

ELOI TEIXEIRA PEREIRA

EN 356 Casal do Arqueiro ◊ 2440-019 Batalha, Portugal
(+351) · 965078179 ◊ eloi@berkeley.edu ◊ www.eloipereira.com

SUMMARY

Mobile Cyber-Physical Systems (CPS), such as networks of autonomous vehicles, are becoming ubiquitously embedded in our environment. These systems not only interact with users, but also with their environment using sensors and actuators, and with other devices using communication infrastructures. Large networks of Mobile CPS exhibit complex interaction patterns due to the constant mobility of each entity and the dynamics of the communication topology, making such systems difficult to model, program, and formally analyse.

My research endeavour explores the boundaries between computer science, artificial intelligence, and mobile robotics in order to develop mathematical models and engineering frameworks for modelling and programming reactive and scalable networks of Mobile CPS. The theoretical side of my research focuses on developing mathematical models for systems with dynamic structure. I have been applying these models on the development of software architectures and programming languages for teams of Unmanned Aerial Vehicles (UAV).

My engineering work have been focusing on the design, development, and operation of UAVs performing a wide range of missions such as environmental monitoring, maritime surveillance, and environmental sensing. See <http://www.eloipereira.com/videos> for videos of UAV field exercises. I have been recently assigned to serve at the Air Force Base no. 5 to be the co-chief and technical manager of the Portuguese Air Force Precision Measurement Equipment Laboratory (PMEL), which is responsible for the calibration of most of the measuring equipment used in the Portuguese Air Force.

EDUCATION

University of California, Berkeley

Summer 2015

PhD. in Systems Engineering (Dept. of Civil & Environmental Engineering)

Minor in **Computer Science**: combinatorial algorithms; design of programming languages;

Minor in **Electrical Engineering**: formal verification; embedded systems; linear systems; networks

Thesis: “Mobile Reactive Systems over Bigraphical Machines - A Programming Model and its Implementation”,

Committee: Prof. Raja Sengupta (chair and adviser), Prof. Edward Lee, Prof. Alexandre Bayen

Porto University

Fall 2009

Master in Automation, Instrumentation and Control (2-year degree, pre-Bologna Process)

Dissertation: “Collaborative Control of Unmanned Aerial Vehicles”, Adviser: Prof. João Sousa

Portuguese Air Force Academy & Instituto Superior Técnico (IST)

Fall 2005

“Licenciatura” in Electrical Engineering - Telecommunications (6-year degree, pre-Bologna Process)

Minor: Power Systems

Dissertation: “Ultra Dense WDM Systems with DPSK modulation”, Adviser: Prof. Adolfo Cartaxo

EXPERIENCE

Air Force Base no. 5

August 2016 - present

Co-chief and Technical Manager

Monte Real, Portugal

- Portuguese Air Force Precision Measurement Equipment Laboratory (PMEL)

Portuguese Air Force Academy

April 2006 - July 2016

Assistant Professor and Researcher

Sintra, Portugal

- Lecturer: Telecommunications; Avionic Systems; Digital Systems
- Researcher: systems engineering; computer science; software engineering; control engineering; embedded systems.

- Projects: PITVANT - Research Project on UAVs (Portuguese MoD funded); Seagull - unmanned maritime systems (QREN funded);
- Field demos/exercises: Portuguese Navy Rapid Environmental Picture exercise 2012 (REP12); Portuguese Navy Rapid Environmental Picture exercise 2013 (REP13) Portuguese Navy; Portuguese Air Force SharpEye 2014 exercise; Seagull final demonstration 2015.

University California, Berkeley

Graduate Student Researcher and Instructor

April 2009 - December 2013

Berkeley, CA

- Instructor: CE290I - Control and Information Management
- Researcher: Software and control systems for unmanned vehicles
- Projects: Cyber-Physical Cloud Computing (NSF funded project); Collaborative Control of Unmanned Vehicles (ONR funded project)

European Defence Agency

GEM4 - Guidance and Control National Coordinator

2007 - 2009

Lisbon, Portugal & Brussels, Belgium

- Coordination of research activities at the GEM4 forum, including European military, academia, and industry.

Institute for Systems and Robotics - Porto

Researcher

September 2006 - August 2009

Porto, Portugal

- Software, communication, and control engineer

Academia Militar Marechal Samora Machel

Consulting and Lecturer

January 2009 - March 2009

Nampula, Mozambique

- Design the syllabus of the Pilot degree in the areas of telecommunications, electronics and avionics.

Center for Collaborative Control of Unmanned Vehicles

Summer intern

Summers of 2007 and 2008

Berkeley, CA

- Project: webservices to manage and control teams of UAVs through the internet
- Project: load-balancing algorithm for teams of UAVs based on dynamic programming and mixed-initiative

PUBLICATIONS

E. Pereira, *Mobile Reactive Systems over Bigraphical Machines - A Programming Model and its Implementation*. PhD thesis, University of California at Berkeley, 2015.

E. Pereira, C. Krainer, P. M. D. Silva, C. Kirsch, and R. Sengupta, "A runtime system for logical-space programming," in *Proc. Workshop on the Swarm at the Edge of the Cloud (SWEC)*, April 2015.

M. Sevegnani and E. Pereira, "Towards a bigraphical encoding of actors," in *to appear at the proceedings of the 1st International Workshop on Meta Models for Process Languages (MeMo 2014)*, (Berlin, Germany), 2014.

E. Pereira, P. Marques, C. Krainer, C. M. Kirsch, J. Morgado, and R. Sengupta, "A Networked Robotic System and its Use in an Oil Spill Monitoring Exercise," in *Swarm at the Edge of the Cloud Workshop (ESWeek'13)*, vol. 2, (Montreal, QC, Canada), pp. 1–2, 2013.

E. Pereira, K. Hedrick, and R. Sengupta, "The C3UV Testbed for Collaborative Control and Information Acquisition Using UAVs," in *American Control Conference (ACC)*, vol. 2, (Washington, DC, USA), pp. 1466 – 1471, IEEE, 2013.

E. Pereira, C. Potiron, C. M. Kirsch, and R. Sengupta, "Modeling and controlling the structure of heterogeneous mobile robotic systems: A bigactor approach," in *2013 IEEE International Systems Conference (SysCon)*, (Orlando, FL, USA), pp. 442–447, IEEE, Apr. 2013.

- E. Pereira, C. M. Kirsch, R. Sengupta, and J. a. B. de Sousa, "Bigactors - A Model for Structure-aware Computation," in *ACM/IEEE 4th International Conference on Cyber-Physical Systems*, (Philadelphia, PA, USA), pp. 199–208, ACM/IEEE, 2013.
- E. Pereira, C. Kirsch, and R. Sengupta, "Computation over worlds with dynamic structure," in *3rd International Workshop on Bigraphs*, February 2013.
- C. Kirsch, E. Pereira, R. Sengupta, H. Chen, R. Hansen, J. Huan, F. Landolt, M. Lippautz, A. Rottmann, R. Swick, and Others, "Cyber-Physical Cloud Computing: The Binding and Migration Problem," in *Proceedings of the Design, Automation and Test in Europe - DATE2012*, (Dresden, Germany), 2012.
- E. Pereira and R. Sengupta, "An Algebraic Model of Computation for Systems with Dynamic Structure," in *IADIS Applied Computing'12*, (Madrid, Spain), IADIS, 2012.
- R. Sengupta, R. Hansen, E. Pereira, J. Huang, C. M. Kirsch, H. Chen, F. Landolt, M. Lippautz, A. Rottmann, R. Swick, R. Trummer, and D. Vizzini, "Cloud Computing on Wings: Applications to Air Quality," in *Proc. American Astronautical Society Guidance and Control Conference (AASGNC)*, (Breckenridge, CO, USA), pp. 1–17, AAS, 2012.
- E. Pereira and J. a. B. de Sousa, "Reallocations in teams of UAVs using dynamic programming and mixed initiative interactions," in *IEEE Autonomous and Intelligent Systems*, no. 1, (Povoa do Varzim, Portugal), IEEE, 2010.
- J. Love, J. Jariyasunant, E. Pereira, M. Zennaro, K. Hedrick, C. M. Kirsch, and R. Sengupta, "CSL: A Language to Specify and Re-specify Mobile Sensor Network Behaviors," in *2009 15th IEEE Real-Time and Embedded Technology and Applications Symposium*, (San Francisco, CA, USA), pp. 67–76, IEEE, Apr. 2009.
- E. Pereira, "Collaborative control of unmanned aerial vehicles," Master's thesis, School of Engineering, University of Porto, 2009.
- E. Pereira, R. Bencatel, J. Correia, L. Felix, G. Gonçalves, J. Morgado, and J. a. B. de Sousa, "Unmanned air vehicles for coastal and environmental research," *Journal of Coastal Research*, vol. 2009, no. 56, 2009.
- E. Pereira and J. a. B. de Sousa, "Dynamic reallocation in teams of Unmanned Air Vehicles," in *AIAA Conference Unmanned... Unlimited*, (Seattle, WA, USA), pp. 1–9, AIAA, 2009.
- R. Bencatel, J. Correia, J. a. B. de Sousa, G. Gonçalves, and E. Pereira, "Video tracking control algorithms for unmanned air vehicles," in *ASME Dynamic Systems and Control Conference*, (Ann Arbor, MI, USA), ASME, 2008.
- E. Pereira, P. Garcia, and A. Cartaxo, "Optimization of MUX and DEMUX Bandwidths for 40 Gb/s/channel Ultra Dense WDM NRZ-DPSK Transmission Systems," in *III International Symposium on Enabling Optical Networks*, (Aveiro, Portugal), pp. 1–5, 2005.

TECHNICAL SKILLS

Programming Languages	Java, Scala, Haskell, C/C++, Matlab/Octave, Ptolemy II, Python, Javascript
Robotics	Robot Operating System (ROS), Gazebo Simulator
Hardware	PC-104, Arduino, Raspberry-Pi, FPGA, Ardupilot, PX4, Piccolo, Micropilot
Formal Verification	Spin Model Checker, BigMC model checker; PiPe (petri nets)
Reactive Programming	Akka actors, Spray RESTful framework, Scala.js, Slick database access
Compiler design	AntLR, Scala Parser Combinators, JavaCC
Operating systems	Linux (Ubuntu, Debian), OS-X, Windows
Tools	SVN, Git, Emacs, Eclipse, IntelliJ IDEA, Maven, Sbt

AWARDS AND HONORS

- 2009 - 2015: Pinto-Fiallon Foundation award
 2009 - 2013: FCT, PhD scholarship
 2008: AFCEA, European Scholarship Award;

2006: AFAP, Best Finalist Air Force Academy Student;
2006: AFCEA, Best Finalist Electrical Engineering Student;
2002: OGMA, Best 3rd year Electrical Engineering student;

MISCELLANEOUS

Hobbies: Urban sketching, swimming, running, karate, parachuting (automatic deploy license), open water diver (SSI license), reading, listening music

Languages: Portuguese, English, French, Spanish (enough to understand a conversation)