

Christoforos Mavrogiannis

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Last Update: Oct 2018

EDUCATION

Cornell University, Sibley School of Mechanical & Aerospace Engineering

Ph.D. in Mechanical Engineering

Dec 2018 (exp.)

Minors: Computer Science, Cognitive Studies

Tentative Thesis Title: "Design and Evaluation of Topologically Adaptive Planning Algorithms for Socially Competent Robotic Navigation in Dynamic Multi-Agent Environments"

Special Committee: Ross A. Knepper (chair), Kilian Weinberger, Shimon Edelman, Anca Dragan (UC Berkeley)

Cornell University, Sibley School of Mechanical & Aerospace Engineering

M.S. in Mechanical Engineering

Aug 2016

Selected Coursework: Advanced Artificial Intelligence, Advanced Machine Learning, Feedback Control Systems, Intermediate Dynamics and Vibrations, Autonomous Mobile Robots, Formal Methods for Robotics, Introduction to Mobile Manipulation.

GPA: 4.055/4.00

National Technical University of Athens (NTUA), Department of Mechanical Engineering

Diploma (eq. to M.Sc.) in Mechanical Engineering

Feb 2013

Concentration: Design & Control

Thesis Title: "Grasp Synthesis Algorithms for Multifingered Robot Hands"

Advisor: Kostas J. Kyriakopoulos

GPA: 8.46/10 (top 5% in a class of more than 200 students)

RESEARCH/PROFESSIONAL EXPERIENCE

Graduate Research Assistant, Robotic Personal Assistants Lab (RPAL), Cornell University

Nov 2014-Present

- Developing mathematical models, algorithms and software (MATLAB, python, communication through ROS) for robots navigating around human pedestrians (NSF grants IIS-1526035 and IIS-1563705).
- Conducting lab experiments and user studies to understand the effects of robot behaviors on human subjects.
- Employing data-driven techniques to learn navigation strategies from humans.
- Supervising and mentoring undergraduate and M.Eng. students carrying out projects in the lab.

Research Associate, OpenBionics (www.openbionics.org)

July 2013-Present

- Consulting on the development of open-source robotic and prosthetic hands.

Undergraduate Research Assistant, Control Systems Lab (CSL), NTUA

Mar 2011-Aug 2013

- Research on the development of grasp planning strategies and algorithms for dexterous and underactuated robot hands under the Integrated Project no. 248587, "THE Hand Embodied", (supported by the European Commission) within the FP7-ICT-2009-4-2-1 program "Cognitive Systems and Robotics".
- Implemented a software framework for gesture-based teleoperation of the Sony AIBO robot dog through MS Kinect.

IAESTE Summer Intern, Hydron Unipress, Łódź, Poland

July 2011-Aug 2011

- Designed solder production machines in the CAD software SolidEdge.

TEACHING EXPERIENCE

Teaching Assistant for CS 4750/5750: Foundations of Robotics, Cornell University, Fall 2016, Fall 2017.

- Held weekly office hours and delivered guest lectures.
- Prepared notes and helped design homework assignments, projects and exams.
- Graded assignments, projects and exams.

HONORS & AWARDS

- Travel Grant to attend the *2018 BMW Summer School: “Intelligent Cars on Digital Roads – Frontiers in Machine Intelligence”*, in Munich, Germany.
- Travel Grant to attend the *2018 Robotics: Science and Systems Conference (RSS)* as a participant in the *Pioneers* doctoral consortium. [acceptance rate 38%]
- Cornell University Student Travel Grant to attend *IROS 2017*.
- **Best Paper Award Finalist** at the ACM/IEEE International Conference on Human-Robot Interaction (*HRI*) 2017.
- Cornell University Student Travel Grant to attend *HRI 2017*.
- Travel grant to attend the *2017 International Conference on Human-Robot Interaction (HRI)* as a participant in the *Pioneers* doctoral consortium. [acceptance rate 31%]
- Student Travel Support to attend the Workshop on the Algorithmic Foundations of Robotics (*WAFR*) 2016.
- **2nd Prize** Award at the **Hackaday Prize 2015 (out of 900+ projects from 50+ countries)** for the project “Openbionics Affordable Prosthetic Hands”.
- **1st Prize** Award at the **Robotdalen International Innovation Award 2015** for the project “Openbionics Affordable Prosthetic Hands”.
- Sibley School of Mechanical & Aerospace Engineering Graduate Fellowship 2013.
- Thomaidion Award for Scientific Publications 2013 for NTUA students presenting a peer-reviewed paper at an international conference.
- Finalist, National Final Round of the *European Best Engineering Competition 2012*.
- 2nd Place, NTUA Innovative Design Competition 2011, project: “Design and Control of a Solar Tracking Device”.
- Qualified for an IAESTE internship as 3rd out of a pool of more than 30 applicants from NTUA in 2011.

LEADERSHIP AND TEAMWORK EXPERIENCE

Volunteer, *North East Robotics Colloquium (NERC)* *Oct 2016*

- Collaborated with a team of students to provide support for more than 150 people.

Graduate Teaching Assistant, *CS4750/5750 Foundations of Robotics*, Cornell University *Fall 2016, Fall 2017*

- Collaborated with a team of graduate students to prepare notes, design and grade assignments.
- Delivered guest lectures.

Research Associate, *Openbionics* *2013-2016*

- Led the management of the open source research projects of the team.
- Provided technical consulting on the design of artificial hands.

Team Member, *NTUA Team, Board of European Students of Technology Engineering Competition* *May 2012*

- Collaborated with mechanical and civil engineering undergraduates to tackle a series of open-ended design challenges.

Team Member, *NTUA Innovative Design Competition* *Sept 2011*

- Collaborated with a team of mechanical engineering undergraduates on the design of a solar tracking device.

SKILLS, LANGUAGES AND HOBBIES

Programming Languages/Utilities: MATLAB/Simulink, C/C++, Python, Fortran, LaTeX.

Version Control: GitHub.

Engineering Software: ROS (Robot Operating System), Solidworks, ANSYS, SolidEdge, SolidCAM, AutoCAD (ECDL 2008).

Operating Systems: MS Windows, Mac OS X, Linux.

Languages: English (Fluent, CPE- Uni. of Cambridge 2006), French (Intermediate, DALF C2 2010), Greek (Native).

Hobbies: Table Tennis, Tennis, Soccer, Swimming, Guitar.

PUBLICATIONS

Journal Articles

[1] **Christoforos I. Mavrogiannis** and Ross A. Knepper, “Multi-Agent Path Topology in Support of Socially Competent Navigation Planning”, *The International Journal of Robotics Research*, 2018. **[Invited Submission]**

Refereed Conference Proceedings

- [10] **Christoforos I. Mavrogiannis** and Ross A. Knepper, “Multi-Agent Trajectory Prediction and Generation with Topological Invariants Enforced by Hamiltonian Dynamics”, *International Workshop on the Algorithmic Foundations of Robotics (WAFR)*, Mérida, Mexico, 2018. [To appear]
- [9] **Christoforos I. Mavrogiannis**, Wil Thomason and Ross A. Knepper, “Social Momentum: A Framework for Legible Navigation in Dynamic Multi-Agent Environments”, *Proceedings of the 2018 ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, Chicago, IL, USA, 2018, pp. 361-369. [**Acceptance rate 23%**]
- [8] **Christoforos I. Mavrogiannis**, Valts Blukis and Ross A. Knepper, “Socially Competent Navigation Planning by Deep Learning of Multi-Agent Path Topologies”, *Proceedings of the 2017 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Vancouver, BC, CA, 2017, pp. 6817-6824.
- [7] Ross A. Knepper, **Christoforos I. Mavrogiannis**, Julia Proft and Claire Liang, “Implicit Communication in a Joint Action”, *Proceedings of the 2017 ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, Vienna, Austria, 2017, pp. 283-292. [**Acceptance rate 24%**][**Best Paper Award Finalist**]
- [6] **Christoforos I. Mavrogiannis** and Ross A. Knepper, “Decentralized Multi-Agent Navigation Planning with Braids”, *proceedings of the 2016 International Workshop on the Algorithmic Foundations of Robotics (WAFR)*, San Francisco, CA, USA, 2016. [**Direct acceptance rate 25%**]
- [5] George Kontoudis, Minas V. Liarokapis, Agisilaos G. Zisimatos, **Christoforos I. Mavrogiannis** and Kostas J. Kyriakopoulos, “Open-Source, Anthropomorphic, Underactuated Robot Hands with a Selectively Lockable Differential Mechanism: Towards Affordable Prostheses”, *Proceedings of the 2015 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Hamburg, Germany, 2015, pp. 5857-5862.
- [4] **Christoforos I. Mavrogiannis**, Minas V. Liarokapis and Kostas J. Kyriakopoulos, “Quantifying Anthropomorphism of Robot Arms”, *Proceedings of the 2015 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Hamburg, Germany, 2015, pp. 4084-4089.
- [3] Agisilaos G. Zisimatos, Minas V. Liarokapis, **Christoforos I. Mavrogiannis** and Kostas J. Kyriakopoulos, “Open-Source, Affordable, Light-Weight, Underactuated Robot Hands”, *Proceedings of the 2014 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Chicago, IL, USA, 2014, pp. 3207-3212.
- [2] **Christoforos I. Mavrogiannis**, Charalampos P. Bechlioulis, Minas V. Liarokapis and Kostas J. Kyriakopoulos, “Task-Specific Grasp Selection for Underactuated Hands”, *Proceedings of the 2014 IEEE International Conference on Robotics and Automation (ICRA)*, Hong Kong, China, 2014, pp. 3676-3681.
- [1] **Christoforos I. Mavrogiannis**, Charalampos P. Bechlioulis and Kostas J. Kyriakopoulos, “Sequential Improvement of Grasp based on Sensitivity Analysis”, *Proceedings of the 2013 IEEE International Conference on Robotics and Automation (ICRA)*, Karlsruhe, Germany, 2013, pp. 1094-1099. [**Acceptance rate 39%**]

Doctoral Consortia

- [3] *BMW Summer School: “Intelligent Cars on Digital Roads – Frontiers in Machine Intelligence”*, Munich, Germany, 2018.
- [2] *Pioneers Workshop, Robotics: Science and Systems (RSS)*, Pittsburgh, PA, USA, 2018. [**Acceptance rate 38%**]
- [1] *Pioneers Workshop, ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, Vienna, Austria, 2017. [**Acceptance rate 31%**]

Refereed Workshop Papers

- [7] **Christoforos I. Mavrogiannis** and Ross A. Knepper, “Decentralized Navigation Planning Using Multi-Agent Trajectory Prediction Governed by Hamiltonian Dynamics”, *Workshop on Multi-robot Perception-Driven Control and Planning, International Conference on Intelligent Robots and Systems (IROS '18)*, Madrid, Spain, 2018.
- [6] **Christoforos I. Mavrogiannis** and Ross A. Knepper, “Online Multi-Agent Trajectory Generation for Adaptive Navigation Planning”, *Pioneers Workshop, Robotics: Science and Systems (RSS)*, Pittsburgh, PA, USA, 2018.
- [5] **Christoforos I. Mavrogiannis**, Valts Blukis and Ross A. Knepper, “Inferring Strategies of Avoidance: Towards Socially Competent Navigation in Human Environments”, *Workshop on Mathematical Models, Algorithms and Human Robot-Interaction, in Robotics Science and Systems (RSS)*, Boston, MA, 2017.
- [3] **Christoforos I. Mavrogiannis** and Ross A. Knepper, “Designing Algorithms for Socially Competent Robotic Navigation”, *Pioneers Workshop, Proceedings of the Companion of the 2017 ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, Vienna, Austria, 2017, pp. 357-358.
- [3] **Christoforos I. Mavrogiannis** and Ross A. Knepper, “Towards Socially Competent Navigation of Pedestrian Environments”, *Workshop on Social Trust in Autonomous Robots, in Robotics Science and Systems (RSS)*, Ann Arbor, MI, 2016.
- [2] **Christoforos I. Mavrogiannis** and Ross A. Knepper, “Interpretation and Communication of Pedestrian Intentions Using Braid Groups”, *Workshop on Intention Recognition in Human-Robot Interaction, 11th ACM / IEEE International Conference on Human-Robot Interaction (HRI)*, Christchurch, New Zealand, 2016.

[1] Minas V. Liarokapis, Agisilaos G. Zisimatos, **Christoforos I. Mavrogiannis** and Kostas J. Kyriakopoulos, “OpenBionics: An Open-Source Initiative for the Creation of Affordable, Modular, Light-Weight, Underactuated Robot Hands and Prosthetic Devices”, *2nd ASU Rehabilitation Robotics Workshop, Arizona State University (ASU), Tempe, AZ, 2014.*

Theses

[2] **Christoforos I. Mavrogiannis**, “Design and Evaluation of Topologically Adaptive Planning Algorithms for Socially Competent Navigation in Dynamic Multi-Agent Environments”, PhD Dissertation, Cornell University, 2018. [In preparation][tentative title]

[1] **Christoforos I. Mavrogiannis**, “Grasp Synthesis Algorithms for Multifingered Robot Hands”, Diploma Thesis, National Technical University of Athens (NTUA), Athens, Greece, March 2013.

Technical Reports

[2] George P. Kontoudis, Minas V. Liarokapis, Agisilaos G. Zisimatos, **Christoforos I. Mavrogiannis**, George P. Kontoudis and Kostas J. Kyriakopoulos, “How to Create Affordable, Anthropomorphic, Personalized, Light-Weight Prosthetic Hands”, Control Systems Lab, School of Mechanical Engineering, National Technical University of Athens, October 2015.

[1] Agisilaos G. Zisimatos, Minas V. Liarokapis, **Christoforos I. Mavrogiannis**, George P. Kontoudis and Kostas J. Kyriakopoulos, “How to Create Affordable, Modular, Light-Weight, Underactuated, Compliant Robot Hands”, Control Systems Lab, School of Mechanical Engineering, National Technical University of Athens, January 2015.

SELECTED TALKS AND PRESENTATIONS

[15] “Socially Competent Robot Navigation”, *Paul G. Allen School of Computer Science and Engineering, University of Washington, Seattle, WA, USA, October 2018.* [Invited talk]

[14] “Inferring and Expressing Intentions in Systems of Multiple Navigating Agents”, *BMW Summer School: Intelligent Cars on Digital Roads – Frontiers in Machine Intelligence*, Munich, Germany, July 2018. [Spotlight Talk and Poster Presentation]

[13] “Online Multi-Agent Trajectory Generation for Adaptive Navigation Planning”, *Pioneers Workshop, Robotics: Science and Systems (RSS)*, Pittsburgh, PA, USA, June 2018. [Spotlight Talk and Poster Presentation]

[12] “Social Momentum: A Framework for Legible Navigation in Dynamic Multi-Agent Environments”, *ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, Chicago, IL, USA, March 2018. [Oral Presentation]

[11] “Socially Competent Navigation Planning by Deep Learning of Multi-Agent Path Topologies”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Vancouver, BC, Canada, September 2017. [Oral Presentation]

[10] “Socially Competent Navigation Planning by Deep Learning of Multi-Agent Path Topologies”, *Microsoft Artificial Intelligence Seminar*, Cornell University, Ithaca NY, September 2017. [Oral Presentation]

[9] “Inferring Strategies of Avoidance: Towards Socially Competent Navigation in Human Environments”, *Workshop on Mathematical Models, Algorithms and Human Robot-Interaction, in Robotics Science and Systems (RSS) 2017*, Boston, MA, July 2017. [Spotlight Talk and Poster Presentation]

[8] “Designing Algorithms for Socially Competent Robotic Navigation”, *Pioneers Workshop, ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, Vienna, Austria, March 2017. [Poster Presentation]

[7] “Decentralized Multi-Agent Navigation Planning with Braids”. *International Workshop on the Algorithmic Foundations of Robotics*, San Francisco, CA, December 2016. [Oral Presentation]

[6] “Decentralized Multi-Agent Navigation Planning with Braids”. *Robotics Seminar*, Cornell University, Ithaca, NY, December 2016. [Oral Presentation]

[5] “Decentralized Multi-Agent Navigation Planning with Braids”. *North East Robotics Colloquium (NERC)*, Cornell University, Ithaca, NY, October 2016. [Poster Presentation]

[4] “Towards Socially Competent Navigation of Pedestrian Environments”, *Workshop on Social Trust in Autonomous Robots, in Robotics: Science and Systems (RSS)*, Ann Arbor, MI, June 19, 2016. [Poster Presentation]

[3] “Socially Competent Pedestrian Navigation Using Braid Groups”, *Graduate Visit Weekend Poster Session, Sibley School of Mechanical & Aerospace Engineering*, Ithaca, NY, March 2016. [Poster Presentation]

[2] “OpenBionics Workshop: From Robot Hands to Prosthetic Devices”, *Athens Hackerspace*, Athens, Greece, December 2015. [Oral Presentation]

[1] “Sequential Improvement of Grasp based on Sensitivity Analysis”, *IEEE International Conference on Robotics and Automation (ICRA)*, Karlsruhe, Germany, May 2013. [Oral Presentation]

STUDENT MENTORING

- Alena Hutchinson, *Summer Research Experience for Undergraduates Project*: “User Study for the Evaluation of Social Navigation Algorithms in a Controlled Lab Environment.”, Summer 2018.

- John Macdonald, *Undergraduate Research Project*: “Implementation and Testing of Social Navigation Algorithms on a Beam Telepresence Robot”, 2017–2018
- Joshua Lee, *Masters of Engineering Project*: “Design of a User Study for the Evaluation of Social Navigation Algorithms”, Spring 2018.
- Yogisha Dixit, Daryl Sew, Samantha Chen, Shiv Malhotra, Zachary Vinegar, *Undergraduate Research Project*: “Detecting and Tracking Human Pedestrians”, 2015–2017.

SELECTED PRESS COVERAGE

Cornell Chronicle, Jan 19, 2017: “Humans must overcome distrust of robots”.

ERT (Greek Public TV Station), Dec 27, 2016: Invited to a morning news show to talk about the OpenBionics Project.

3ders.org, Nov 5, 2015: “OpenBionics adds NFC ready fingers to 3D printed hand prosthetics for 2015 Hackaday Prize finals”.

blog.atmel.com, Nov 3, 2015: “1:1 interview with Hackaday Prize finalist OpenBionics”.

Hackaday.com, Oct 5, 2015: “10 finalist projects prove we can save the world”.

Hackaday.com, Sept 20, 2015: “Hackaday Prize Semifinalist: OpenBionics Affordable Prosthetic Hands”.

3dprint.com, Sept 23, 2015: “OpenBionics Affordable Bionic Hand is Selected as a Hackaday Prize Semifinalist”.

Hackaday.com, June 17, 2015: “Hackaday Prize Entry: OpenBionics”.

GoodNews.gr, May 8, 2015: “The most Affordable Prosthetic Hands will be made in Greece”. [In greek]

RoboHub.com, April 9, 2015: “OpenBionics prosthetic hands: Open source, affordable, lightweight, anthropomorphic”.

3ders.org, March 18, 2015: “Greek OpenBionics unveils affordable, light-weight 3D printed bionic hands with 144 grasp movements”.

3DPrint.com, March 18, 2015: “OpenBionics open source prosthetic hand can execute 144 different grasps & costs under \$200”.

MEMBERSHIPS AND SERVICE

Memberships

IEEE Student Member

ACM Student Member

IEEE Robotics and Automation Society (RAS)

IAESTE Alumni Network

Technical Chamber of Greece

Reviewer

IEEE Robotics and Automation Magazine (RAM)

ACM/IEEE International Conference on Human-Robot Interaction (HRI)

IEEE International Conference on Robotics and Automation (ICRA)

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)

International Symposium on Experimental Robotics (ISER)

IEEE Mediterranean Conference on Control and Automation (MED)

IEEE/RAS International Conference on Humanoid Robots

IEEE RAS/EMBS International Conference on Biomedical Robotics and Biomechanics (BioRob)

IEEE International Conference on Automation Science and Engineering (CASE)

International Workshop on the Algorithmic Foundations of Robotics (WAFR)