

## Catalin S. Trenchea

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### Education

- **Ph.D.** in Mathematics, Iasi University, Romania, January 2001.  
Dissertation title: *Optimal Control of Some Periodic Systems with Distributed Parameter*.  
Thesis adviser: Professor Viorel Barbu
- **M.Sc.** in Evolution Equations and Applications, Iasi University, Romania, September 1996.
- **M.Sc.** in Numerical Analysis and Optimization, Iasi University, Romania, June 1995.
- **B.S.** in Mathematics, Iasi University, Romania, June 1994.

### Mathematical Interests

Numerical Analysis, Control Theory, Partial Differential Equations

### Research Grants Awarded

- FY09 Small Grant Award, University of Pittsburgh, 2008.
- Grant of Department of Education and Research, Romania 2001.
- Grant of National Agency for Science, Technology and Information, Romania 2000.
- Grant of National Agency for Science, Technology and Information, Romania 1999.

### Employment

- **Assistant Professor** at the Department of Mathematics, University of Pittsburgh, December 2006 - present.
- **Postdoctoral Research Associate** at the School of Computational Science, Florida State University, October 2003 - November 2006.  
Host: Professor Max D. Gunzburger
- **Postdoctoral Researcher** at the Department of Mathematics, University of Bretagne Occidentale, Brest, France, January 2003–July 2003. Host: Professor Marc Quincampoix
- **Postdoctoral Fellow**, Department of Mechanics and Aerospace Engineering, University of California, San Diego, May 2001–December 2001. Host: Professor Thomas R. Bewley
- **Research Scientist**, Institute of Mathematics of Romanian Academy, Iasi Romania, 1998-2000
- **Teaching Assistant**, Department of Mathematics, Iasi University, Romania, 1996–2000

## Publications

1. M. Gunzburger, J. Peterson, C. Trenchea, The velocity tracking problem for MHD flows with distributed magnetic field controls. *Int. J. Pure Appl. Math.* 42 (2008), no. 2, 289-296.
2. M. Gunzburger and C. Trenchea, Analysis of an optimal control problem for the three-dimensional coupled modified Navier-Stokes and Maxwell equations, *J. Math. Anal. Appl.*, no. 333 (2007), 295-310.
3. M.R. Garvie and C. Trenchea, Optimal control of a 'nutrient-phytoplankton-zooplankton-fish' system, *SIAM J. Control Optim.*, 46 (2007) 775-791.
4. M.R. Garvie and C. Trenchea, Finite element approximations of spatially extended predator-prey interactions with the Holling type II functional response, *Numer. Math.* 107 (2007), no.4, 641-667.
5. M. Gunzburger and C. Trenchea, Analysis and Discretization of an Optimal Control Problem for the Time-Periodic MHD Equations, *J. Math. Anal. Appl.* 308 (2005), no. 2, 440-466.
6. M. Gunzburger and C. Trenchea, Optimal Control of time-periodic MHD equations, to appear in *Nonlinear Anal., Theory Methods Appl.*, Proceedings for the Fourth World Congress of Nonlinear Analysis WCNA-2004.
7. C. Trenchea, Optimal control of an elliptic equation under periodic conditions, *Mem. Sect. Științ. Acad. Române Ser. IV* 25 (2002), 23-35 (2005).
8. C. Trenchea, Periodic optimal control of the Boussinesq equation, *Nonlinear Anal., Theory Methods Appl.* 53A, No.1, 81-96 (2003), 81-96.
9. C. Trenchea, Periodic optimal control of the Euler-Bernoulli equation, *Commun. Appl. Anal.* 7 (2003), no. 1, 115-125.
10. T. Bewley and C. Trenchea, Noncooperative optimization of controls for time periodic Navier-Stokes systems with multiple solutions, *AIAA 2002-2754*.
11. C. Moroșanu and C. Trenchea, Identification for nonlinear periodic wave equation, *Appl. Math. Optimization*, 44 (2001), 87-104.
12. C. Trenchea, Optimal control of the periodic string equation with internal control, *J. Optim. Theory Appl.*, 101(1999), 429-447.
13. M. Gunzburger, J. Peterson, and C. Trenchea, The velocity and magnetic field tracking problem for MHD flows with distributed controls, submitted.
14. A. Labovschii, W. Layton, C. Manica, M. Neda, L. Rebholz, I. Stanculescu, and C. Trenchea, "Mathematical Architecture of Approximate Deconvolution Models of Turbulence", *Quality and Reliability of Large-Eddy Simulations*, ERCOFTAC, Springer, 2007.
15. M.R. Garvie and C. Trenchea, Global existence for reaction-diffusion systems modelling predator-prey interactions with the Holling type II functional response, submitted.
16. A. Labovsky and C. Trenchea, Large eddy simulation for MHD flows, submitted.
17. A. Labovsky and C. Trenchea, Approximate Deconvolution Models for Magnetohydrodynamics, submitted.

## Conferences and Talks

- *Computational Methods for SPDE Control Problems* 8th World Congress on Computational Mechanics, 5th European Congress on Computational Methods in Applied Sciences and Engineering, Venice, Italy, June 30 - July 4, 2008.
- *Magnetohydrodynamics: control and large eddy simulations*, Department of Mathematics and Statistics, University of Guelph, April 17, 2008.
- *Control and parameter identification in reaction-diffusion equations*, University of Queensland, Australia, March 20, 2008.
- *Control and parameter identification in reaction-diffusion equations*, School of Mathematics and Statistics, University of Sydney, Australia, March 19, 2008.
- *Magnetohydrodynamics: optimal control and turbulence*, Department of Mathematics Colloquia, University of Toledo, OH, February 22, 2008.
- *Biomanipulation of Food-Webs in Eutrophic Lakes*, 46th IEEE Conference on Decision and Control, December 12-14, 2007, New Orleans, Louisiana.
- *Velocity tracking for MHD flows with magnetic field controls*, Fourth International Conference of Applied Mathematics and Computing, August 12-18, 2007, Plovdiv, Bulgaria.
- *Parameter identification for reaction-diffusion equations modeling pattern formation* SIAM Conference on Control and Its Applications, June 29 - July 1, 2007, in San Francisco, California.
- *Optimal control of time-periodic MHD equations*, Mathematical Association of America 85th Annual Meeting, 31 March - 1 April 2006, Auburn, Alabama.
- *Velocity and magnetic field tracking for MHD flows with distributed controls*, ICAM Workshop on Mathematics as an Enabling Science, 30 September - 02 October 2005, Virginia Tech, Blacksburg, VA.
- *Optimal Control of a Plankton-Fish System*, SIAM Conference on Control and its Applications, July 11-14, 2005, New Orleans, LA.
- *Analysis and discretization of an optimal control problem for the time-periodic MHD equations*, SIAM Conference on Computational Science and Engineering, February 12-15, 2005, Orlando Florida.
- *Analysis and discretization of an optimal control problem for the time-periodic MHD equations*, Colorado State University, February 10, 2005.
- *Analysis and discretization of an optimal control problem for the time-periodic MHD equations*, University of Nebraska-Lincoln, January 20, 2005.
- *Optimal control of time-periodic MHD equations*, Fourth World Congress of Nonlinear Analysis, June 30 - July 7, 2004, Orlando Florida. Invited speaker.
- *Optimal control of the time-periodic MHD equations*, University of Wyoming Mathematics Department Colloquium, May 6th, 2004. Invited speaker.
- *Value function and optimality conditions for a boundary control problem*, Evolution Equations for Deterministic and Stochastic Systems, TMR Workshop, Roscoff, May 19-23, 2003, France. Invited speaker.

- *Noncooperative optimization of controls for time periodic Navier-Stokes systems with multiple solutions*, 1st AIAA Flow Control Conference, June 24-26, 2002, St. Louis, MO.
- *Optimal control of some periodic systems with distributed parameter*, Workshop on Analysis and PDEs, Iasi University, January 2001, Romania. Invited speaker.
- *Parameter identification for nonlinear time-periodic wave equation*, 5th French-Romanian Colloquium on Applied Mathematics, August 2000, Constanta, Romania. Invited speaker.
- *Time-periodic optimal control for the Euler-Bernoulli equation*, Annual Meeting of the Iasi Division of Romanian Academy, October 2000, Romania.
- *Time periodic optimal control for the Boussinesq equation*, Conference on Fixed Point Theory and Applications, "Babes Bolyai" Cluj-Napoca University, November 1999, Romania. Invited speaker.
- *Optimal control of time periodic wave equations*, Annual Meeting of the Iasi Division of Romanian Academy, October 1999, Romania.

### **Teaching Experience**

- Lecturer for *Numerical Mathematical Analysis* (MATH 1070) University of Pittsburgh, Fall 2008
- Lecturer for *Numerical Methods in Scientific Computing III. Optimal Control Theory* (MATH 2603) University of Pittsburgh, Fall 2008
- Lecturer for *Numerical Methods in Scientific Computing II* (MATH 2071), University of Pittsburgh, Spring 2008
- Lecturer for *Numerical Methods in Scientific Computing I* (MATH 2070), University of Pittsburgh, Fall 2007
- Lecturer for *Numerical Linear Algebra* (MATH 1080), University of Pittsburgh, Spring 2007
- Lecturer for *Differential Equations* (MATH 0290), University of Pittsburgh, Spring-Fall 2007
- Lecturer for *Differential Equations* (MAP 2302), Florida State University, Fall 2004
- Teaching Assistant for *Calculus, Differential Equations, Partial Differential Equations*, Iasi University, 1996-2000

### **Professional Membership**

- *Society for Industrial and Applied Mathematics*