Michael Plexousakis

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EDUCATION

University of Tennessee, Knoxville
Doctor of Philosophy, Mathematics — **Dec 1996**
Thesis: "An adaptive nonconforming finite element method for the nonlinear Schrödinger equation."
Advisor: Ohannes Karakashian.

University of Tennessee, Knoxville
Master of Science, Mathematics — **Aug 1991**
Thesis: "Parallel implementation of implicit Runge–Kutta methods." Advisor: Ohannes Karakashian

University of Crete, Heraklion
Diploma, Mathematics — **Nov 1987**

ACADEMIC AND WORK EXPERIENCE

Department of Applied Mathematics, University of Crete
Assistant Professor	**Jun 2010–Current**
Systems Manager	**Dec 2003–Jun 2010**
Adjunct Assistant Professor	**Sep 2002–Aug 2005**
Systems Manager	**Mar 2002–Aug 2002**

NADA, Royal Institute of Technology, Stockholm, Sweden
Postdoctoral Fellow — **Feb 2000–Dec 2001**

Department of Mathematics, University of Milan, Italy
Postdoctoral Fellow — **Feb 1999–Dec 1999**

Department of Mathematics, University of Tennessee, Knoxville
Teaching Assistant — **Jan 1989–Dec 1996**

Institute of Applied and Computational Mathematics, FO.R.T.H.
Research Assistant — **Jul 1985–Jul 1988**

TEACHING EXPERIENCE

During my tenure as an Adjunct Assistant Professor in the Department of Applied Mathematics of the University of Crete, I prepared notes and taught several courses in the area of numerical mathematics and computer science including Introduction to Computing, Introduction to Numerical Algorithms, Numerical Analysis, Numerical solution of Ordinary differential equations, Numerical solution of Partial differential equations, Data structures. I also prepared and taught the lab sessions of these courses. After my appointment as an Assistant Professor in the Department of Applied Mathematics of the University of Crete I taught the first–year courses Introduction to Computing and Introduction to Programming, the fourth–year advanced course Topics in Numerical Analysis, and the specialization courses Discrete Mathematics and Design and Analysis of Algorithms. During the Spring Semester 2013 I taught jointly with P. Chatzipantelides and G. Zouraris the graduate–level course in Numerical Analysis. In the Spring Semester 2014 I am teaching the graduate–level course in Scientific Computing, jointly with V. Harmandaris and Th. Katsaounis.

STUDENTS

Optimal control theory, Maria Alexandrou, Diploma Thesis, Fall Semester 2012-13, Department of Applied Mathematics, University of Crete.

Applications of Principal Component Analysis in Meteorology, Georgia Sfakianaki, Diploma Thesis, Fall Semester 2013-14, Department of Mathematics and Applied Mathematics, University of Crete.

TECHNICAL SKILLS

Extensive software and hardware experience in information technology. Good knowledge of the Linux, Mac OS X and Windows operating systems. Excellent programming skills in C, C++, Fortran, Perl, Python, PHP, Unix shell scripting and in other languages. Several years of experience with Matlab, Maple, Tecplot and other scientific software packages. Proficient in TeX, LaTeX, Office and other productivity packages for Linux, Mac OS X and Windows platforms.

SOFTWARE

nls2d–An adaptive multilevel finite element code for the solution of the Nonlinear Schrödinger equation
nls2d is a finite element code implementing a discontinuous Galerkin method for the nonlinear Schrödinger equation (NLS) in two dimensions. The purpose of the code is to approximate singular solutions of the NLS, but without any assumption on radial symmetry of the solution or that the

modulus of the solution approaches infinity at exactly one point. The approximating spaces used in the code reduce to piecewise polynomial functions of degree one, two or three, which are, in general, discontinuous across interelement boundaries. The temporal discretization is achieved by means of a variable step Crank-Nicolson scheme. The code employs a spatial refinement strategy which allows the mesh to be refined locally and without compromising its overall quality. The adaptive refinement strategy is effected by a simple and computationally efficient test, motivated by a local H^1–L^2 inverse estimate on the approximating subspace. The temporal stepsize k is also subject to adaptation by monitoring the second invariant of the NLS. The code is able to follow the evolution in time of initial profiles with or without radial symmetry, having one or several peaks, and achieves amplitude magnifications in the range $O(10^7)$ to $O(10^8)$.

femplot–A visualization tool for the finite element method
femplot is a visualization tool for numerical simulations with the finite element method in two dimensions. It can handle non-conforming meshes, i.e., meshes with hanging nodes, and discontinuous (across interelement boundaries) functions. Its capabilities include mesh plots in 2D, 3D surfaces, contour plots (including contour lines and color flood between contour levels) and combinations of mesh, surface and contour plots. It uses a graphical user interface to create and arrange plots and supports rotation and zooming via the mouse. It produces color and gray-level output in Postscript. femplot is written in C and is easily portable to Unix environments.

ecotax–A tool for the determination of the optimal taxation of common pool resources
ecotax implements an algorithm for the determination of the best regulated feedback Nash equilibrium and the optimal steady state tax function for the shallow lake problem. We calculate the optimal state–dependent tax in four different functional forms: a tax scheme with a fixed rate, a tax scheme with a tax rate proportional to the state of the system, a tax scheme which is a quadratic function of the state, and a tax scheme which is a cubic function of the state.

RESEARCH INTERESTS	Numerical solution of partial differential equations, finite element and finite volume methods, adaptive algorithms, singular solutions of nonlinear equations, scientific computing and visualization.
RESEARCH AFFILIATIONS	Archimedes Center for Modeling, Analysis and Computations (ACMAC). Department of Applied Mathematics, University of Crete.
	Institute of Applied and Computational Mathematics, Foundation for Research and Technology, Hellas. Heraklion, Crete.
RESEARCH GRANTS	Study of extreme weather phenomena in local regions and their impact to civil protection and the economy. Research Program "SYNERGASIA", Greek Secretariat of Research and Technology, 2011-2014.
	Optimal Managment of Dynamic Systems of the Economy and the Environment. Research Program "THALIS", Section: Social, Administrative and Economical sciences, 2012-2014, Ministry of Education, Lifelong Learning and Religious Affairs. 2012-2014.
	Analysis, Modeling and Simulations of Complex and Stochastic Systems "AMOSICSS". Research Program "THALIS". Ministry of Education, Lifelong Learning and Religious Affairs. 2012-2015.
CONFERENCES	International Conference on Applied Mathematics, 16–20 September 2013, Heraklion, Crete. Organizer (with N. Christakis, N. Chrysoulakis and G. Kossioris) of the mini symposium entitled Modeling and Computations in Atmospheric Sciences.
	The 11th European Finite Element Fair, May 31 and June 01 2013, Heraklion, Crete. Organizer with P. Chatzipantelides, T. Katsaounis, Ch. Makridakis, Ch. Tsogka and G. Zouraris.
	Workshop on Software Frameworks for Challenging Compuational Problems, Archimedes Center for Modeling, Analysis and Compuations (ACMAC), 14–18 January 2013, Heraklion, Crete. Organizer (with V. Harmandaris and T. Katsaounis).
	Modern Mathematical Methods in Science and Technology (M3ST), 26-28 August 2012, Kalamata, Greece (speaker).
	5th Workshop on Numerical Methods for Evolution Equations, 24–25 September 2010, Heraklion, Crete (speaker).
	12th International Conference on Meteorology, Climatology and Atmospheric Physics, COMECAP 2014 Heraklion, 28 May 31 May 2014 (speaker).
PUBLICATIONS	G. Kossioris, M. Loulakis and M. Plexousakis, *Optimal Stochastic Control of Non Linear Systems: The Lake problem*. In preparation.

Stephen L. Keeling, T. Katsaounis, and M. Plexousakis, *Consistent discretization for vanishing regulatization solutions to image processing problems*. In preparation.

N. Christakis, Th. Katsaounis, G. Kossioris and M. Plexousakis, *An analysis of WRF performance for the analysis of surface wind speeds over various Greek regions*. In preparation.

N. Christakis, G. Kossioris and M. Plexousakis, *An evaluation of the WRF parametrization schemes for extreme weather events in Greece using high resolution terrain data*. In preparation.

G. Kossioris, M. Loulakis and M. Plexousakis. *The stochastic shallow lake control pollution problem*. In preparation.

G. Kossioris, M. Plexousakis, Y. Vardas, A. Xepapadeas, *Optimal Pollution Control and Resource Management at Different Time Scales*. In preparation.

D. A. Mitsoudis, Ch. Makridakis, and M. Plexousakis, *A standard Galerkin finite element method for the Helmholtz equation with artificial boundary conditions in a two dimensional waveguide*. In preparation.

N. Benas, N. Chrysoulakis, N. Christakis, G. Kossioris and M. Plexousakis, *WRF parameterization updates based on recent and long–term satellite observations*, Submitted to COMECAP 2014.

D. C. Antonopoulou, M. Plexousakis, *Crank–Nicolson finite element discretizations for a two dimensional linear Schrödinger-type equation posed in a noncylindrical domain*. Submitted to Numer. Math.

D. C. Antonopoulou, G. Karali, M. Plexousakis, and G. E. Zouraris,*Crank-Nicolson finite element discretizations for a two dimensional linear Schrodinger-type equation posed in a noncylindrical domain*. To appear in Math. Comp.

D. A. Mitsoudis, Ch. Makridakis, and M. Plexousakis, *Helmholtz Equation with Artificial Boundary Conditions in a Two-Dimensional Waveguide*. SIAM J. Math. Anal. **44**, (2012), no. 6, 4320–4344. doi: 10.1137/120864052.

G. Kossioris, M. Plexousakis, A. Xepapadeas and A. de Zeeuw, *On the optimal taxation of common-pool resources*. J. Econom. Dynam. Control. **35**, (2011), no. 11, 1868-1879. doi: 10.1016/j.jedc.2011.05.007.

N. M. Abukhdeir, D. G. Vlachos, M. Katsoulakis and M. Plexousakis, *Long-time integration methods for mesoscopic models of pattern-forming systems*. J. Comp. Phys. **230**, (2011), no. 14, 5704-5715. doi: 10.1016/j.jcp.2011.03.052

I. Kyza, Ch. Makridakis and M. Plexousakis, *Error control for time-splitting spectral approximations of the semiclassical Schrödinger equation*. IMA J. Numer. Anal. **31**, 2011, no. 2, 416-441. doi:10.1993/imanum/drp044

Th. Baxevanis, M. Plexousakis, *On the effect of fiber creep-compliance in the high-temperature deformation of continuous fiber-reinforced ceramic matrix composites*. Intern. J. of Solids and Structures **47**, (2010), 2487-2497. doi:10.1016/j.ijsolstr.2010.05.007

D. C. Antonopoulou, M. Plexousakis, *Discontinuous Galerkin methods for the linear Schrödinger equation in non-cylindrical domains*. Numer. Math. **115**, (2010), no. 4, 585-608. doi: 10.1007/s00211-010-0296-5

D. A. Mitsoudis, M. Plexousakis, *A Finite Element Method with Nonlocal Boundary Conditions for the Helmholtz Equation with Complex Wavenumber in Stratified Waveguides*. Acta Acustica united with Acustica, **95** (2009), no. 4, 753-756. doi: 10.3813/AAA.918203

Th. Baxevanis, M. Plexousakis, *Estimation of base settlement from the surface profile: two-dimensional plane field of displacements*. Intern. J. for Numer. and Analytical Methods in Geomechanics, **33** (2009), no. 8, 1109-1121. doi: 10.1002/nag.760

G. Kossioris, M. Plexousakis, A. Xepapadeas and A. de Zeeuw, *Feedback Nash equilibria for non-linear differential games in pollution control*. J. Econom. Dynam. Control, **32**, (2008), no. 4, 1312-1331. doi: 10.1016/j.jedc.2007.05.008

G. Kossioris, M. Plexousakis and A. N. Yannacopoulos, *A Hamilton-Jacobi approach to the control of the trapping time of a soliton by an external potential*. Quart. Appl. Math. **63**, (2005), no. 2, 309-324. M. Plexousakis, G. E. Zouraris, *On the construction and analysis of high order locally conservative finite volume-type methods for one-dimensional elliptic problems*. SIAM J. Numer. Anal. **42**, (2004), no. 3, 1226-1260. doi: 10.1137/S0036142902406302

P. Chatzipantelidis, Ch. Makridakis and M. Plexousakis, *A posteriori error estimates for a finite volume method for the Stokes problem in two dimensions*. Appl. Numer. Math. **46**, (2003), no. 1, 45-58. doi: 10.1016/S0168-9274(03)00011-4