

Curriculum Vitae

Savvas G. Loizou, Ph.D

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EDUCATION

Doctor of Philosophy, Mechanical Engineering, National Technical University of Athens.

Thesis: Automated planning of motion tasks for teams of multiple micro-robotic systems
Advisor: Prof. Kostas J. Kyriakopoulos
Duration: November 2000 – September 2005

Diploma in Mechanical Engineering, National Technical University of Athens (NTUA).

Diploma Thesis: Coordinating the Motion of a Manipulator and a Non Holonomic Mobile Base in 3-D Environments
Graduation Rank: 7th out of a class of 168 students (Highest 5 %).
Duration: September 1995 – October 2000

ACADEMIC EMPLOYMENT

Assistant Professor October 2008 onwards

Frederick University, Nicosia, CYPRUS
Department: Mechanical Engineering

Lecturer October 2007 – August 2008

National Technical University of Athens, Athens, GREECE
Department: Naval Architecture & Marine Engineering

RESEARCH EMPLOYMENT

Visiting Researcher, August 2007 – September 2007

Department of ME, Control Systems Lab, National Technical University of Athens, Athens, GREECE.

Conducted collaborative research with Prof. Kostas Kyriakopoulos and his research group on modular robotics, air traffic management and autonomous air vehicles. Assisted in developing the theoretical foundations of the R-Cell self reconfigurable modular robotic system.

Postdoctoral Researcher,

October 2005 – June 2007

Department of Mechanical Engineering, GRASP Laboratory, University of Pennsylvania, Philadelphia, PA.

Research supervisor: Professor **Vijay Kumar**. Developing analytic techniques and bio-inspired algorithms for navigation, coordination and control of swarms of heterogeneous autonomous vehicles, under the ARO MURI sponsored SWARMS project. Managing and coordinating the integration of SWARMS algorithms developed by participating institutions: Proposed the architecture for simulating decentralized SWARMS algorithms and developed a simulation tool in MATLAB. Conducting collaborative research with Professors **Daniel Koditschek**, **George Pappas** and **Ali Jadbabaie**. Co-supervising starting doctoral students. Co-instructing and co-developed a graduate course on robotics.

Graduate Student Researcher,

March 2002 – September 2005

Department of ME, Control Systems Lab, National Technical University of Athens, Athens, GREECE. Established a new framework for multi-robot navigation. The developed technique is feedback based and methodologies for its application to holonomic and nonholonomic kinematically and dynamically described robot models as well as special classes of stick-slip actuated micro robots were developed. The methodology has been successfully applied to the MiCRoN platform of micro-robotic agents (EU sponsored MiCRoN project). Developed techniques for automated task planning based on spatiotemporal task specifications.

Visiting Researcher

September 2004 - December 2004

Coordinated Science Lab, University of Illinois at Urbana-Champaign, IL. Invited by Prof. Christoforos Hadjicostis. Conducted research on applications of navigation and proposed methodologies for critical regions avoidance in decentralized large scale networks.

Visiting Researcher

September 2002 – December 2002

GRASP Lab, CIS Department, University of Pennsylvania, Philadelphia PA. Invited by Prof. George J. Pappas. Conducted research on spatiotemporal task definition languages and developed analytic methodologies for motion planning in uncertain environments and motion planning in dynamic environments.

Graduate Student Researcher,

January 2001 – January 2002

Department of ME, National Technical University of Athens, Athens, GREECE. Researched and implemented multi-sensor data fusion algorithms for estimation of pipe & cable positions for autonomous underwater inspections under the EU sponsored AUTOTRACKER contract (G3RD-CT-2000-00265).

MILITARY SERVICE

Cyprus National Guard

June 1993 – September 1995

Completed Military Services with the grade of second lieutenant at Signal Corps

HONORS & AWARDS

- 2000 – 2003: Thomaidion award for Scientific Publications
- 2000: Eugenides Foundation Scholarship for graduate studies
- 1995 – 2000: National Scholarships Foundation
- 1995 – 1996: Christos Papakyriakopoulou award for performance in Mathematics (NTUA).
- 1995 – 1996: National Scholarships Foundation award for high gradation (NTUA).
- 1993: Laudation for the Cyprus Mathematical Society contest.
- 1992 –1993: Ethnomartyras Kyprianos Lyceum award for the highest gradation in Physics.
- 1992: Laudation for the Pan Cyprian Olympiad of Physics and Chemistry.
- 1992: Distinction in Chemistry – Olympiad of Physics and Chemistry.
- 1992: Distinction in the Pan Cyprian Olympiad of Informatics
- 1992: Special distinction in Informatics award, Ethnomartyras Kyprianos Lyceum
- 1991: **First award** in the 5th Pan Cyprian Physics Olympiad
- 1991: Special distinction in Physics award, Ethnomartyras Kyprianos Lyceum
- 1990: Laudation for the Cyprus Mathematical Society contest

PUBLICATIONS

JOURNAL ARTICLES

- J1. S.G. Loizou and A. Jadbabaie "Density Functions for Navigation Function Based Systems", **IEEE Transactions on Automatic Control**, vol. 53 (2), pp. 612-617, March 2008
- J2. S.G. Loizou and K.J. Kyriakopoulos "Navigation of Multiple Kinematically Constrained Robots", **IEEE Transactions on Robotics**, vol. 24 (1), pp. 221-231, Feb. 2008
- J3. S.G. Loizou and V. Kumar, "Mixed Initiative Control of Multiple Autonomous Vehicles", (submitted March 2008), **IEEE Transactions on Robotics**
- J4. S.G. Loizou and V. Kumar, "Weak Input to State Stability Properties for Navigation Function Based Controllers", (submitted, December 2007), **IEEE Transactions on Automatic Control**
- J5. X. Papageorgiou, H.G. Tanner, S.G. Loizou and K.J. Kyriakopoulos, "Controlling the Constrained Motion of Hybrid Bionic Systems", (under revision 2008), **European Journal of Control**
- J6. R.Estana, J.Seyfried, S.Johansson, N.Snis, J.M.Breguet, W.Driesen, T.Velten, J.Gao, P.Vartholomeos, S.G.Loizou, K.J.Kyriakopoulos, F.Caparrelli, J.Wedekind, A.Eisenberg, K.Houston, J.Samitier, M.Puig-Vidal and H.Woern, "The MiCRoN Micro Project", (under revision 2008), **Industrial Robot**
- J7. S.G. Loizou and K.J. Kyriakopoulos "A feedback Based Multiagent Navigation Framework" , **International Journal of Systems Science**, vol. 37 (6), pp. 377-384, May 2006
- J8. D.V. Dimarogonas, S.G. Loizou, K.J. Kyriakopoulos and M.M. Zavlanos "A Feedback Stabilization and Collision Avoidance Scheme for Multiple Independent Non-point Agents", **Automatica**, vo. 42(2), pp. 229-243, Feb. 2006
- J9. H. Tanner, S.G. Loizou and K.J. Kyriakopoulos "Nonholonomic Navigation and Control of Cooperating Mobile Manipulators", **IEEE Transactions on Robotics and Automation.**, vol. 19(1), pp. 53-64, Feb. 2003

BOOK CHAPTERS

- B1. S.G. Loizou and K.J. Kyriakopoulos "Multirobot Navigation Functions I", in H.A.P Blom and J. Lygeros (eds.) *Stochastic Hybrid Systems: Theory and Safety Critical Applications*, Chapter 10, Springer, 2006
- B2. D.V. Dimarogonas, S.G. Loizou and K.J. Kyriakopoulos "Multirobot Navigation Functions II: Towards Decentralization", in H.A.P Blom and J. Lygeros (eds.) *Stochastic Hybrid Systems: Theory and Safety Critical Applications*, Chapter 11, Springer, 2006
- B3. K.J. Kyriakopoulos and S.G. Loizou "Robotics: Fundamentals and Prospects" in Axel Munack (ed), *CIGR Handbook of Agricultural Engineering Volume 6: Information Technology*, Part I, Chap. 2.4

REFEREED CONFERENCE PUBLICATIONS

- C1. A. Oikonomopoulos, S.G. Loizou and K.J. Kyriakopoulos, "Hybrid Control of a Constrained Velocity Unicycle with Local Sensing", (under review), 47th IEEE International Conference on Decision and Control, 2008
- C2. D. Chatzigeorgiou, S.G. Loizou and K.J. Kyriakopoulos, "R-Cell: A Module for a Self-Reconfigurable Robotic System", (under review), IEEE/RSJ 2008 International Conference on Intelligent Robots and Systems
- C3. N. Michael, J. Fink, S.G. Loizou, V. Kumar, "Architecture, Abstractions, and Algorithms for Controlling Large Teams of Robots: Experimental Testbed and Results", 13th International Symposium of Robotics Research (ISRR2007).
- C4. S.G. Loizou, V. Kumar, "Biologically Inspired Bearing-Only Navigation and Tracking", 46th IEEE Conference on Decision and Control, New Orleans, 2007
- C5. S.G. Loizou, V. Kumar, "Mixed Initiative Control of Autonomous Vehicles", 2007 IEEE International Conference on Robotics and Automation
- C6. M.A. Hsieh, S.G. Loizou, V. Kumar, "Stabilization of Multiple Robots on Stable Orbits via Local Sensing", 2007 IEEE International Conference on Robotics and Automation
- C7. X. Papageorgiou, S.G. Loizou, K.J. Kyriakopoulos, "Motion Tasks and Force Control for Robot Manipulators on Embedded 2D Manifolds", 2007 IEEE International Conference on Robotics and Automation
- C8. S.G. Loizou, A. Jadbabaie, "Density Functions for Navigation Function Based Systems," 45th IEEE Conference on Decision and Control, San Diego, California, USA, December 2006
- C9. S.G. Loizou, V. Kumar, "Weak Input-to-State Stability Properties for Navigation Function Based Controllers," 45th IEEE Conference on Decision and Control, San Diego, California, USA, December 2006
- C10. G. E. Fainekos, S.G. Loizou, G.J. Pappas, "Translating temporal logic to controller specifications," 45th IEEE Conference on Decision and Control, San Diego, California, USA, December 2006

- C11. P. Vartholomeos, S.G. Loizou, M. Thiel, K. J. Kyriakopoulos, E. Papadopoulos "Control of the Multi Agent Micro-Robotic Platform MiCRoN, " IEEE 2006 International Conference on Control Applications, Munich, Germany, October 2006
- C12. X. Papageorgiou, S.G. Loizou, K.J. Kyriakopoulos, "Motion Tasks for Robot Manipulators on Embedded 2-D Manifolds", IEEE 2006 International Symposium on Intelligent Control, Munich, Germany, October 2006
- C13. S.G. Loizou and K.J. Kyriakopoulos "Automated Planning of Motion Tasks for Multi-Robot Systems," 44th IEEE Conference on Decision and Control 2005
- C14. S.G. Loizou and K.J. Kyriakopoulos "Motion Planning of Piezoelectrically Driven Micro-Robots via Navigation Functions, 13th IEEE Mediterranean Conference on Control and Automation 2005
- C15. X. Papageorgiou and S.G. Loizou and K.J. Kyriakopoulos "Motion Planning and Trajectory Tracking on 2-D Manifolds embedded in 3-D Workspaces", IEEE 2005 Int. Conference on Robotics and Automation
- C16. S.G. Loizou and K.J. Kyriakopoulos "Automatic Synthesis of Multi-Agent Motion Tasks Based on LTL Specifications," to, 43rd IEEE Conference on Decision and Control 2004
- C17. S.G. Loizou, K.J. Kyriakopoulos, "Centralized Feedback Stabilization of Multiple Nonholonomic Agents under Input Constraints," 5th IFAC Symposium on Intelligent Autonomous Vehicles, IAV 2004
- C18. S.G. Loizou, D.V. Dimarogonas, K.J. Kyriakopoulos, "Decentralized Feedback Stabilization of Multiple Nonholonomic Agents," Int. Conf. On Robotics and Automation 2004
- C19. S.G. Loizou H.G. Tanner, V. Kumar, K.J. Kyriakopoulos "Closed loop navigation for mobile agents in dynamic environments", IEEE/RSJ International Conference on Intelligent Robots and Systems, 2003
- C20. S.G. Loizou H.G. Tanner, V. Kumar, K.J. Kyriakopoulos "Closed Loop Motion Planning and Control for Mobile Robots in Uncertain Environments", 42nd IEEE Conference on Decision and Control, 2003
- C21. D. V. Dimarogonas, M.M. Zavlanos, S. G. Loizou and K. J. Kyriakopoulos "Decentralized Motion Control of Multiple Holonomic Agents under Input Constraints", 42nd IEEE Conference on Decision and Control, 2003
- C22. S.G. Loizou and K.J. Kyriakopoulos "*Closed Loop Navigation for Multiple Non-Holonomic Vehicles*", Proceedings of the 2003 Int. Conf. On Robotics and Automation
- C23. S.G. Loizou and K.J. Kyriakopoulos "*Closed Loop Navigation for Multiple Holonomic Vehicles*", Proceedings of the 2002 IEEE/RSJ Int. Conf. on Intelligent Robots and Systems.
- C24. H. Tanner, S.G. Loizou and K.J. Kyriakopoulos "*Non-Holonomic Stabilization with Collision Avoidance for Mobile Robots*", Proceedings of the 2001 IEEE/RSJ Int. Conf. on Intelligent Robots and Systems.
- C25. H. G. Tanner, S. G. Loizou, K. J. Kyriakopoulos and N. Sigrimis, "*Coordinating the Motion of a Manipulator and a Mobile Base in Tree Environments*," in Proceedings of the 2nd IFAC/CIGR International Workshop on Bio-Robotics, Information Technology and Intelligent Control for Bioproduction Systems, November 2000, Osaka, Japan

WORKSHOP PARTICIPATIONS

- W1. M.Y. Hsieh, S.G. Loizou, *Stabilization of Multiple Robots on Stable Orbits via Local Sensing*. 2nd Workshop on Swarming in Natural and Engineered Systems, May 2007, Philadelphia, PA
- W2. S.G. Loizou, *Biologically Inspired Landmark Based Navigation*. 2nd Workshop on Swarming in Natural and Engineered Systems, May 2007, Philadelphia, PA
- W3. S.G. Loizou, *Biologically Inspired Landmark Based Navigation*. 3rd Northeast Control Workshop, May 2007, Philadelphia, PA
- W4. S.G. Loizou, *Biologically Inspired Landmark Based Navigation*. IEEE 2007 Int. Conference on Robotics and Automation, Workshop on Collective Behaviors inspired by Biological and Biochemical Systems
- W5. S.G. Loizou and Vijay Kumar, *Human-Robot Augmentation with Applications to Assistive Technology*. Robotics: Science and Systems Conference, Philadelphia PA, August 2006
- W6. S.G. Loizou and K.J. Kyriakopoulos, *Navigation of Multiple Input Constraint Micro-Robotic Agents*, IEEE 2005 Int. Conference on Robotics and Automation Workshop on Cooperative Robotics, Barcelona, Spain

TECHNICAL REPORTS

- T1. Dimos V. Dimarogonas, Savvas G. Loizou, Kostas J. Kyriakopoulos and Michael M. Zavlanos, "Decentralized Feedback Stabilization and Collision Avoidance of Multiple Agents", Technical Report 04-01
- T2. Savvas G. Loizou and K. J. Kyriakopoulos, "Closed Loop Navigation for Multiple Holonomic Vehicles," Technical Report No. 01-02, Control Systems Lab. M.E. Dept, NTUA, 2002
- T3. Savvas G. Loizou and K. J. Kyriakopoulos, "Closed Loop Navigation for Multiple Non-Holonomic Vehicles," Technical Report No. 02-02, Control Systems Lab. M.E. Dept, NTUA, 2002

TEACHING EXPERIENCE

Marine Control Systems: Guidance Navigation and Control, NTUA Spring 2008

Dept. of Naval Arch. & Marine Eng.: Restructuring of an undergraduate course on Marine Control Systems.

Introduction to Automatic Control Systems, NTUA Fall 2007

Dept. of Naval Arch. & Marine Eng.: Undergraduate course on Automatic Control Systems.

Robotics and Motion Planning, University of Pennsylvania Spring 2006 & 2007

Course co-instructor for MEAM 620: Robotics and Motion Planning. Graduate level course on advanced Motion Planning Techniques.

Micro-Systems Technology, NTUA Spring 2004

Teaching assistant for a graduate level course on Micro-Systems Technology

Adaptive Control, NTUA

Spring 2003

Teaching assistant for a graduate level course on Adaptive Control

INVITED TALKS

- IT1. “*Compositional Controllers for Networked Robots: Enabling Mixed Initiative Control*”, **University of Cyprus**, Nicosia, Cyprus, July 2008
- IT2. “*Compositional Controllers for Networked Robots: Enabling Mixed Initiative Control*”, **Technische Universität München**, Munich, Germany, July 2008
- IT3. “*Compositional Controllers for Networked Robots: Enabling Mixed Initiative Control*”, **Virginia Tech**, ME Dept., Blacksburg VA, May 2008
- IT4. “*Compositional Controllers for Networked Robots: Enabling Mixed Initiative Control*”, **Institute of Advanced Learning and Research**, Danville VA., May 2008
- IT5. “*Compositional Controllers for Networked Robots: Enabling Mixed Initiative Control*”, **Royal Institute of Technology**, EE Dept., Stockholm, Sweden, Feb. 2008
- IT6. “*Compositional Controllers for Networked Robots: Enabling Mixed Initiative Control*”, Mechanical Engineering Dept., **University of New Mexico**, Albuquerque NM, May 2007
- IT7. “*Compositional Controllers for Networked Robots: Enabling Mixed Initiative Control*”, College of Engineering, **Drexel University**, Philadelphia PA, January 2007

PROFESSIONAL ACTIVITIES

- **Organizer**
 - **Co-organizer of the IEEE ICRA’07 Workshop** on Collective Behaviors inspired by Biological and Biochemical Systems
- **Professional Memberships**
 - Institute of Electrical and Electronics Engineers - Control Systems Society (**IEEE-CSS**)
 - Technical Chamber of Greece (TEE)
- **Reviewer:**
 - IEEE Transactions on Robotics
 - IEEE Transactions on Automatic Control
 - IEEE Transactions on Automation Science and Engineering
 - Robotics and Autonomous Systems Journal
 - Automatica
 - IEEE Conference on Robotics and Automation
 - IEEE Conference on Decision and Control
 - American Control Conference
 - IEEE Mediterranean Conference on Control and Automation
 - Journal of Zhejiang University SCIENCE
 - Arabian Journal for Science and Engineering
 - IEEE Conference on Networking Sensing and Control
 - IEEE Conference on Intelligent Robots and Systems