Vasileios Vasilopoulos

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EDUCATION

2021 **Ph.D., University of Pennsylvania**
School of Engineering and Applied Science (SEAS)
Department of Mechanical Engineering and Applied Mechanics (MEAM)
Thesis: *Reactive Planning with Legged Robots in Unknown Environments*
Advisor: Daniel E. Koditschek
Committee: George J. Pappas (chair), Daniel E. Koditschek (advisor), Nicholas Roy (external), Kostas Daniilidis, Mark Yim

2018 **M.S.E., University of Pennsylvania**
School of Engineering and Applied Science (SEAS)
Department of Mechanical Engineering and Applied Mechanics (MEAM)
Concentration: Mechatronic and Robotic Systems
GPA: 3.91/4.00

2014 **Diploma (Dipl.-Ing.), National Technical University of Athens (NTUA)**
School of Mechanical Engineering
Concentration: Mechanical Design & Control
Thesis: *Dynamics and Control of a Monopod Robot with a Single Actuator on Compliant Terrain*
Supervisor: Evangelos G. Papadopoulos
GPA: 9.38/10.00 (*1st out of 179 graduates*)

RESEARCH AND WORK EXPERIENCE

2021 – today **Dept. of Electrical & Systems Engineering**, University of Pennsylvania – Philadelphia, PA
Postdoctoral Researcher, working with Prof. Daniel E. Koditschek and Prof. George J. Pappas

- Working on a hierarchical task and motion planning architecture, for autonomously solving problems involving mobile manipulation in unexplored semantic environments

2015 – 2021 **GRASP Laboratory, Kod*lab**, University of Pennsylvania – Philadelphia, PA
Graduate Research Assistant, working with Prof. Daniel E. Koditschek

- Developed a novel algorithm with simultaneous formal guarantees of convergence and collision avoidance in unexplored workspaces, using deep perceptual feedback and semantic information
- Showed how to physically execute mobile manipulation tasks with legged robots
- Implemented the accompanying sensor and planning software pipeline using C++, Python and ROS, as well as a high-fidelity simulation environment in Gazebo

2017 – 2019 **Ghost Robotics** – Philadelphia, PA
Scientific Advisor (2018 – 2019)
Engineering Associate, Navigation & Perception (2017 – 2018)

- Developed Python software for reactive obstacle avoidance using LIDAR and stereo cameras

2013 **Interlink Automations SA** – Athens, Greece
Undergraduate Intern

- Developed GUI for Put/Pick to Light Systems using Qt Creator and C++

2011 – 2015 **Control Systems Laboratory**, National Technical University of Athens – Athens, Greece
Research Assistant, working with Prof. Evangelos G. Papadopoulos (2013 – 2015)
Undergraduate Research Trainee (2011 – 2013)

- Introduced novel viscoplastic models describing the foot-terrain interaction of legged robots on compliant terrains
- Showed how to control hopping height and speed over compliant terrains with a single actuator per leg, for monopedal and quadrupedal robots

PUBLICATIONS

Peer-Reviewed Journal Publications:

[3] P. B. Reverdy, **V. Vasilopoulos**, and D. E. Koditschek, "Motivation dynamics for autonomous composition of navigation tasks", *IEEE Transactions on Robotics*, vol. 37, no. 4, August 2021 (accepted).

[2] **V. Vasilopoulos**, G. Pavlakos, S. L. Bowman, J. D. Caporale, K. Daniilidis, G. J. Pappas, and D. E. Koditschek, "Reactive Semantic Planning in Unexplored Semantic Environments Using Deep Perceptual Feedback", *IEEE Robotics and Automation Letters*, vol. 5, no. 3, pp. 4455-4462, July 2020.

[1] **V. Vasilopoulos**, I. S. Paraskevas, and E. G. Papadopoulos, "Monopod Hopping on Compliant Terrains", *Robotics and Autonomous Systems*, vol. 102, pp. 13-26, April 2018.

Full-Text Peer-Reviewed Conference Publications:

[9] **V. Vasilopoulos***, Y. Kantaros*, G. J. Pappas, and D. E. Koditschek, "Reactive Planning for Mobile Manipulation Tasks in Unexplored Semantic Environments", *IEEE International Conference on Robotics and Automation (ICRA)*, Xi'an, China, May 2021 (accepted).

[8] T. T. Topping, **V. Vasilopoulos**, A. De, and D. E. Koditschek, "Composition of Templates for Transitional Pedipulation Behaviors", *The International Symposium on Robotics Research (ISRR '19)*, Hanoi, Vietnam, October 2019.

[7] **V. Vasilopoulos**, and D. E. Koditschek, "Reactive Navigation in Partially Known Non-Convex Environments", *13th International Workshop on the Algorithmic Foundations of Robotics (WAFR)*, Mérida, Mexico, December 2018.

[6] **V. Vasilopoulos**, T. T. Topping, W. Vega-Brown, N. Roy, and D. E. Koditschek, "Sensor-Based Reactive Execution of Symbolic Rearrangement Plans by a Legged Mobile Manipulator", *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Madrid, Spain, October 2018, pp. 3298-3305.

[5] **V. Vasilopoulos**, W. Vega-Brown, O. Arslan, N. Roy, and D. E. Koditschek, "Sensor-Based Reactive Symbolic Planning in Partially Known Environments", *IEEE International Conference on Robotics and Automation (ICRA)*, Brisbane, Australia, May 2018, pp. 5683-5690.

[4] **V. Vasilopoulos**, O. Arslan, A. De, and D. E. Koditschek, "Sensor-Based Legged Robot Homing Using Range-Only Target Localization", *IEEE International Conference on Robotics and Biomimetics (ROBIO)*, Macau, China, December 2017, pp. 2630-2637.

[3] **V. Vasilopoulos**, K. Machairas, and E. G. Papadopoulos, "Quadruped Pronking on Compliant Terrains Using a Reaction Wheel", *IEEE International Conference on Robotics and Automation (ICRA)*, Stockholm, Sweden, May 2016, pp. 3590-3595.

[2] **V. Vasilopoulos**, I. S. Paraskevas, and E. G. Papadopoulos, "Control and Energy Considerations for a Hopping Monopod on Compliant Terrains", *IEEE International Conference on Robotics and Automation (ICRA)*, Seattle, Washington, USA, May 2015, pp. 4570-4575.

[1] **V. Vasilopoulos**, I. S. Paraskevas, and E. G. Papadopoulos, "Compliant Terrain Legged Locomotion Using a Viscoplastic Approach", *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Chicago, Illinois, USA, September 2014, pp. 4849-4854.

Abstract-Based Peer-Reviewed Conference Publications:

[2] T. T. Topping, **V. Vasilopoulos**, A. De, and D. E. Koditschek, "Towards bipedal behavior on a quadrupedal platform using optimal control", *SPIE 9837, Unmanned Systems Technology XVIII, p. 98370H*, Baltimore, MD, USA, April 2016.

[1] **V. Vasilopoulos**, I. S. Paraskevas, and E. G. Papadopoulos, "Monopod Hopping on Rough Planetary Environments", *13th Symposium on Advanced Space Technologies in Robotics and Automation (ASTRA)*, ESA, ESTEC, Noordwijk, The Netherlands, May 2015.

Peer-Reviewed Workshop Publications:

[1] **V. Vasilopoulos**, "Reactive Mobile Manipulation with Legged Robots", *RSS Pioneers*, July 2020.

Pre-prints:

[1] **V. Vasilopoulos**, G. Pavlakos, K. Schmeckpeper, K. Daniilidis, and D. E. Koditschek, "Reactive Navigation in Partially Familiar Planar Environments Using Semantic Perceptual Feedback", February 2020, arXiv:2002.08946.

Technical Reports:

[4] **V. Vasilopoulos***, Y. Kantaros*, G. J. Pappas, and D. E. Koditschek, "Technical Report: Reactive Planning for Mobile Manipulation Tasks in Unexplored Semantic Environments", *Technical Report*, November 2020, arXiv:2011.00642.

[3] **V. Vasilopoulos**, G. Pavlakos, S. L. Bowman, J. D. Caporale, K. Daniilidis, G. J. Pappas, and D. E. Koditschek, "Technical Report: Reactive Semantic Planning in Unexplored Semantic Environments Using Deep Perceptual Feedback", *Technical Report*, February 2020, arXiv:2002.12349.

[2] **V. Vasilopoulos**, and D. E. Koditschek, "Technical Report: Reactive Navigation in Partially Known Non-Convex Environments", *Technical Report*, July 2018, arXiv:1807.08432.

[1] **V. Vasilopoulos**, W. Vega-Brown, O. Arslan, N. Roy, and D. E. Koditschek, "Technical Report: Sensor-Based Reactive Symbolic Planning in Partially Known Environments", *Technical Report*, September 2017, arXiv:1709.05474.

Theses:

[2] **V. Vasilopoulos**, "Reactive Planning with Legged Robots in Unknown Environments", Ph.D. Dissertation, University of Pennsylvania, Philadelphia, PA, USA, 2021.

[1] **V. Vasilopoulos**, "Dynamics and Control of a Monopod Robot with a Single Actuator on Compliant Terrain", Diploma Thesis, NTUA, Athens, Greece, 2014 (in Greek).

TEACHING, MENTORING AND OUTREACH

2016 – today **GRASP Laboratory, University of Pennsylvania**
Mentor of Undergraduate and Masters students
- Mentored 3 undergraduate (submatriculated in graduate programs) and 2 graduate students
- Supervised 2 theses and 2 independent studies

2021 **Aerospace Engineering, University of Michigan**
Guest Lecture for AERO 740 (Visual Navigation for Autonomous Aerial Vehicles)
- Title: "Reactive Planning in Unexplored Semantic Environments"
- Instructor: Prof. Vasileios Tzoumas

2018 **Mechanical Engineering and Applied Mechanics, University of Pennsylvania**
Guest Lecture for MEAM 517 (Control & Optimization with Applications in Robotics)
- Title: "Towards Bipedal Standing on a Quadrupedal Robot Using Polynomial Optimization"
- Instructor: Prof. Michael Posa

2017 **EdX – "Robotics: Locomotion Engineering" (MicroMasters Program: Robotics)**
Teaching Assistant
- Developed online projects on legged locomotion (SLIP/Jerboa) using MATLAB
- Managed forum discussion

2016 – 2017 **Mechanical Engineering and Applied Mechanics, University of Pennsylvania**
Teaching Assistant for MEAM 513: Feedback Control, MEAM 348: Mechanical Engineering Design Laboratory, and MEAM 210: Statics and Strength of Materials
- Offered recitations, held office hours, graded exams, offered solutions to homework problems

2016 **"Research Experience for Teachers (RET)" (NSF program)** – Philadelphia, PA
Mentor of Middle School teachers
- Guided a middle school teacher through a research project on legged locomotion for 8 weeks

2016 **FIRST LEGO League - Qualifiers** – Philadelphia, PA
Project Judge
- Judge of Robotics projects from middle school students

2016 **USA Science & Engineering Festival** – Washington, DC
Representing GRASP Lab

HONORS AND AWARDS

2020 **Pioneer, Robotics: Science and Systems**
One of 28 senior Ph.D. students and postdocs selected for the 2020 RSS Pioneers workshop

2017 **Award from the Technical Chamber of Greece**
For excellent performance during the undergraduate studies at NTUA

2015 **Thomaidion Award for Scientific Publications, NTUA**
For the paper "Monopod Hopping on Rough Planetary Environments"

2015 **Awards from the National Technical University of Athens**
For graduating 1st out of 179 students in 2014 graduating class

2015 **Student Travel Grant from IEEE**
For participation at the International Conference on Robotics and Automation (ICRA)

2015 **Limmat Stiftung 1st prize (€10,000)**
For graduating 1st out of 179 students in 2014 graduating class

2014 **Chrisovergi Award**
For graduating 1st out of 179 students in 2014 graduating class

2014 **Thomaidion Award for Scientific Publications, NTUA**
For the paper "Compliant Terrain Legged Locomotion Using a Viscoplastic Approach"

2009 – 2014 **Sarantopoulos Foundation scholarship for undergraduate studies**
For achieving the best GPA at the university entrance examinations

2009 – 2012 **State Scholarships Foundation annual award**
For achieving the best GPA at the university entrance examinations and in the 1st, 2nd and 3rd year of undergraduate studies

2011 **Tiftixi Award**
For achieving the best GPA in the 2nd year of undergraduate studies

2010 **Nikolaos I. Kritikos scholarship**
For exceptional performance in Mathematics during the 1st year of undergraduate studies

2009 **Award from the National Technical University of Athens**
For achieving the best grade at the entrance examinations for the School of Mechanical Engineering

2008 **Bronze Medal in the 25th Hellenic Mathematical Olympiad**
Participation in the qualifying stage for the National Mathematical Team guided by the Hellenic Mathematical Society (HMS)

INVITED TALKS

2021 **MIT, Computer Science & Artificial Intelligence Laboratory (CSAIL)**
Title: "Reactive Planning with Legged Robots in Unknown Environments"

2021 **University of Pennsylvania, ARO MURI W911NF2010080 Group Meeting: "Robust Concept Learning and Lifelong Adaptation Against Adversarial Attacks"**
Title: "Reactive Planning for Mobile Manipulation Tasks in Unexplored Semantic Environments"

2021 **Georgia Tech, IRIM Robograds Seminar Series**
Title: "Reactive Planning with Legged Robots in Unexplored Semantic Environments"

2020 **BIRS-CMO workshop "Topological Complexity and Motion Planning"**
Title: "Doubly Reactive Methods of Task Planning for Robotics"

2019 **University of Pennsylvania, MEAM Seminar**
Title: "Reactive Mobile Manipulation with Legged Robots in Partially Known Environments"

PRESS

2019 **IEEE Spectrum - Video Friday**
For the video accompanying the paper:
"Composition of Templates for Transitional Pedipulation Behaviors", ISRR 2019
URL: `https://tinyurl.com/y4f2yk3o`

2018 **IEEE Spectrum - Video Friday**
For the video accompanying the paper:
"Sensor-Based Reactive Execution of Symbolic Rearrangement Plans by a Legged Mobile Manipulator", IEEE IROS 2018
URL: `https://goo.gl/r8pPfA`

2017 **IEEE Spectrum - Video Friday**
For the video accompanying the paper:
"Sensor-Based Legged Robot Homing Using Range-Only Target Localization",
IEEE ROBIO 2017
URL: `https://goo.gl/TnhKtS`

2016 **Technical.ly**
"Why 10 District teachers spent their summer doing grad-level STEM research"
URL: `https://rb.gy/rghcu2`

2016 **GRASP News**
"GRASP at 3rd USA Science & Engineering Festival"
URL: `https://rb.gy/c9v2dy`

SKILLS

Programming	C, C++, Python, Fortran, MATLAB, ROS, Gazebo, Git, Docker,
Design Software	Solidworks - SolidCAM, Autodesk Inventor, ANSYS Mechanical, CadSoft EAGLE,
Operating Systems	Mac OS X, Linux, Unix-based systems, MS Windows,
Other Software	MS Office, LaTeX, Wolfram Mathematica, MathCad,
Languages	English (Excellent knowledge), French (Basic knowledge), Greek (Native)

DEVELOPED SOFTWARE

- `semnav` – **Reactive Navigation with Semantic Feedback Using ROS**
  Written in C++ and Python, using ROS
  URL: `https://github.com/vvasilo/semnav`
- `semnav_matlab` – **Simulation of Reactive Navigation In Non-Convex Planar Environments**
  Written in MATLAB
  URL: `https://github.com/vvasilo/semnav_matlab`
- `kodlab_gazebo` – **Simulation of Legged Platforms Using Gazebo**
  Written in C++ and Python, using ROS and Gazebo
  URL: `https://github.com/KodlabPenn/kodlab_gazebo`
- `doubly_reactive_matlab` – **Reactive Homing Algorithm Using Range-Only Target Localization**
  Written in MATLAB, using the ROS-MATLAB bridge to read the sensors and generate commands
  URL: `https://github.com/KodlabPenn/doubly_reactive_matlab`
- `yolov3_pytorch_ros` – **Real-time Object Detection with ROS, based on YOLOv3 and PyTorch**
  Written in Python, using ROS and PyTorch
  URL: `https://github.com/vvasilo/yolov3_pytorch_ros`

ACADEMIC SERVICE

- **International Workshop Organizer:**
  "Geometry and Topology in Robotics: Learning, Optimization, Planning, and Control", Robotics: Science and Systems (RSS) 2021, with Noémie Jaquier, Claire Liang, Christoforos Mavrogiannis, Leonel Rozo, Hans-Peter Schröcker, Søren Hauberg, Subhrajit Bhattacharya, Florian Pokorny, Siddhartha S. Srinivasa and Suvrit Sra

- **Program Committee Member:**
  2021 Pioneers Workshop, Robotics: Science and Systems (RSS)
  2021 International Joint Conference on Artificial Intelligence (IJCAI)

- **Reviewer:**
  IEEE Transactions on Robotics (T-RO)
  Elsevier Mechatronics
  Elsevier Mechanism and Machine Theory
  IEEE Transactions on Systems, Man, and Cybernetics: Systems
  IEEE Robotics and Automation Letters (RA-L)
  The American Mathematical Monthly
  IEEE International Conference on Robotics and Automation (ICRA)
  IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
  AACC American Control Conference (ACC)

- **Memberships:**
  IEEE (Student Member)
  ASME (Student Member)
  IEEE Robotics and Automation Society (RAS)