

IOANNIS NOMPELIS

CURRICULUM VITAE

PERSONAL INFORMATION

Nationality: Greek (Hellenic Republic, European Union)
Residency: U.S. Permanent Resident (green card)
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EDUCATION

Ph.D. Aerospace Engineering, University of Minnesota, May 2004
Thesis: *Computational Study of Hypersonic Double-Cone Experiments for Code Validation* Adviser: Graham V. Candler

B. E. Composite Materials Engineering, Winona State University, May 1998
Emphasis: Mechanical

RESEARCH INTERESTS

- Numerical analysis and numerical methods. Computational physics. Computational fluid dynamics (CFD). Computational mechanics. Reacting and nonequilibrium flows. Rarefied gas flows. Monte-Carlo and stochastic methods for PDEs.
- Algorithm development. High-performance computing. Computer graphics and scientific visualization. Software engineering.
- Game theory simulations with applications to economics, psychology and finance.

ACADEMIC AND PROFESSIONAL POSITIONS

Research Associate	University of Minnesota,	November 2016 - present
	Department of Aerospace Engineering and Mechanics	
	Development of CFD/DSMC software / Multi-disciplinary research	
Sr Comp. Engineer	Third Wave Systems, Inc.,	October 2015 - September 2016
	Research & development group	
	Software development / Proposal author / Govt. project management	
Teaching Faculty	University of Minnesota,	August 2011 - September 2015
	Department of Aerospace Engineering and Mechanics	
	Instructor for graduate-level CFD courses	

Research Associate	University of Minnesota, Department of Aerospace Engineering and Mechanics Development of CFD/DSMC software / Research in hypersonics	June 2007 - September 2015
Post-doctoral Research Associate	University of Minnesota, Department of Aerospace Engineering and Mechanics Algorithm development / Simulation of hypersonic flows	June 2004 - May 2007
Research Assistant	University of Minnesota, Department of Aerospace Engineering and Mechanics Numerical simulation of hypersonic nonequilibrium flows	June 1999 - May 2004
Teaching Assistant	University of Minnesota, Department of Aerospace Engineering and Mechanics Recitations and grading for sophomore-junior level courses	September 1998 - May 1999
Web Developer	Winona State University, Department of Engineering Design and maintenance of departmental web-pages	August 1997 - May 1998
Research Assistant	Winona State University, Department of Engineering Dynamic mechanical analysis of polymer suspensions (with F. Parsi)	March 1997 - August 1997

SKILLS & EXPERIENCE

Languages: English, French, Greek (mother tongue)

Programming: C (ANSI), C++, FORTRAN (77/90/95,2003), Java, Python, Unix C shell and variants
Object-oriented architectures, design patterns

Projects: Architect and author of Univ. of Minnesota US3D flow simulation code
Primary developer/maintainer of Univ. of Minnesota MGDS v2.0 DSMC flow solver

Parallel programming on distributed and shared memory systems (MPI & pthreads / OpenMP)

Interactive, high performance graphics with OpenGL / Xlib & GLX

Non-interactive graphics and raytracing / Image processing / 3D imaging

Network applications programming (raw sockets UDP/TCP, SSL and Unix pipes)

Audio programming for real-time systems (ALSA/OSS, MIDI, etc)

Web applications programming (scripted applications DHTML-JavaScript / PHP-MySQL)

Microcontroller and TTL-hardware programming (Parallax Propeller, Pi and variants)

Advanced user of the Unix system and clones with preference on the Linux kernel and GNU

AFFILIATIONS & SERVICE

American Institute of Aeronautics and Astronautics (AIAA) senior member

Reviewer for the AIAA Journal

Reviewer for the AIAA Journal of Thermophysics and Heat Transfer

Reviewer for the Physics of Fluids journal

Reviewer for the American Physical Society (APS) Physical Review Fluids

Reviewer for the Journal of Parallel and Distributed Computing

Former board member and adviser of the Hellenic Student Association at the U of MN

Open-source software advocate and contributor (<http://github.com/nompelis>)

Volunteer driving instructor (ACNA, Northstar BCA, Nordstern PCA, SCCA)

RECENT PUBLICATIONS

⁻¹ Valentini, P., Schwartzentruber, T. E., Bender, J. D., [Nompelis, I.](#) and Candler, G. V., “Direct molecular simulation of nitrogen dissociation based on an ab initio potential energy surface,” *Physics of Fluids*, Vol. 27, 086102 (2015).

⁰ Bender, J. D., Valentini, P., [Nompelis, I.](#), Pauku, Y., Varga, Z., Truhlar, D. G., Schwartzentruber, T. and Candler, G. V., “An Improved Potential Energy Surface and Multi-Temperature Quasiclassical Trajectory Calculations of $N_2 + N_2$ Dissociation Reactions.” *Journal of Chemical Physics*, Vol. 143, 054304, 2015.

¹ [Nompelis, I.](#), Doraiswamy, S., Speer, M., Treviño, L. and Candler, G. V., “High-Temperature Thermodynamic Data for Gaseous Species Encountered in Atmospheric Entry,” (*To appear as a technical note in the AIAA Journal of Thermophysics and Heat Transfer, 2015*)

² Candler, G. V., Subbareddy, P. K., and [Nompelis, I.](#), “Decoupled Implicit Method for Aerothermodynamics and Reacting Flows,” *AIAA Journal*, Vol. 51, No. 5, pp. 1245-1254, May 2013.

³ Knight, *et al.*, “Assessment of CFD Capability for Prediction of Hypersonic Shock Interactions,” *Progress in Aerospace Sciences*, Vol. 8, No. 26, 2012.

⁴ Ozawa, T., Levin, D. A., [Nompelis, I.](#), Barnhardt, M., and Candler, G. V., “Particle and Continuum Method Comparison of a High-Altitude, Extreme-Mach-Number Reentry Flow,” *Journal of Thermophysics and Heat Transfer*, Vol. 24, No. 2, pp. 225-240, April-June 2010.

⁵ Druguet, M.-C., Candler, G. V., and [Nompelis, I.](#) “Effect of Numerics on Navier-Stokes Computations of Hypersonic Double-Cone Flows,” *AIAA Journal*, Vol. 43, No. 3, pp. 616-623, March 2005.

⁶ [Nompelis, I.](#), Candler, G. V., and Holden, M. S., “Effect of Vibrational Nonequilibrium on

Hypersonic Double-Cone Experiments,” *AIAA Journal*, Vol. 41, No. 11, pp. 2162-2169, Nov. 2003.

SELECT CONFERENCE PROCEEDINGS

¹ Stern, E., Nompelis, I., Schwartzentruber, T. and Candler, G. V., “Microscale Simulations of Porous TPS Materials: Ablating Microstructures and Micro-tomography,” *AIAA Paper No. 2015-1450*, 53rd AIAA Aerospace Sciences Meeting, 2015.

² Nompelis, I. and Candler, G. V., “US3D Predictions of Double-Cone and Hollow Cylinder-Flare Flows at High-Enthalpy (Invited),” *AIAA Paper No. 2014-3366*, 44th AIAA Fluid Dynamics Conference, 2014.

³ Stern, E., Nompelis, I., Schwartzentruber, T. and Candler, G. V., “Microscale Simulations of Porous TPS Materials: Application to Permeability,” *AIAA Paper No. 2014-2247*, 11th AIAA / ASME Joint Thermophysics and Heat Transfer Conference, 2014.

⁴ Komives, J. R., Nompelis, I. and Candler, G. V., “Numerical Investigation of Unsteady Heat Transfer on a Double Wedge Geometry in Hypervelocity Flows,” *AIAA Paper No. 2014-2354*, 44th AIAA Fluid Dynamics Conference, 2014.

⁵ Nompelis, I., and Schwartzentruber, T. E., “Strategies for Parallelization of the DSMC Method,” *AIAA Paper No. 2013-1204*, 51st AIAA Aerospace Sciences Meeting, Grapevine, Texas, January 2013.

⁶ Candler, G. V., Subbareddy, P. K., and Nompelis, I., “A Decoupled Implicit Method for Aerothermodynamics and Reacting Flows,” *AIAA Paper No. 2012-5917*, 18^{rmth} International Space Planes and Hypersonic Systems and Technologies Conference, Tours, France September 2012.

⁷ Schwing, A. M., Nompelis, I., and Candler, G. V., “Implementation of Adaptive Mesh Refinement in an Implicit Unstructured Finite-Volume Flow Solver,” *AIAA paper No. 2012-3307*, 21st AIAA Computational Fluid Dynamics Conference, San Diego, California, June 2013.

⁸ Titov, E., Burt, J., Josyula, E., and Nompelis, I., “Implications of Slip Boundary Conditions on Surface Properties in Hypersonic Flows,” *AIAA Paper No. 2012-3307*, 43rd AIAA Thermophysics Conference, New Orleans, Louisiana, June 2012.

⁹ Nompelis, I., Bender, L. !D. and G. V. Candler, “Implementation and Comparisons of Parallel Implicit Solvers for Hypersonic Flow Computations on Unstructured Meshes,” *AIAA Paper No. 2011-3547*, June 2011.

¹⁰ Nompelis, I., G. V. Candler, M. MacLean, T. P., Wadhams, and M. S., Holden, “Numerical Investigation of Double-Cone Flow Experiments with High-Enthalpy Effects,” *AIAA Paper No. 2010-1283*, Jan. 2010.

¹¹ Nompelis, I., G. V. Candler, and R. J. Conti, “A Parallel Implicit CFD Code for the Simulation

- of Ablating Re-Entry Vehicles,” *AIAA Paper No. 2009-1562*, Jan. 2009.
- ¹² Nompelis, I., T. Wan, and G. V. Candler, “Performance Comparisons of Parallel Implicit Solvers for Hypersonic Flow Computations on Unstructured Meshes,” *AIAA Paper No. 2007-4334*, June 2007.
- ¹³ Gidzak, V., I. Nompelis, and G. V. Candler, “Development of Stencil-Based Mesh Partitioning for Parallel Unstructured CFD Solvers,” *AIAA Paper No. 2007-4087*, June 2007.
- ¹⁴ Nompelis and G. V. Candler, “Investigation of Hypersonic Double-Cone Flow Experiments at High Enthalpy in the LENS Facility,” *AIAA Paper No. 2007-0203*, Jan. 2007.
- ¹⁵ Hash, D., J. Olejniczak, M. J. Wright, D. Prabhu, M. Pulsonetti, B. Hollis, P. Gnoffo, M. Barnhardt, I. Nompelis, and G. V. Candler, “FIRE II Calculations for Hypersonic Nonequilibrium Aerothermodynamics Code Verification: DPLR, LAURA, and US3D,” *AIAA Paper No. 2007-0605*, Jan. 2007.
- ¹⁶ Drayna, T. W., I. Nompelis, and G. V. Candler, “Numerical Simulation of the AEDC Waverider at Mach 8,” *AIAA Paper No. 2006-2816*, June 2006. (Outstanding paper award)
- ¹⁷ Drayna, T. W., I. Nompelis, and G. V. Candler, “Hypersonic Inward Turning Inlets: Design and Optimization,” *AIAA Paper No. 2006-2816*, Jan. 2006.
- ¹⁸ Nompelis, I., T. W. Drayna and G. V. Candler, A Parallel Unstructured Implicit Solver for Reacting Flow Simulations,” *AIAA Paper No. 2005-4867*, June 2005.
- ¹⁹ Nompelis, I., G. V. Candler, M. MacLean, T. P. Wadhams and M. S. Holden, “Numerical Investigation of High Enthalpy Chemistry on Hypersonic Double-Cone Experiments,” *AIAA Paper No. 2005-0584*, Jan. 2005.
- ²⁰ Coblish, J. J., M. S. Smith, T. Hand, G. V. Candler and I. Nompelis, “Double-Cone Experiment and Numerical Analysis at AEDC Hypervelocity Wind Tunnel No. 9,” *AIAA Paper No. 2005-0902*, Jan. 2005.
- ²¹ Nompelis, I., T. W. Drayna, and G. V. Candler, “Development of a Hybrid Unstructured Implicit Solver for the Simulations of Reacting Flows Over Complex Geometries,” *AIAA Paper No. 2004-2227*, June 2004.
- ²² Nompelis, I., G. V. Candler, T. P. Wadhams, and M. S. Holden, “Numerical Simulation of High-Enthalpy Experiments in the LENS-X Expansion Tube Facility,” *AIAA Paper No. 2004-1000*, Jan. 2004.
- ²³ Nompelis, I., G. V. Candler, M. S. Holden, and T. P. Wadhams, “Computational Investigation of Hypersonic Viscous/Inviscid Interactions in High Enthalpy Flows,” *AIAA Paper No. 2003-3642*, June 2003.
- ²⁴ Druguet, M.-C., G. V. Candler, and I. Nompelis, “Simulations of Viscous Hypersonic Double-

Cone Flows: Influence of Numerics,” *AIAA Paper No. 2003-3548*, June 2003.

²⁵ Nompelis, I., G. V. Candler, M. S. Holden, and T. P. Wadhams, “Real Gas Effects on Hypersonic Shock Wave Laminar Boundary Layer Interactions,” *AIAA Paper No. 2003-0443*, Jan. 2003.

²⁶ Druguet, M.-C., G. V. Candler, and I. Nompelis, “Navier-Stokes Computations of Hypersonic Double-Cone Flows: Influence of Numerics,” *West-East High Speed Flow Fields*, D. E. Zeitoun, J. Periaux, L. D. Desideri, M. Marini (Eds.), CIMNE, Barcelona, 2002.

²⁷ Nompelis, I., and G. V. Candler, “Computational Investigation of High Enthalpy Flows Past a Finite Cylinder,” *West-East High Speed Flow Fields*, D. E. Zeitoun, J. Periaux, L. D. Desideri, M. Marini (Eds.), CIMNE, Barcelona, 2002.

²⁸ Candler, G. V., I. Nompelis, M.-C. Druguet, M. S. Holden, T. P. Wadhams, I. D. Boyd, and L.-W. Wang, *CFD Validation for Hypersonic Flight: Hypersonic Double-Cone Flow Simulations*,” *AIAA Paper No. 2002-0581*, Jan. 2002.

²⁹ Candler, G. V., and I. Nompelis, “CFD Validation for Hypersonic Flight Real Gas Flows,” *AIAA Paper No. 2002-0434*, Jan. 2002.

³⁰ Wang, W.-L., I. D. Boyd, G. V. Candler, and I. Nompelis, “Particle and Continuum Computations of Hypersonic Flows over Sharp and Blunted Cones,” *AIAA Paper No. 2001-2900*, June 2001.

³¹ Candler, G. V., I. Nompelis, and M.-C. Druguet, “Navier-Stokes Predictions of Hypersonic Double-Cone and Cylinder-Flare Flow Fields,” *AIAA Paper No. 2001-1024*, Jan. 2001.

³² Candler, G. V., I. Nompelis, and M. S. Holden, “Computational Analysis of Hypersonic Laminar Viscous-Inviscid Interactions,” *AIAA Paper No. 2000-0532*, Jan. 2000.

³³ Ioannou, C. A. and I. Nompelis, “Algorithmic Bounded Rationality in the Iterated Prisoner’s Dilemma Game,” *International Conference on Genetic and Evolutionary Methods*, July 2011.