Tuesday 10/4 in Stockholm, room 1537,

- Meeting #4: Wednesday 2/5 in Uppsala, room 2344.

All meetings are scheduled between 10.15 AM and 15.00 PM. **Please note that lunch is included!** Contact Stefan or Katarina in case you have special concerns regarding food.

List of articles

1. Brandt A.: Multi-level adaptive solutions to boundary value problems. Math. Comp. 31, 333–390, (1977).

2. Cooley J.W. and Tukey J.W.: An algorithm for the machine calculation of complex Fourier series. Math. Comp. 19, 297–301, (1965).

3. Courant R., Friedrichs K.O. and Lewy H.: Über die partiellen Differenzengleichungen der mathematischen Physik. Mathematische Annalen 100, 32-74 (1928). Translated as: On the partial difference equations of mathematical physics. IBM J. of Research and Development 11, 215–234, (1967).

4. Dahlquist G.: A special stability problem for linear multistep methods. BIT 3, 27–43, (1963).

5. Engquist B. and Majda A.: Absorbing boundary conditions for the numerical simulation of waves. Math. Comp. 31, 629–651, (1977).

6. Greengard L. and Rokhlin V.: A fast algorithm for particle simulations. J. Comput. Phys. 73, 325–348, (1987).

7. Kreiss, H.-O.: On difference approximations of the dissipative type for hyperbolic differential equations, Comm. Pure Appl. Math. 17, 335–353, (1964).

8. Lax P. D. and Richtmyer R. D.: Survey of the stability of linear finite difference equations. Comm. Pure Appl. Math. IX, 267–293, (1956).

9. Hestenes M. R. and Stiefel E. L.: Methods of conjugate gradients for solving linear systems. J. Res. Nat. Bur. Stand., Sect B, 49, 409–436, (1952).

10. Golub G. H. and Kahan W.: Calculating the singular values and pseudoinverse of a matrix. SIAM J. Numer. Anal. 2, 205–224, (1965).

11. Daubechies, I., Orthonormal Bases of compactly supported wavelets, Comm. Pure Appl. Math. 41, 909-996, (1988).

12. Metropolis, N. et.al, Equation of state calculations by fast computing machines, J. Chem. Phys. 21, 1087-1092, (1953).

13. Osher, S. and Sethian, J. A., Fronts propagating with curvature-dependent speed: algorithms based on Hamilton-Jacobi Formulations, J. Comput. Phys. 79, 12-49, (1988).

14. Eriksson, K. and Johnson C., An adaptive finite element method for linear elliptic problems, Math. Comp. 50, 361-383, (1988).

The articles can be categorized as follows:
Linear algebra: 9, 10,
Ordinary differential equations: 4
Partial differential equations: 1, 3, 5, 7, 8, 13, 14
Miscellaneous subjects: 2, 6, 11, 12

Student	Short	Mail
Jennifer Grünig	JG	jgrunig@csc.kth.se
Ludvig af Klinteberg	LaK	ludvigak@kth.se
Niclas Jansson	NJ	njansson@csc.kth.se
Niyazi Cem Degirmenci	NCD	ncde@kth.se
Jeannette Spühler	JS	spuhler@kth.se
Magnus Gustafsson	MG	magnus.gustafsson@it.uu.se
Pavol Bauer	PB	bauer.pa@gmail.com
Daniel Elfverson	DE	daniel.elfverson@it.uu.se
Sofia Eriksson	SE	sofia.eriksson@it.uu.se
Lina Meinecke	LM	lina.meinecke@it.uu.se
Marcus Holm	MH	marcus.holm@it.uu.se
Sven-Erik Ekström	S-EE	sven-erik.ekstrom@it.uu.se
Martin Tillenius	MT	martin.tillenius@it.uu.se

Article #	History	Mathematics	Experiments	Date
1	MG	PB	JG,JS	28/2
2	MT	NJ	MH,S-EE	28/2
3	DE	MH	NJ,LaK	28/2
4	SE	S-EE	NCD,NJ	20/3
5	JG	NCD	LM,MG	20/3
6	S-EE	JG	MT,MH	20/3
7	MH	MG	S-EE,MT	10/4
8	PB	LM	LaK,JG	10/4
9	NCD	SE	PB,DE	10/4
10	LaK	JS	SE,LM	10/4
11	NJ	LaK	DE,SE	2/5
12	LM	MT	JS,NCD	2/5
13	JS	DE	MG,PB	2/5
14	-	-	-	

In case you have really good reasons to change article or date with someone else, try to do so by contacting the person in question yourself.

Good luck!

Stefan Engblom and Katarina Gustavsson