

# PEDRO ANTÓNIO LOURENÇO

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## EDUCATION

### **PhD. Degree in Electrical and Computer Engineering** (currently enrolled)

2013 - 2017 (*Expected*) Instituto Superior Técnico - University of Lisbon, Portugal

*Currently working on "New techniques for globally convergent simultaneous localization and mapping." Work advised by Prof. Paulo Oliveira, Prof. Pedro Batista, and Prof. Carlos Silvestre at the Institute for Systems and Robotics.*

### **MSc. Degree in Aerospace Engineering**

2010 - 2012 Instituto Superior Técnico - Technical University of Lisbon, Portugal

Branch of Avionics: guidance, navigation and control; avionic systems; telecommunications

Final average grade of 18 out of 20

*Worked on my master's thesis titled "Analysis, Design and Implementation of an Integrated Simultaneous Localization and Mapping Algorithm" advised by Prof. Paulo Oliveira, Prof. Pedro Batista, and Prof. Carlos Silvestre at the Institute for Systems and Robotics with a research grant.*

### **BSc. Degree in Aerospace Engineering**

2007 - 2010 Instituto Superior Técnico - Technical University of Lisbon, Portugal

Final average grade of 17 out of 20

*Includes courses of Classical and Fluid Mechanics, Electrical Sciences and Electronics, Computer Science, Mathematics and Control.*

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## EXPERIENCE (1 / 2)

### **Doctoral researcher at Institute for Systems and Robotics**

April 2013 - Present

- Designed novel simultaneous localization and mapping algorithms for autonomous vehicles, essential for indoor operations. Focus on merging advanced theoretical challenges with practical hands-on work for experimental validation with computer vision and acoustic sensors. Achieved performance and reliability guarantees not present in literature.

### **Undergraduate researcher at Institute for Systems and Robotics**

October 2011 - March 2013

- Analysed, designed and implemented an integrated strategy for simultaneous localization and mapping with cameras and depth sensors (Microsoft Kinect).

### **Visiting scholar at Sensor-based Cooperative Robotics Laboratory, Faculty of Science and Technology, University of Macau, Macao, China**

July 2012 (2 weeks) / November 2012 - December 2012 (1 month)

- Deployed experimentally sensor-based simultaneous localization and mapping techniques based on Kinect and acoustic range measurements on a Pelican quadrotor.
- Evaluated feasibility of localization techniques for Wi-Fi based algorithms.

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## EXPERIENCE (2 / 2)

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### Internship at AENA Aeropuertos, Spain

July 2011 – August 2011 (2 months)

Internship at the Division of Airport Services of the Palma de Mallorca Airport.

- Participated on the preliminary stages of the implementation of the airport services management system SGESER, by producing/editing airport plans and the database of available equipment;
- Evaluated the airport situation in terms of IATA's levels of reference regarding airport services;
- Collected and analysed statistic data, and created predicting models for traffic flow in the bus parking.

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## AWARDS AND SCHOLARSHIPS

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2012

**Doctoral scholarship** from the Fundação para a Ciência e Tecnologia

2010/2011

**Merit Award** by Instituto Superior Técnico: best M.Sc. student in Aerospace Engineering, 9<sup>th</sup> best M.Sc. student overall.

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## PUBLICATIONS

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### Journal Papers

- [J3] **P. Lourenço**, B. J. Guerreiro, P. Batista, Paulo Oliveira, and C. Silvestre, "Uncertainty Characterization of the Orthogonal Procrustes Problem with Arbitrary Covariance Matrices," *Pattern Recognition*, vol. 61, pp. 210–220, Jan. 2017.
- [J2] **P. Lourenço**, B. J. Guerreiro, P. Batista, P. Oliveira, and C. Silvestre, "Simultaneous Localization and Mapping for Aerial Vehicles: a 3-D sensor-based GAS filter," *Autonomous Robots*, vol. 40, no. 5, pp. 881–902, Jun. 2016.
- [J1] **P. Lourenço**, P. Batista, P. Oliveira, C. Silvestre, and C. L. P. Chen, "Sensor-based Globally Exponentially Stable Range-Only Simultaneous Localization and Mapping," *Robotics and Autonomous Systems*, vol. 68, pp. 72–85, Jun. 2015.

### Conference Papers

- [C7] **P. Lourenço**, P. Batista, P. Oliveira, and C. Silvestre, "Towards Uncertainty Optimization in Active SLAM," in *Proc. of the 54th IEEE Conference on Decision and Control*, Osaka, Japan, 2015, pp. 3242–3247.
- [C6] **P. Lourenço**, P. Batista, P. Oliveira, and C. Silvestre, "A Globally Exponentially Stable filter for Bearing-Only Simultaneous Localization and Mapping in 3-D," in *Proc. of the 2015 European Control Conference*, Linz, Austria, 2015, pp. 2817–2822.
- [C5] **P. Lourenço**, P. Batista, P. Oliveira, and C. Silvestre, "Simultaneous Localization and Mapping in Sensor Networks: a GES sensor-based filter with moving object tracking," in *Proc. of the 2015 European Control Conference*, Linz, Austria, 2015, pp. 2359–2364.
- [C4] **P. Lourenço**, P. Batista, P. Oliveira, C. Silvestre, and C. L. P. Chen, "Sensor-based Globally Asymptotically Stable Range-Only Simultaneous Localization and Mapping," in *Proc. of the 52nd IEEE Conference on Decision and Control*, Florence, Italy, 2013, pp. 5692–5697.
- [C3] **P. Lourenço**, B. J. Guerreiro, P. Batista, P. Oliveira, and C. Silvestre, "3-D Inertial Trajectory and Map Online Estimation: Building on a GAS Sensor-based SLAM filter," in *Proc. of the 2013 European Control Conference*, Zurich, Switzerland, 2013, pp. 4214–4219.
- [C2] **P. Lourenço**, B. J. Guerreiro, P. Batista, P. Oliveira, and C. Silvestre, "Preliminary Results on Globally Asymptotically Stable Simultaneous Localization and Mapping in 3-D," in *Proc. of the 2013 American Control Conference*, Washington D.C., USA, 2013, pp. 3093–3098.
- [C1] **P. Lourenço**, P. Batista, P. Oliveira, C. Silvestre, and C. L. P. Chen, "A Received Signal Strength Indication-Based Localization System," in *Proc. of the 21st Mediterranean Conference on Control and Automation*, Crete, Greece, 2013, pp. 1242–1247.

### Book Chapters

- [BC1] **P. Lourenço**, B. J. Guerreiro, P. Batista, P. Oliveira, and C. Silvestre, "New Design Techniques for Globally Convergent Simultaneous Localization and Mapping: Analysis and Implementation," in *Sensing and Control for Autonomous Vehicles: Applications to Land, Water and Air Vehicles*, T. I. Fossen, K. Y. Pettersen, and H. Nijmeijer, Eds. Springer, 2017.

## CONFERENCE PRESENTATIONS

### Oral Presentations

**P. Lourenço**, P. Batista, P. Oliveira, and C. Silvestre, "A Globally Exponentially Stable filter for Bearing-Only Simultaneous Localization and Mapping in 3-D," presented at the European Control Conference, Linz, Austria, July 2015

**P. Lourenço**, P. Batista, P. Oliveira, and C. Silvestre, "Simultaneous Localization and Mapping in Sensor Networks: a GES sensor-based filter with moving object tracking," presented at the European Control Conference, Linz, Austria, July 2015

**P. Lourenço**, P. Batista, P. Oliveira, C. Silvestre, and C. L. P. Chen, "A Received Signal Strength Indication-Based Localization System," presented at the 21st Mediterranean Conference on Control and Automation, Crete, Greece, June 2013

### Poster Presentations

**P. Lourenço**, P. Batista, P. Oliveira, and C. Silvestre, "New design techniques for globally convergent simultaneous localization and mapping: analysis and implementation," presented at the Ciência 2016 - Portuguese Science and Technology Meeting, Lisboa, Portugal, 2016

**P. Lourenço**, P. Batista, P. Oliveira, and C. Silvestre, "New design techniques for globally convergent simultaneous localization and mapping: analysis and implementation," presented at the IST PhD Open Days, Lisboa, Portugal, 2016

**P. Lourenço**, P. Batista, P. Oliveira, and C. Silvestre, "A Globally Exponentially Stable filter for Bearing-Only Simultaneous Localization and Mapping in 3-D," presented at the LARSyS Annual Conference, Lisboa, Portugal, 2015

**P. Lourenço**, P. Batista, P. Oliveira, and C. Silvestre, "Sensor-based Globally Exponentially Stable Range-Only Simultaneous Localization and Mapping," presented at the LARSyS Annual Meeting, Lisboa, Portugal, 2014

**P. Lourenço**, B. J. Guerreiro, P. Batista, P. Oliveira, and C. Silvestre, "Simultaneous Localization and Mapping for Aerial Vehicles," presented at the LARSyS Annual Meeting, Lisboa, Portugal, 2013

## LANGUAGES

<b>Portuguese</b>	Mother tongue
<b>English</b>	Full professional fluency (understanding, speaking and writing)
<b>Spanish</b>	Solid understanding and speaking proficiency. Basic writing.
<b>German</b>	Intermediate fluency (understanding, speaking and writing)
<b>French</b>	Basic understanding (listening and reading).

## SKILLS

<b>Matlab/Simulink, MS Office, LaTeX</b>	Advanced user
<b>C/C++</b>	Solid knowledge at the level of basic programming, serial and internet communication, and parallel computing
<b>Linux, Python, Robot Op. System</b>	Intermediate user
<b>Solidworks, Autocad, Photoshop</b>	Basic user

## OTHER ACTIVITIES & INTERESTS

- Peer-reviewed more than 20 papers for several international journals and conferences.
- Performed volunteer work as caretaker and group leader/activity organizer, between 2004 and 2009.
- Participated in engineering competitions/courses of BEST and *Ciência Viva*.
- Studied Flute; Self-taught guitar and keyboards player.
- Along with two friends, I bicycled for three weeks and around 1000 km from Tróia, Portugal to Casablanca, Morocco, sharing experiences along the road and getting to know the local culture.
- I am an avid reader, and enjoy swimming, cycling, and playing/composing/listening to music.