

Curriculum Vitae
Hasnaa ZIDANI

Professor at ENSTA ParisTech,
Co-leader of the Research team COMMANDS (ENSTA - INRIA Saclay - Ecole Polytechnique).

Born in Casablanca (Morocco) in November 26, 1971.

Married, 2 childrens (Suleyman & Bilal).

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1 Academic positions held

since 2002 Professor-Researcher in the Applied Mathematics Departement of ENSTA ParisTech¹

since 2007 co-leader of the Research Team “COMMANDS”², INRIA Saclay - ENSTA Paris-Tech - Ecole Polytechnique

1999-2002 Associate professor at Université d’Orléans

1998-2000 Maître de conférence at Ecole Polytechnique (part time teaching position).

1999-2006 Research member at INRIA Rocquencourt, in the team “Sydoco”

1998-99 Post doc position at INRIA Rocquencourt

1997-98 Professor at Ecole des Hautes Études en Commerce et Informatique, Morocco

1996-97 Attachée temporaire d’enseignement et de recherche (ATER) at Université Paul Sabatier (UPS) Toulouse.

2 Degrees and Diplomas

- Habilitation à diriger la recherche (HdR), University Pierre & Marie Curie, November 2010.
- PhD in Applied Mathematics, University Paul Sabatier (UPS), Septembre 1996.
Advisor: J.-P Raymond. Title: “*Optimal control of semilinear parabolic equations: Optimality conditions and numerical approximations*”.

¹the National Institute of Advanced Technologies - Ecole Nationale des Techniques Avancées

²Control, Optimization, Models, Methods and Applications for Nonlinear Dynamical Systems

- D.E.A. (Diplôme d'études avancées) in applied Mathematics, UPS, June 1993.
- Master of Mathematics, Université Hassan II (Casablanca), Juin 1992

3 Teaching activities (since 2006)

Graduate course on "Optimal Control", at Ensta ParisTech (also in Master cursus of University Orsay, 2006-2010).

Graduate course on "Numerical approximations for front propagation problems", Ensta Paris Tech, and Ecole Centrale de Paris.

Undergraduate course on "Optimisation", Ensta ParisTech

Responsible of the graduate modulus at Ensta ParisTech: "Control of nonlinear systems (84 h)" since 2009, and "Operational research (168h)" from 2002 to 2008.

4 Research interest

My research interests lie in the area of applied mathematics with a particular focus on optimization based methods in control theory and numerical analysis for Hamilton-Jacobi equations:

- ☞ Optimal control theory, Hamilton-Jacobi Equations, feedback control laws
- ☞ Numerical methods for front propagation, Numerical analysis and Error estimates theory for first and second order Hamilton-Jacobi equations
- ☞ Reachability analysis, motion planning and obstacle avoidance
- ☞ Optimal control of hybrid systems.

Applications. Optimization of launcher trajectories, management of energy resources, air traffic control.

5 Research projects and grants

- ◇ General coordinator and scientific leader of the European project "Sensitivity Analysis for Deterministic Controller Design (SADCO)", FP7-PEOPLE-2010-ITN-264735, Jan 2011 - Dec 2014.
- ◇ Scientific leader of "Energy management for hybrid vehicles", supported by Renault, 2009-2013.
- ◇ Scientific leader of "Planification de trajectoires par approche HJB: atteignabilité, et évitement d'obstacles", supported by DGA (Direction Générale de l'Armement), 2007-2012.

- ◇ Scientific leader of “Optimisation de trajectoire pour le lanceur Ariane 5: approche HJB”, in the framework of OPALÉ Programme of CNES, 2006-2010.
- ◇ Scientific leader of the project “Bibliothèque Numérique en Calcul Parallèle pour les équations Hamilton-Jacobi”, supported by INRIA and HPC-Project.
- ◇ Member of the project “Approche d’optimisation à deux niveaux pour l’optimisation paramétrique d’un moteur hybride”, supported by Renault, 1999-2001.

6 Supervision of research activities

Ongoing PhD thesis

Zhiping RAO: *Sensitivity analysis for some perturbed control problems*. Ecole Polytechnique fellowship (AMX), will start in September 2010.

Giovanni GRANATO: *Energy management for hybrid vehicles*, started in December 2009. Supported by Renault-Technocentre

Finished Thesis

Nadia Megdich (2004-07) (Co-direction with O. Bokanowski): *Antidiffusive numerical methods for Hamilton-Jacobi-Bellman equations*, University Pierre et Marie Curie, January 2008. Presently Professor at Institute of Electronics and Communications - ISEC, Sfax (Tunisia).

Stefania Maroso (2003-06) (Co-direction with F. Bonnans): *Numerical analysis of stochastic control problems*. University Pierre et Marie Curie, December 2006. Presently ATER, Université Montpellier II.

Post-doctoral

Nicolas Forcadel (2007-08): Inria grant for post-doctoral position in 2007-2008. N. Forcadel is associate professor at University Paris-dauphine, since September 2008.

Emiliano Cristiani: 2 years post-doctoral position supported by CNES. Presently Post-doc at INDAM (Italy).

Grégory Rousseau (from January to December 2009): one year post-doc position, supported by Renault-Technocentre. Presently Research engineer since January 2010 at Valeo.

7 Publications

International scientific journals.

- [1] O. BOKANOWSKI, E. CRISTIANI, J. LAURENT-VARIN and H. ZIDANI (2010), *Hamilton-Jacobi approach for the climbing problem of multi-stage launchers*, submitted.
- [2] A. BRIANI and H. ZIDANI (2010), *Characterisation of the value function of final state constrained control problems with BV trajectories*, submitted to Comm. on Pure and Appl. Analysis (revision process).
- [3] O. BOKANOWSKI, N. FORCADEL, H. ZIDANI (2010), *Reachability and minimal times for state constrained nonlinear problems without any controllability assumption*, SIAM J. Control and Optimization, vol. 48(7), pp. 4292-4316, 2010

- [4] O. BOKANOWSKI, N. FORCADEL, H. ZIDANI (2010), *Deterministic state constrained optimal control problems without controllability assumptions*, ESAIM: Control, Optimisation and Calculus of Variations (E-first 2010), DOI: 10.1051/cocv/2010030
- [5] O. BOKANOWSKI, E. CRISTIANI, H. ZIDANI (2010), *An efficient data structure and accurate scheme to solve front propagation problems*, Journal of Scientific Computing, vol. 42(2), pp. 251–273.
- [6] O. BOKANOWSKI, N. FORCADEL, H. ZIDANI (2010), *L^1 -error estimates for numerical approximations of Hamilton-Jacobi-Bellman equations in dimension 1*, Mathematics of Computation, vol. 79(271), pp. 1395–1426.
- [7] O. BOKANOWSKI, N. MEGDICH, H. ZIDANI, (2010) *Convergence of a non-monotone scheme for Hamilton-Jacobi-Bellman equations with discontinuous initial data*, Numerische Mathematik, vol. 115(1), pp. 1–44.
- [8] O. BOKANOWSKI, A. BRIANI, H. ZIDANI, (2009) *Minimum time control problems for non autonomous differential equations*, Systems & Control Letters, vol. 58, pp 742–746.
- [9] O. BOKANOWSKI, S. MAROSO, H. ZIDANI, (2009) *Some convergence results for Howard’s algorithm*, SIAM. J. Num. Analysis, vol. 47(4), pp. 3001–3026
- [10] O. BOKANOWSKI, B. BRUDER, S. MAROSO, H. ZIDANI, (2009) *Numerical approximation for a superreplication problem under gamma constraints* SIAM. J. Numerical Analysis, vol. 47(3), pp. 2289–2320
- [11] O. BOKANOWSKI, H. ZIDANI, (2007) *Anti-dissipative schemes for advection and application to Hamilton-Jacobi-Bellman equations*, J. Sci. Computing, vol. 30(1), pp. 1–33
- [12] J.-F. BONNANS, S. MAROSO, H. ZIDANI, (2007) *Error estimates for a stochastic impulse control problem*, Appl. Math. and Optimization, vol. 55-3, pp. 327–357.
- [13] O. BOKANOWSKI, S. MARTIN, R. MUNOS, H. ZIDANI, (2006) *An anti-diffusive scheme for viability problems*, Applied Numerical Mathematics, vol. 56(9), pp. 1147–1162
- [14] O. BOKANOWSKI, N. MEGDICH, H. ZIDANI, (2006) *An adaptative anti-dissipative method for optimal control problems*, ARIMA, vol. 5, pp. 256–271
- [15] J.-F. BONNANS, S. MAROSO, H. ZIDANI (2006) *Error estimates for stochastic differential game: the adverse stopping case*, IMA J. Numerical Analysis, vol. 28, pp. 188–212
- [16] R. MUNOS and H. ZIDANI, (2005) *Consistency of a simple multidimensional scheme for HJB equations*, C. R. Acad. Sci. Paris, Ser. I, vol. 340
- [17] J.-F. BONNANS, A. KETFI-CHERIF, D. VON WISSEL, C. SAGASTIZÁBAL, H. ZIDANI, (2004) *Parametric optimization of hybrid car engines*, Optimization and Engineering, vol. 5-4, pp. 395-415
- [18] J.-F. BONNANS, E. OTTENWAEELTER, H. ZIDANI (2004) *A fast algorithm for the two dimensional HJB equation of stochastic control*, ESAIM:M2AN, vol. 38-4, pp. 723-735.
- [19] J.-F. BONNANS, H. ZIDANI, (2003) *Consistency of Generalized Finite Difference Schemes for the Stochastic HJB Equation*, SIAM J. Num. Anal., 41-3, pp. 1008-1021
- [20] J.-F. BONNANS, PH. CHARTIER, H. ZIDANI, (2003) *Discrete Approximation of the Hamilton-Jacobi Equation for a Control Problem of Differential-Algebraic System*, Control and Cybernetics, vol. 32-1, pp. 33-55.

- [21] M. BERGOUNIOUX, H. ZIDANI, (2002) *Fully Discrete Approximation for a Control Problem of Parabolic Variational Inequalities*, SIAM J. Numer. Anal., 39, no. 6, 2014–2033
- [22] E. CASAS, J.-P. RAYMOND, H. ZIDANI, (2000) *Pontryagin Principle for Local Solutions of Control Problems with mixed State Control Constraints*, SIAM J. Cont. Opt., 39-4, p. 1182–1203.
- [23] J.-P. RAYMOND, H. ZIDANI, (2000) *Time Optimal Control Problems with Boundary Controls*, Diff. Int. Eq, 13, 7-9, p. 1039–1072.
- [24] J.-F. BONNANS, H. ZIDANI, (1999) *Optimal Control Problems with Partially Polyhedric Constraints*, SIAM J. Control and Optimization, 37-6, p. 1726–1741.
- [25] M. BERGOUNIOUX, H. ZIDANI, (1999) *Pontryagin Maximum Principle for Optimal Control of Variational Inequalities*, SIAM J. Control and Optimization, 37-4, p. 1273–1290.
- [26] J.-P. RAYMOND, H. ZIDANI, (1999) *Hamiltonian Pontryagin’s Principles for Control Problems Governed by Semilinear Parabolic Equations*, Applied Mathematics and Optimization, 39-2, p. 143–177.
- [27] O. BOKANOWSKI, I. SCHINDLER, H. ZIDANI, (1999) *On the Minimization of the Energy of Free-Electron Gas with Constrained Density Function*, Nonlinear Analysis, T.M.A., 35, 1073–1090.
- [28] J.-P. RAYMOND, H. ZIDANI, (1999) *Pontryagin’s Principle for Time Optimal Problems*, Journal of Optimization, Theory and Applications, 101-2, p. 375–402,
- [29] J.-P. RAYMOND, H. ZIDANI, (1998) *Pontryagin’s Principle for State-Constrained Control Problems Governed by Parabolic Equations with Unbounded Controls*, SIAM J. Control and Optimization, 36-6, p. 1853–1879.

Book chapter, International conferences with reviewing process

- [1] J.-F. BONNANS, H. ZIDANI, (2000) “Characterization of consistency of some numerical schemes for the stochastic HJB equation, in Contrôle optimal et EDP - Innovations et Applications”, (Book in the honor of Professor A. Bensoussan) Ed. J.L. Menaldi et al, IOS Presse, Amsterdam.
- [2] E. CASAS, J.-P. RAYMOND, H. ZIDANI, (1998) ”Optimal Control Problem Governed by Semilinear Elliptic Equations with Integral Control Constraints and Pointwise State Constraints”, dans *Inter. Conf. on Control and Estimations of Distributed Parameter Systems*, Inter. Series. of Num. Math., W. Desch and F. Kappel Eds., Birkhäuser-Verlag.
- [3] J.-P. RAYMOND, H. ZIDANI, (1996) ”Optimal Control Problem Governed by a Semilinear Parabolic Equation”, dans *System Modelling and Optimization*, J. Dolezal and J. Fiedler Eds., Chapman and Hall, p. 211–217.

8 (Co-)organisation of workshops, schools and invited sessions in international conferences

◇ Minisymposium ”Sensitivity Analysis of deterministic control systems : theory, numerical methods and applications”, 14 th Belgian-French-German Conference on Optimization. Leuven, September 14-18, 2009

- ◇ Membre of the scientific board of the conference: “Tendances en applications des mathématiques”, May 04–08, 2009, Kenitra - Morocco. Invited session: ”Modèles mathématiques en finance“.
- ◇ Workshop “Aerospatial dynamics and Optimal Control” ENSTA, 23 Mai, 2008
- ◇ Ecole CEA-EDF-INRIA ”Numerical methods for Hamilton-Jacobi equations and hyperbolic conservation laws” INRIA Rocquencourt, 15–19 September 2008
- ◇ Ecole d’automne “Introduction to numerical methods for moving boundaries”, ENSTA 12–14 Novembre 2007.
- ◇ Workshop “Numerical methods for the Hamilton-Jacobi-Bellman equations of optimal control and applications”. ENSTA, September 11-12, 2003.
- ◇ Member of the scientific board of the conference “Nonlinear Analysis 2000→”, May 28 - June 2, 2000, Courant Institute, New York.

9 Recruiting Committees, National expertise

- Agence Nationale de la Recherche: reports on proposals in 2009-2010.
- Member of recruiting commission of University Marseille - Aix en Provence, 2009.
- Member of jury d’admissibilité CR at INRIA Saclay, 2008 and 2009.