

Pedro Pereira

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Education

- **KTH Automatic Control Department** Stockholm, Sweden
PhD, supervised by Professor Dimos Dimarogonas. May 2014 – February 2019
 - PhD thesis: Geometric Control of Thrust Propelled Systems.
 - Research topics: aerial cargo transportation, aerial path planning, pose trajectory tracking, nonlinear control, hybrid control, multi-agent systems.
- **KTH Automatic Control Department** Stockholm, Sweden
Licentiate, supervised by Professor Dimos Dimarogonas. May 2014 – November 2016
 - Licentiate thesis: Control of Single and Multiple Thrust Propelled Systems with Applications to Attitude Synchronization.
- **IST-Lisbon** Lisbon, Portugal
MSc, Aerospace Engineering 2011–2013
 - Average grade: 18/20 (double degree programme with TU-Delft).
- **TU-Delft** Delft, The Netherlands
MSc, Aerospace Engineering 2011–2013
 - Average grade: 9/10 (double degree programme with IST-Lisbon).

Work Experience

- **UCSD** San Diego, USA
Visiting Researcher March 2018 – May 2018
 - I had a three month research visit at UCSD, supervised by Professor Jorge Cortés.
 - I worked on developing algorithms for position tracking of aerial vehicles under the presence of unknown wind forces, and on hybrid global stabilization of rigid-body pendulums.
- **SML, Smart Mobility Lab** Stockholm, Sweden
Research Assistant/Supervisor 2014 – 2018
 - I managed the acquisition of material for the Lab (rotorcrafts, RCs, chargers, batteries, etc).
 - I supervised, in cooperation with Antonio Adaldo, the development of the software architecture for deploying missions with rotorcrafts.
- **KTH, Automatic Control Department** Stockholm, Sweden
Researcher 2015 – 2017

- EU project AEROWORKS, concerned with the development of software and hardware tools for deploying teams of autonomous aerial vehicles for the purposes of inspection of aging infrastructures. The project was in collaboration with several partners, which included Skellefteå Kraft.
- My work focused on using aerial vehicles for lifting cargos: aerial tethered transportation with a single UAV for point-mass cargos and with two UAVs for bar-like cargos.
- Aerial tethered transportation with a manipulator and a cable:
https://youtu.be/NADR9_VffBk.
- Asymmetric aerial tethered transportation, with non-identical UAVs:
<https://youtu.be/rgweowQ8fAE>.

- **KTH Automatic Control Department** Stockholm, Sweden
TA (Teaching Assistant) 2014 – 2017
 - Lab Assistant in Water Tank Lab at KTH (2014, 2015, 2016): I supervised students with maintaining a desired water level in a double tank system.
 - Basic Control TA with Henrik Sandberg (2015): I solved exercises demonstrating basic control concepts and techniques.
 - Nonlinear Control TA with Jonas Mårtensson (2016, 2017): I solved exercises demonstrating advanced control concepts and techniques.
- **KTH Automatic Control Department** Stockholm, Sweden
MSc thesis supervisor 2014 – 2017
 - I supervised several MSc students: my work consisted on setting up a work plan with the students, guiding them with the simulations arrangement, helping them with the experiments setup, and keeping up with their progress in weekly meetings.
 - My six MSc students: Ioannis Chatzis (2015), Riccardo Zanella (2015), Manuel Herzog (2015), Spyridon Papasideris (2016), Massimiliano Pandolfo (2016), Pedro Roque (2017).
- **DSOR Lab** Lisbon, Portugal
Research Engineer December 2012 – May 2014
 - I designed and tested algorithms for accomplishing formations of aerial vehicles.
 - I tested my algorithms at the University of Macau.

Work Projects

- **University of Patras** Patras, Greece
Presenter October 2019
 - I was a speaker at the AEROWORKS Autumn School.
 - I presented my work on Control of Single and Multiple Thrust Propelled Systems.
- **IST** Lisbon, Portugal
MSc thesis 2013
 - I designed and tested leader-follower path planing algorithms, for aerial vehicles. MSc thesis: Three Dimensional Trajectory Planner for Real Time Leader Following.
 - Video at <https://youtu.be/yNCJGaRcpkc>.

- **IST** Lisbon, Portugal
Course Project 2012
 - In *Autonomous Systems*, we designed a mapping algorithm for a Pioneer robot equipped with eight sonars. We also implemented an Extended Kalman filter that used the map being constructed to make corrections to the odometry.
 - Videos: floor map and corridor map.
- **TU-Delft** Delft, The Netherlands
Course Project 2012
 - In *Control Systems Lab*, we designed an LQR controller, a Kalman filter and a gain scheduling mechanism to control the position of a container in a container-crane system.
 - Video of the experiment at <https://www.youtube.com/watch?v=Ol2MyjcZIXg>.
- **TU-Delft** Delft, The Netherlands
Course Project 2012
 - In *Advanced Flight Control*, I developed a controller using Reinforcement Learning with the purpose of stabilizing a pendulum in the upward position, when starting in the downward position.
 - The challenge stemmed from the fact that the available torque input was limited, and the algorithm had to learn to swing the pendulum, in order to gain momentum, and, in the long run, reach the upward position.

Skills

- Software skills:
 - Python: used it to implement algorithms using its object-oriented paradigm (control algorithms, filters, trajectory generation, etc).
 - C++: used it to design model plugins for Gazebo.
 - Qt: used it to design graphical user interfaces (to monitor and to easily change system's parameters).
 - Gazebo: used it to simulate mechanical systems and to test algorithms on them.
 - URDF, SDF: used them to define systems of constrained rigid bodies (open kinematic chain, closed kinematic chain).
 - ROS: used this software middleware to design nodes that communicate with each other and which could run on separate machines.
 - Linux: OS I used to conduct my research work.
 - Git, SVN: version control systems I used to maintain and keep track of my work progress.
 - MATLAB, Simulink: used them to simulate mechanical systems and to test algorithms on them.
 - Mathematica: used it when I was interested in symbolic calculations (computation of exact derivatives and Jacobians).
 - Makefile: used it to compile documents with co-dependencies.
- Spoken languages: English (fluent), Portuguese (native).

Awards

- I received three scholarships for presenting at conferences: two Erik Petersohns Minne scholarships (CDC 2015 and CDC 2017), and one Knut och Alice Wallenbergs scholarship (IROS 2016).
- May 2014: Best MSc thesis of 2013 in Robotics awarded by the Portuguese Society of Robotics.
- 2008–2009, 2009–2010, 2010–2011: Three scholarships for best student in the Aerospace Bachelor Programme at IST-Lisbon.

Publications

I am the author of 7 journal papers (4 in Automatica, 2 in IEEE TAC, 1 in TCST) and 11 peer-reviewed conference papers (in CDC, ICRA, IROS). For a complete list of publications see my personal website.

- Pedro O. Pereira, Dimos V. Dimarogonas, “Pose Stabilization of a Bar Tethered to Two Aerial Vehicles”, Automatica, 2019 (accepted for publication).
- P.Pereira, Jorge Cortes and D.V.Dimarogonas, “Position Tracking for Aerial Slung Load Under Unknown Wind Forces”, IEEE Transactions on Automatic Control, 2019 (provisionally accepted).
- Pedro O. Pereira, Dimos V. Dimarogonas, “Pose and Position Trajectory Tracking for Aerial Transportation of a Rod-Like Object”, Automatica, Volume 109, November 2019.
- Pedro O. Pereira, Rita Cunha, David Cabecinhas, Carlos Silvestre, Paulo Oliveira, “Leader following trajectory planning: A trailer-like approach, Automatica”, Volume 75, 2017, Pages 77-87.
- P. O. Pereira, P. Roque and D. V. Dimarogonas, “Asymmetric Collaborative Bar Stabilization Tethered to Two Heterogeneous Aerial Vehicles,” 2018 IEEE International Conference on Robotics and Automation (ICRA), Brisbane, QLD, 2018, pp. 5247-5253.
- P. O. Pereira and D. V. Dimarogonas, “Nonlinear Pose Tracking Controller for Bar Tethered to Two Aerial Vehicles with Bounded Linear and Angular Accelerations,” 2017 IEEE 56th Conference on Decision and Control (CDC), Melbourne, Australia, 2017.