

Eloi Pereira

PhD Candidate, Systems Engineering, UC Berkeley. Researcher at the Portuguese Air Force Academy.

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Summary

I'm a PhD candidate at the Systems Engineering program of UC Berkeley . My adviser is Prof. Raja Sengupta. I'm an officer of the Portuguese Air Force (holding the rank of Captain) affiliated with the Portuguese Air Force Academy where I perform research in the area of mobile robotics.

My dissertation work focuses on exploring the boundaries between computation and mobile robotics. I'm interested on systems of concurrent mobile agents that operate over environments with a dynamic structure. Agents can interact with their environment as well as with other agents. These agents can range from autonomous robots to people walking with smartphones. The main premise is that they are mobile and interactive.

As a roboticist, my work focuses on domain-specific languages (DSL) and for specifying collaborative interactions of Unmanned Vehicles performing a wide-range of maritime missions such as surveillance, environmental sensing, and tracking of oceanic features.

I'm currently involved in the following research projects:

PITVANT - R&D Project on Unmanned Air Vehicles

CPCC - Cyber-Physical Cloud Computing

C3UV - Center for Collaborative Control of Unmanned Vehicles

Detection and Tracking of Oceanic Fronts

QREN Project - SEAGULL

Research Interests:

Cyber Physical Systems; Domain Specific Languages; Models of Computation; Collaborative Control of Unmanned Vehicles; Formal Verification; Communication networks.

Experience

PhD Candidate at the Systems Engineering doctoral program at UC Berkeley

August 2009 - Present (4 years 9 months)

I'm a PhD candidate at the Systems Engineering doctoral program (also known as Civil Systems). The Civil Systems Manifesto states that "...the objective of the Civil Systems program is to train leaders and professionals who will be able to design, build, manage, operate and implement systems (large and small) that behave as desired, achieving their intended performance goals efficiently as planned."

Teaching experience:

Assisted Professor Raja Sengupta in his class on Control and Information Management (CE290I) in the area of design of programming languages (syntax and semantics).

Electrical Engineer, Teacher and Researcher (Currently holding the rank of Capitan) at Portuguese Air Force Academy

April 2006 - Present (8 years 1 month)

Teaching experience:

From 2006 to 2009 I was responsible for teaching two classes at the Air Force Academy, Avionic Systems and Introduction to Telecommunication, both for 4th year pilot students.

Research experience:

I've been working as a researcher and engineer at the "R&T Project on Unmanned Air Vehicles - PITVANT" (2009-present). I'm responsible for the collaborative control area and high-level software interfaces.

Researcher at Institute of Systems and Robotics - Porto

September 2006 - August 2009 (3 years)

Collaboration work under the memorandum of understanding between the Portuguese Air Force Academy and the School of Engineering of Porto University.

The main objective of this collaboration was focused on the operational deployment of Unmanned Air Vehicles. This collaboration preceded the PITVANT project.

Consultant and Teacher at Academia Militar Marechal Samora Machel - Mozambique

January 2009 - March 2009 (3 months)

I worked at the Mozambique Military Academy at Nampula as a consultant and a teacher. The project was under the memorandum of understanding between the Portuguese Air Force Academy and the Military Academy of Mozambique and consisted at designing the curriculum of the Pilot degree in the areas of telecommunications, informatics and avionics. I also got the opportunity to teach a short course on Microprocessors for the local students. The whole project was split into two visits each with a duration of approximately 1.5 months.

National Coordinator for the European Defence Agency CapTech GEM4 at European Defence Agency

January 2007 - January 2009 (2 years 1 month)

I worked as a National Coordinator for the European Defence Agency Captech GEM4 - Guidance and Control. My job required to coordinate research activities between the Portuguese Ministry of Defence, and all the participants of the EDA GEM4 forum, including academia and industry.

Summer-ship at the Center for Collaborative Control of Unmanned Vehicles (C3UV) at UC Berkeley

August 2008 - October 2008 (3 months)

I developed a load-balancing algorithm for teams of UAVs based on dynamic programming and mixed-initiative interactions. This work was performed under the advise of Prof. Raja Sengupta from UCB and Prof. Joao Sousa from FEUP. The main results contributed for my master thesis "Cooperative Control of Teams of Unmanned Air Vehicles".

Summer-ship at the Center for Collaborative Control of Unmanned Vehicles (C3UV) at UC Berkeley

August 2007 - September 2007 (2 months)

During my summership at C3UV I developed a webservice for publishing tasks to a network of Unmanned Aerial Vehicles through web. The webservice served as an Application Programmable Interface (API) for the Collaborative Sensing Language. The webservice was implemented over the SOAP protocol.

Projects

Models of Computation for Systems with Dynamic Structure

September 2009 to Present

Members: Eloi Pereira, Raja Sengupta, Christoph Kirsch, Pedro Marques da Silva, Clemens Krainer

We investigate models of computation (MoC) and domain specific languages (DSL) for networked systems with dynamic structure. By structure we mean the location of computation entities and their connectivity. Our approach is to merge computation modeled using well-known MoCs (e.g. the Actor model) with models that represent the dynamics of the structure (e.g. the Bigraph model). This project is mainly concerned with my doctoral dissertation work.

Cyber-Physical Cloud Computing

2012 to Present

Members: Eloi Pereira, Raja Sengupta, Christoph Kirsch, Jiangchuan Huang, Clemens Krainer

This project presents the idea of the Virtual Vehicle (VV): a Virtual Machine (VM) in the sense of cloud computing extended with the notion of a Virtual Speed. Like a VM, a VV executes computation hosted over a machine. Although, our machines are vehicles that can move (e.g. an autonomous vehicle, a smartphone, a tablet, etc.). A VV can also migrate from one machine to another. Thus, a VV can move together with its host (physical mobility) or move using migration (virtual mobility). A CPCC client gets a VV with a contracted virtual speed. The system's role is to manage VVs by binding them to real vehicles in order to meet the contracted virtual speed.

PITVANT - R&T Project on Unmanned Aerial Vehicles

September 2009 to Present

Members: Eloi Pereira, Gonçalo Cruz, Pedro Marques da Silva, Tiago Oliveira, Francisco Machado, et al.

PITVANT is funded by the Portuguese MoD and has the participation of the Portuguese Air Force, the University of Porto, the University of California at Berkeley, the Swedish Defense Agency (FOI), Honeywell, and Embraer Brazil. The focus of PITVANT is on the development and operation of Unmanned Aerial Systems for a widespread kinds of military and civilian missions.

QREN project - SEAGULL

July 2013 to Present

Members: Research teams from the Portuguese Air Force Academy, Critical Software, University of Porto, and Technical University of Lisbon

Development of Unmanned Aerial Systems for vision-based surveillance missions.

Publications

A Networked Robotic System and its Use in an Oil Spill Monitoring Exercise

Swarm at the Edge of the Cloud Workshop (ESWeek'13) 2013

Authors: Eloi Pereira, Pedro Marques da Silva, Clemens Krainer, Christoph M. Kirsch, Jose Morgado, Raja Sengupta

The C3UV Testbed for Collaborative Control and Information Acquisition Using UAVs

American Control Conference (ACC) July 2013

Authors: Eloi Pereira, Karl Hedrick, Raja Sengupta

Modelling and Controlling the Structure of Heterogeneous Mobile Robotic Systems: A BigActor Approach

2013 IEEE International Systems Conference April 2013

Authors: Eloi Pereira, Raja Sengupta, Camille Potiron, Christoph Kirsch

BigActors - A Model for Structure-aware Computation

ACM/IEEE 4th International Conference on Cyber-Physical Systems April 2013

Authors: Eloi Pereira, Christoph Kirsch, Raja Sengupta, João Sousa

Cloud Computing on Wings: Applications to Air Quality

Advances in the Astronautical Sciences 2012

Authors: Raja Sengupta, Robert Hansen, Eloi Pereira, Jiangchuan Huang, Christoph Kirsch, Hao Chen, Landolt, Michael Lippautz, Rottmann, Ryan Swick, Daniel Vizzini

An Algebraic Model of Computation for Systems with Dynamic Structure

Applied Computing 2012 September 2012

Authors: Eloi Pereira, Raja Sengupta

Cyber-Physical Cloud Computing: The Binding and Migration Problem

The Design, Automation, and Test in Europe (DATE) conference March 2012

Authors: Eloi Pereira, C. Kirsch, Raja Sengupta, Hao Chen, Robert Hansen, J. Huan, F. Landolt, M. Lippautz, A. Rottmann, Daniel Vizzini, R. Trummer

CSL: A Language to Specify and Re-specify Mobile Sensor Network Behaviors

2009 15th IEEE Real-Time and Embedded Technology and Applications Symposium 2009

Authors: Joshua Love, Jerry Jariyasunant, Eloi Pereira, Marco Zennaro, Karl Hedrick, Christoph Kirsch, Raja Sengupta

Reallocations in teams of UAVs using dynamic programming and mixed initiative interactions

IEEE International Conference on Autonomous and Intelligent Systems 2010

Authors: Eloi Pereira, João Sousa

Dynamic reallocation in teams of Unmanned Air Vehicles

AIAA Conference Unmanned...Unlimited 2009

Authors: Eloi Pereira, João Sousa

Unmanned Air Vehicles for coastal and environmental research

10th International Coastal Symposium (ICS 2009) April 2009

Authors: Eloi Pereira, Ricardo Bencatel, João Correia, Luís Félix, Gil Gonçalves, José Morgado, João Sousa

Video tracking control algorithms for unmanned air vehicles.

ASME Dynamic Systems and Control Conference 2008

Authors: Ricardo Bencatel, João Correia, João Sousa, Gil Gonçalves, Eloi Pereira

Optimization of MUX and DEMUX Bandwidths for 40 Gb/s/channel Ultra Dense WDM NRZ-DPSK Transmission Systems

III International Symposium on Enabling Optical Networks 2005

Authors: Eloi Pereira, Pedro Garcia, Adolfo Cartaxo

Teaching Experience

Portuguese Air Force Academy

Fall 2006 - Telecommunications (4th year Pilot degree)

Spring 2007 - Avionic systems (4th year Pilot degree)

Fall 2007 - Telecommunications (3rd/4th year Pilot degree)

Spring 2008 - Avionic systems (3rd/4th year Pilot degree)

Fall 2008 - Telecommunications (3rd year Pilot degree)

Spring 2009 - Avionic systems (3rd year Pilot degree)

Spring 2014 - Telecommunications (3rd year Pilot degree)

University of California, Berkeley

Fall 2010 - CE290I Control and Information Management (Teaching assistant)

Fall 2011 - CE290I Control and Information Management (Teaching assistant)

Fall 2012 - CE290I Control and Information Management (Teaching assistant)

Fall 2013 - CE290I Control and Information Management (Teaching assistant)

Education

University of California, Berkeley

PhD, Systems Engineering, 2009 - 2014

Faculdade de Engenharia da Universidade do Porto

Master, Automation, Instrumentation and Control, 2006 - 2009

Instituto Superior Técnico

Licentiate, Electrical Engineering - Telecommunications, 2002 - 2005

Academia da Força Aérea

Licentiate, Electrical Engineering - Telecommunications, 1999 - 2002

Relevant coursework

PhD, Systems Engineering

University of California, Berkeley

Design of Programming Languages	CS263
Combinatorial Algorithms and Data Structures	CS270
Implementation of Programming Languages	CS264
Computer-aided Verification	EE219C
Design of Embedded Systems: Models, Validation and Synthesis	EE249
Linear Systems Theory	EE221A
Control and Information Management	CE290I
Control and Optimization of Distributed Parameters Systems	CE291F
Communication Networks	EE228E
Sensors and Signals Interpretation	CE271
Civil Systems and the Environment	CE268

Mestrado in Automation, Instrumentation and Control (2 year graduate degree pre-Bologne process)

Porto University, School of Engineering

Modern Control Theory, Instrumentation, Non-linear Control, Robotics, Industrial Automation, Modeling and Identification, Discrete-Event Systems

Licenciatura in Electrical Engineering (6 year degree pre-Bologne process)

Portuguese Air Force Academy/Technical University of Lisbon

Introductory courses in Engineering (e.g. chemistry, physics, calculus, algebra)

Introductory courses in Electrical Engineering (e.g. electronics, propagation of electromagnetic waves, classic control, fundamentals of telecommunications, fundamentals of electrical systems)

Major in Telecommunications (e.g. digital transmission, fiber optics communications, telecommunication systems, mobile communications, antennas, microwave propagation, radiopropagation systems)

Minor in Power systems (e.g. electrical installations, power systems in telecommunications)

Languages

Portuguese

French

English

Spanish (enough to understand a conversation)

Skills & Expertise

Java	Robotics	Haskell
Matlab	Domain Specific Languages	JAX-WS
C	Unmanned Vehicles	ANTLR
Scala	Labview	Lustre
C++	Simulations	ICE
Web Services	R&D	Swing
Model Checking	Sensors	Python
Algorithms	Machine Learning	Mobile Robotics
Distributed Systems	Programming	Arduino
Systems Engineering	Signal Processing	Eclipse
LaTeX	Control Systems Design	Avionics
Embedded Systems	Optimization	Computer Architecture
Linux	Artificial Intelligence	Software Design
Software Engineering	Mathematical Modeling	Pattern Recognition
XML	UAV	Image Processing
Simulink	Computer Science	Mathematica
C#	Robot Operating System	

Honors and Awards

2002 - OGMA, Portuguese Aeronautic Industry Award - Best Electrical Engineering student;
2006 - AFAP, Association of Portuguese Air Force Award - Best Air Force Academy Student;
2006 - AFCEA, Armed Forces Communications and Electronics Association Award - Best Electrical Engineering Student;
2008 - AFCEA European Scholarship Award;
2009 - PhD stipend from the Fundação para a Ciência e Tecnologia (FCT)
2009 - Award from the Pinto-Fiallon Foundation (UC Berkeley)

Interests

karate, swimming, parachuting (automatic deploy license), open water diver (SSI license), hiking, sketching, drawing, reading, running, listening music
