**MAP-i: Doctoral Programme in Informatics**
**2011-2012 Edition**

# "Advanced Methods of Modelling and Simulation"

***A Course Unit Proposal***

## Part I: Module Programme

## 1. Course Unit Characterisation

- **Course Title**: "Advanced Methods of Modelling and Simulation"
- **Proposers**:
  Rosaldo J. F. Rossetti, PhD – Assistant Professor, DEI/FEUP, Researcher, LIACC/UP
  Artur J. C. Pereira, PhD – Assistant Professor, DETI/UA, Researcher, IEETA/UA
- **Course**: MAP-I – Doctoral Programme in Informatics (Minho, Aveiro, Porto)
- **Credits (ECTS):** 5
- **Lecturing Hours:** 28 hours
- **Expected Effort:** 135 hours
- **Lecturing Language:** English
- **Term:** either 1st or 2nd Term
- **UC Group:** The present proposal can be considered within the "Technologies" Option (**UCT**).

## 2. Subject, Justification and Motivation

The Corse Unit on **Advanced Methods of Modelling and Simulation** is basically motivated by the natural challenges pushing the development of such an interesting and stimulating topic. Computational modelling and simulation are important subjects in any engineering methodology, especially in domains whose characteristics and relationships are rather stochastic and complex. Given its key relevance, not only to Computer Science but to engineering in general and other application domains, the ACM Reference Curriculum on Computer Science explicitly include "Modelling and Simulation" as a topic on computing methodologies. Thus, many Computer Science, Informatics and Computer Engineering programmes of major Universities all over the world include computer modelling and simulation in their curricula, both in undergraduate as well as in post-graduate programmes, such as the "Introduction to Modeling and Simulation" module at MIT. At FEUP, a course with the same content and programme has been offered to students attending the Doctoral Programme on Informatics Engineering (ProDEI), which is currently in its third edition, with an increasing number of prospective students registering for the course each academic year.

The potential applications of computer modelling and simulation have actually transposed the boundaries of engineering and now are recognised as an imperative tool for analysis and decision support in a vast range of different knowledge areas, from social sciences, medicine, health care and biology, to economics, financial markets and naturally all fields in engineering. On the other hand, modelling and simulation is also an interesting and motivating field of study on its own right. The combination of traditional techniques of systems analysis with new trends involving more intelligent approaches of modelling and simulation, data analysis and on-line decision-making processes has demonstrated to be an important asset in any engineering task. An important issue to address, however, still remains to be bridging the gap between theory and practice. While on the one hand increase in computational power has allowed more detailed models to be specified and built and larger simulation experiments to be carried out, testing, validating and calibrating complex models represent a great challenge for both the scientific community and practitioners. Keeping a

straight and close relation between model and reality seems to be the way to build better simulation models, which must rely on smarter and reliable mechanisms supporting the whole simulation lifecycle, from domain analysis and model specification to testing, validating and calibrating simulation experiments. Therefore, an open and wide spectrum of issues and problems remain to be investigated and motivate many researchers from the scientific community to carry out their research work on the specific field of modelling and simulation.

On the other hand, many practitioners as well as researchers from different communities have realised the importance of modelling and simulation as an important decision support tool. For instance, contemporary communication networks and telecommunication systems are a field where computational simulation has gained a prominent hole, as well as robotics and intelligent transportation systems. Indeed, such systems have quickly grown in complexity and size, both in terms of services now provided and number of users benefiting from such services. As from two decades ago or so, the field of modelling and simulation of communication systems has grown and matured in many ways, and the use of simulation as a day-to-day tool is now even more common practice. These tools now are highly indispensable for anyone developing and managing any kind of infrastructure and services, designing or analysing complex systems in general, or simply considering the application of modelling and simulation to the analysis of engineering problems.

The main aim of this course is to build an understandable framework to study new trends in modelling and simulation, especially those related to the development of intelligent techniques supporting the whole simulation model lifecycle in a wide range of applications. Model conceptualisation will benefit from realistic abstractions allowing behavioural models to be easily built keeping important details in a more microscopic fashion, whereas the concept of hardware/software-in-the-loop-simulation together with agent-based simulation techniques will allow on-line model testing, calibration and validation. Theory and practice will be approached from a more integrated perspective, through examples and students will be motivated to apply these novel modelling and simulation methodologies to different application domains.

On the same way ProDEI students have become interested in this course, we are sure this proposal will equally motivate many students attending the MAP-i Programme, either as they use modelling and simulatin as research and decision support tool or as they carry out research on improving knowledge and advancing technological aspects of modelling and simulation methodologies.

## 3. Goals of the Course Unit

The main objectives for the course on **Advanced Methods of Modelling and Simulation** are:

- To present in a rather practical way basic concepts of computational modelling and simulation in the context of different areas of application;
- To review the main mathematical tools, statistical and quantitative methods in general, indispensable for simulation experiments, namely to deal with raw data and to analyse experimental results;
- To comprehensively present all phases within the simulation project lifecycle, from domain analysis and model specification to testing, calibration, validation and application of results;
- To present and discuss the adequacy of different types of models, as well as different simulation approaches and techniques to various application domains, emphasising on how each approach fits a wide range of application domains;
- To introduce and extensively discuss the state of the art and recent advances in intelligent simulation technologies so as to identify major tendencies, challenges and areas of interest that potentially foster further advances and research projects, especially those resulting in a PhD degree in the specific field of interest of students attending the course.

## 4. Learning Outcomes

After successfully completing the **Advanced Methods of Modelling and Simulation** course programme, a student must be able to:

- Identify problems that can be tackled through simulation, build simulation models, design and carry out a whole simulation project;
- Use modelling and simulation frameworks, tools and environments;
- Gather, analyse and apply simulation results to practical problems, with emphasis on sound data analysis and inference;
- Include modelling and simulation techniques within the scientific methodology in different knowledge domains and research fields, especially those involved in students' main research area of interest;
- Demonstrate acquaintance and understanding of major areas in intelligent modelling and simulation;
- Project, extend and customise simulation frameworks and environments for general and specific purposes;
- Report and deploy simulation results appropriately, according to different perspectives of applications, ranging from systems characterisation to forecasting, training or as a decision support system.

## 5. Detailed Programme

The course syllabus will include the following major subjects, as listed below:

1. First Part – Review and presentation of basic concepts:
    a. Simulation as a tool in engineering;
    b. Modelling (realism vs. abstraction) and types of models (normative vs. behavioural);
    c. Raw data collection and preparation;
    d. Review of statistical and quantitative methods, and random numbers algorithms;
    e. Modelling of complex systems and stochastic processes;
2. Second Part – simulation projects:
    a. Basic simulation techniques: continuous, discrete and stochastic;
    b. The simulation project lifecycle: system analysis and modelling, collection and preparation of raw data, scenario design, test, calibration and validation of models, result analysis and implementation;
    c. Simulation languages, tools and environments;
3. Third Part – advanced topics in modelling and simulation:
    a. Object-oriented simulation;
    b. Distributed simulation;
    c. Visual modelling and simulation;
    d. Realistic simulation;
    e. Simulation environnements vs. environnent simulation;
4. Fourth Part – advanced topics in intelligent modelling and simulation:
    a. Basics of intelligent simulation;
    b. Agent-based modelling and simulation: agent simulations vs. simulation agents;
    c. Learning, adaptation and evolution in simulation models;
    d. Optimisation techniques in simulation;
5. Fifth Part – advanced application of computational modelling and simulation:
    a. General purpose modelling and simulation;
    b. Domain specific modelling and simulation techniques;
6. Sixth Part – Development of a complete simulation project.

## 6. Lecturing Methods

Main teaching techniques will be focused on:

- Challenging students to higher level learning as is appropriate to a PhD programme of this type. Of course low level learning, i.e., comprehending and remembering basic information and concepts is important. However, emphasis will be given to topics related to intelligent modelling and simulation,

using such techniques to problem solving, decision-making, critical thinking/design, and creative thinking/design.

- Use active learning such as the use of modelling and simulation platforms and tools. Exposition will be made mostly with interaction in theoretical classes. Some learning will of course be passive, i.e., listening and reading. Nonetheless, high level learning requires active learning and thus the use of appropriate material/platforms/simulators will also be an important technique to be used in the course. Students will research on general purpose platforms as well as frameworks, both those of general purpose and those tailored to specific domains.
- Structured sequence of different learning activities (lectures, demonstrations, reading, analysis, writing, oral presentations, design, experimentation, among others). Learning activities structured in a sequence such that they enable opening classes and assignments about basic principles to lay the foundations for complex and high level learning tasks in later, complex classes and assignments;
- Detailed feedback given to students about the quality of their research work and learning process. High level, active learning require, more than any type of learning, frequent and immediate feedback for students to know whether they are "doing it well and correctly!".

This high-level teaching methodology will enable students not only to increase their skills in researching on the basics of modelling and simulation but also on developing advanced studies on topics of intelligent modelling and simulation techniques and related fields, both in informatics and computer science, as well as other application domains that can benefit from modelling and simulation as powerful decision support tools. Some of the exercises involving modelling and simulation frameworks will be supported by documentation that will be produced specifically for this course.

## 7. Assessment System

This is primarily a research course, intended first to teach students the state of the art on diverse topics on intelligent modelling and simulation focusing on both general purpose simulation and domain specific applications. Bearing such an aim in mind, it is strongly desirable that students are able to do simple projects and write a paper of publishable quality in an international conference on one of the subjects covered in this course programme. There will be a significant amount of reading/analysis of quality research papers that will be handed out throughout the course. The evaluation of students will be based on:

- Analysis of a selected scientific paper about advanced techniques of intelligent modelling and simulation;
- Oral presentation of a selected new trend on intelligent modelling and simulation;
- Mid-term written examination;
- Practical Project with demonstration, oral defence and production of a publishable scientific paper.

Some of the oral presentations to be carried out by the students will be included in the "Readings in Modelling and Simulation" Seminar Series, at FEUP.

## 8. Main Bibliography


- Michel C. Jeruchim, Philip Balaban, K. Sam Shanmugan (2000) **Simulation of Communication Systems: Modeling, Methodology and Techniques.** Springer: Berlin. 924p.

- Brito, A.; Teixeira, J. (2001) Simulação por computador: fundamentos e implementação em C e C++. Publindústria: Porto.

- Law, A. (2007) Simulation Modeling and Analysis. McGraw-Hill: Boston, MA.

- Banks, J.; Carson, J.; Nelson, B. (2005) Discrete-event System Simulation. Prentice Hall: Upper Saddle River, NJ.

- Chung, C. (2003) Simulation Modeling Handbook: a practical approach. CRC Press: New York, NY.

- Papers published in proceedings of major conferences and journals in the field.

Part II: Lecturing Team

## 9. People involved

Two lecturers will be directly involved with this Course Unit, namely Rosaldo Rossetti, from FEUP, University of Porto, and Artur Pereira, from University of Aveiro. This way, two of the institutions involved in MAP-i are represented in this course proposal. A brief overview of them is presented below.

**Rosaldo J. F. Rossetti** received the B.Eng. (Hons, 5-year) degree in engineering from UFC, in 2005 and both the M.Sc. and Ph.D. degrees in computer science from UFRGS, Brazil, in 1998 and 2002, respectively. He carried out his doctoral research as a Ph.D. research student with Leeds University's Institute for Transport Studies, Leeds, U.K., within the Network Modelling Group. In 2006 he was awarded the equivalent PhD Degree in Computer Science by Faculty of Sciences, University of Porto, Portugal. He is currently with the Department of Informatics Engineering, University of Porto, where he is also a research fellow at LIACC, within the Distributed Artificial Intelligence (DAI) and Robotics Group. His areas of interest generally include complex systems analysis, systems optimization, and computer modelling and simulation. Currently, he is focusing on the application of DAI techniques to tackle engineering problems in general, and more specifically on using multi-agent systems as a modelling metaphor to address issues in Artificial Transportation Systems (ATS). Dr. Rossetti has been engaged as a member of technical committees and/or as a co-organizer of many scientific events concerned with empirical AI, modelling and simulation and intelligent transportation systems, and served as reviewer for journals such as the IEEE Transactions On Intelligent Transportation Systems, Transportation Research Part C, the Journal of the American Society of Civil Engineering, the Transactions of SCS International, and the Journal of Intelligent Transportation Systems: Technology, Planning, and Operations. **He is currently a member of the IEEE ITS Society's Board of Governors and a Co-chair of the Society's Technical Activities Committee on ATS and Simulation.** He is also a member of ACM, APPIA, and AISTI.

**Artur J. C. Pereira** received the B.Eng (Hons, 5-year) degree in Engineering from University of Aveiro, in 1984, and the PhD degree in Electrical and Computers Engineering in 2003, from University of Aveiro. Dr. Pereira has been directly involved with the CAMBADA Project, which is the RoboCup middle-size league soccer team that has been awarded different prizes in that completion since the team started in 2003. He is also one of the creators of the Ciber-Rato Simulator, which is a state-of-the-art robotics simulator that is used in the Micro-Rato Robotics Competition. Besides his involvement with robotics simulation, Dr. Pereira is also directly involved in projects concerning multi-agent based modelling and simulation.

## 10.Course Unit Coordinator

For this proposal, the coordinator will be Dr. Rosaldo Rossetti. His contact details are listed below:

**Dr. Rosaldo Rossetti**
Faculty of Engineering, University of Porto
Department of Informatics Engineering
Rua Dr. Roberto Frias, S/N
4200-465, Porto

Tel: +351 22 508 1566
Fax: +351 22 557 4103
E-mail: rossetti@fe.up.pt

## 11. Short CV of Lecturers

Further details on each of the lecturers involved with this Course Unit Proposal can be found on their personal web sites, as listed below:

Dr. Rosaldo J. F. Rosetti
http://www.fe.up.pt/~rossetti

Dr. Artur J. C. Pereira
http://wiki.ieeta.pt/wiki/index.php/Artur_Pereira
http://www.ieeta.pt/~artur/

# Curriculum Vitae of Rosaldo J. F. Rossetti

## Personal Data

| | |
|---|---|
| Full name: | Rosaldo José Fernandes Rossetti. |
| Date and place of birth: | 29 February 1972, Manaus-AM, Brazil. |
| Citizenship: | Portuguese (EU Citizen) and Brazilian (Mercosul Citizen). |
| Marital status: | Married |

## Contact Information


Affiliation: Department of Informatics Engineering, DEI/FEUP
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Rua Dr Roberto Frias, S/N
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E-mail: rossetti@fe.up.pt, r.rossetti@ieee.org

Home: Rua Alberto Sampaio, 72 Hab. 14
4250-024, Porto
PORTUGAL
Mobile: +351 91 756 1784
E-mail: rosaldo.rossetti@gmail.com


## Education

2006: **PhD in Computer Science**
Title awarded by equivalence, by "Faculdade de Ciências da Universidade do Porto", Porto, Portugal.

1998-2002: **PhD in Computing Science**
Computing Postgraduate Programme, Informatics Institute, Universidade Federal do Rio Grande do Sul (Doctoral Thesis: **A BDI-based approach for the assessment of drivers' decision-making in commuter scenarios**). Porto Alegre-RS, Brazil(Nov.2002)
Supervisor: Dr. Sergio Bampi (PhD, Stanford University, USA)

Combined degree with a PhD Scholarship at the
Network Modelling Group, Institute for Transport Studies, University of Leeds, Leeds, UK.
Supervisor: Dr. Dirck Van Vliet (PhD, Cambridge, UK) / Co-supervisor: Dr. Ronghui Liu (PhD, Cambridge, UK)

Worked on demand modelling and microscopic simulation using DRACULA.

1996-1998: **MSc in Computer Science**
Computing Postgraduate Programme, Informatics Institute, Universidade Federal do Rio Grande do Sul (Master's Dissertation: A software environment to support urban traffic systems simulation) Porto Alegre-RS, Brazil (Mar. 1998).
Supervisor: Dr. Sergio Bampi

1991-1995: **BSc (Hons) in Civil Engineering**
Civil Engineering School, Centro de Tecnologia, Universidade Federal do Ceará, Fortaleza-CE, Brazil (Class 1995).

## Languages Skill

Portuguese: (Mother tongue) fluency of writing, reading and speaking.
English: Very good knowledge of writing, reading and speaking.
Spanish: Elementary knowledge of reading and speaking.
French: Elementary knowledge of reading and speaking.

## Academic and Professional Experience

Jan./11-present: *IEEE Intelligent Transportation Systems Society*

- *Member of the Board of Governors* (elective position for a three-year term)
- *Chair of the ATS & Simulation Technical Activities Committee* (by appointment)

Nov./06-present: *University of Porto, Faculty of Engineering*
Invited Assistant Professor (Nov./06-Dec./07), Electrical and Computer Eng Department
Invited Assistant Professor (Jan./08-Aug./08), Informatics Engineering Department
Assistant Professor (Sep./08-present), Informatics Engineering Department

Position held:

- Department's Mobility Programmes Coordinator (July/08-present);
- TRIAD Seminar Editor (Feb./08-Present): a series of seminars on Distributed Artificial Intelligence and Robotics;
- MSc Projects Supervisor (Nov./06-present): Integrated Master in Informatics Eng. (MIEIC) and Integrated Master in Electrical and Computer Eng. (MIEEC);
- PhD Projects Supervisor (Sept./07-present): Doctoral Programme in Informatics Engineering (ProDEI);
- MAS-Ter Lab Group Coordinator (Nov./06-present): LIACC Intelligent Transportation Systems Interest Group;
- Lecturer of courses and modules

Teaching:

- Advanced Methods of Modelling and Simulation;
- Algorithms Design and Analysis;
- Complements of Programming and Algorithms;
- Algorithms and Data Structures;
- Software Engineering Laboratory;
- Programming II;
- Information Systems and Databases;
- Industrial Information Systems;
- FEUP Project;

Oct./00-Nov./06: *Atlântica University, Computing and Systems Management Department*
Barcarena, Oeiras, Portugal
Lecturer (Jan./03-Nov./06); Invited Lecturer (Oct./00-Dec./02)

Positions held:

- Director: BSc(Hons) in Systems and IT Management (Oct./01- Nov./06);
- Member of the University's Scientific Council (Oct./01- Nov./06);
- Member of the University's Pedagogical Council (Dec./00-Nov./04);
- Chair of the University's Pedagogical Council (Dec./02-Nov./04);
- Founder and Coordinator of the Computing and Systems Management Laboratory (R&D Unit) at Atlântica University (Nov./2003- Nov./06);
- Director: Short Courses in Information Systems (2006- Nov./06);
- Lecturer of courses and modules

Teaching:

- Artificial Intelligence
- Decision Support Systems
- Data and Knowledge Engineering
- Programming Languages

- Object-Oriented Programming
- Introduction to Programming
- Structured Programming
- Informatics and Computing Skills I and V (basic computing skills)
- Applied Informatics I and II (programming)

Mar./05-present: Researcher and external collaborator in the Distributed Artificial Intelligence & Robotics Group (NIAD&R), Artificial Intelligence and Computer Science Laboratory (LIACC), Faculty of Engineering, University of Porto, Portugal.

Sep./99-Dec./99: Graduate Teaching Assistant, Institute for Transport Studies, University of Leeds
MSc Programme in Traffic Engineering and Transportation Planning
Course: Computing Skills (TRAN 530, TRAN 532)
Course Leader: Dr. Paul E. Firmin

Mar./92-Dec./92: Undergraduate Teaching Assistant, Department of Transportation
Centro de Tecnologia, Universidade Federal do Ceará, Fortaleza, Brazil
Course: Descriptive Geometry I (TC551)
Course Leader: Dr. Luis A. M. Carvalho

Mar./95-Feb./96: Civil Engineer (Dec./95-Feb./96), Trainee in Civil Engineering (Mar./95-Feb./96)
METRO Constructions and Consultancy Ltd., Fortaleza, Brazil

Duties: development of CAD tools for structural engineering, operation of CAD tools, structural project and contracts management, control of structure construction.

Aug./95-Dec./95: CAD Instructor at METALSERT Industries Ltd., Fortaleza, Brazil

Developed and taught a 20-hour's course on CAD, covering 2D/3D design basics and advanced modelling techniques. Started the design and development of a graphical data base to aid the automation of mechanical parts production.

*Students Supervision and Tutoring:*

PhD Students (ProDEI, FEUP, University of Porto)
- Zafeiris Kokkinogenis (2010-present): "iControl – agent based urban traffic control and management." (*supervisor*)
- João Emílio Almeida (2010-present): "Social Simulation: validation and calibration methodologies." (*supervisor*)
- Lúcio Sanchez Passos (2009-present): "A multi-agent platform to support ubiquitous transportation systems." (supervisor)

Current MSc Students (MIEIC and MIEEC, FEUP, University of Porto)
- Daniel Almeida (MIEIC, co-supervision with L. Sarmento)
- Marco Costa (MIEIC, co-supervision with A. Coelho)
- João Magalhães (MIEEC, co-supervision with P. Fortuna)
- José Luis Pereira (MIEEC)
- Marco Paiva (MIEEC, co-supervision with M. Petry)
- Jilson Moreira (MIEEC)

Former MSc Students (MIEIC and MIEEC, FEUP, University of Porto)
- João Miguel de Carvalho Magalhães (Feb., 2011): Classificação de atributos através do Ganho de Informação para efeitos de reconhecimento de browsers (*supervisor*)
- Sara Filipa Lemos Carvalho (July/2010): Real-time sensing of traffic information in twitter messages (*supervisor*)
- Fabio Homero Moreira Aguiar (July/2010): Crowd simulation applied to evacuation and emergency situations (*supervisor*)
- Pedro Miguel Tavares Teixeira Ferreira (July/2010): Information systems for public transport users (*supervisor*)
- Helder Marco Barata Nunes(July/2010): Gestão de equipamentos e mobiliário urbano ()
- Filipe Coelho dos Santos (July, 2009): "Ubiquitous computing for health care applications." (*supervisor*)

- Miguel Cordeiro Figueiredo (July, 2009): “An approach to simulation of autonomous vehicles in intense traffic scenarios.” (*supervisor*)
- Tiago Brunhoso Nunes (July, 2009): “Towards a pedestrian navigation system.” (*supervisor*)
- Pedro Fernando Quintas Loureiro (July, 2009): “Automatic traffic congestion detection using uncontrolled video sources.” (*supervisor*)
- Tiago Ribeiro da Mota Freitas (March, 2009): “Geospatial data processing for GPS navigation systems.” (*co-supervisor*)
- João Filipe Barreiras Gonçalves (March, 2009): “Service-oriented architecture for vehicle-to-vehicle communication systems.” (*supervisor*)
- Edgar Ferreira Esteves (March, 2009): “Using autonomous agents in simulation of pedestrian multi-modal interfaces.” (*supervisor*)
- Paulo Alexandre Fonseca Ferreira (July, 2008): “Specification and Implementation of an Artificial Transport System.” (*supervisor*)
- David Tschan Carvalho (July, 2008): “Using Web-Browser Profiling to Detect Click Fraud.” (*supervisor*)

IAESTE and Mobility Students (LIACC/DEI, FEUP, University of Porto)
- Ján Bohácik (ERASMUS PhD Student, University of Zilina, Slovakia, Feb. to April, 2009): “Fuzzy rules and knowledge discovery in databases.”
- Matteo Vasirani (ERASMUS PhD Student, Rey Juan Carlos University, Spain, March to May, 2009): “Vehicle-centric coordination for urban road traffic management: a market-based multiagent approach.”
- Szymon Maciej Lisinski (IAESTE Mobility Programme, Poland, Sept.-Dec., 2008): “GIS data model for microscopic traffic simulation.”
- Panitana Phosri (IAESTE Mobility Programme, Thailand, Oct.-Dec., 2008): “An agent-based modelling methodology for intelligent transportation systems.”
- Juan Carlos Pacheco Hernandez (IAESTE Mobility Programme, Colombia, Oct., 2008-Jan., 2009): “Fuzzy traffic controllers.”
- Douglas Fernando Lopes Santos (IAESTE Mobility Programme, Brazil, Dec., 2008-Feb., 2009): “Mobile pedestrian information systems.”
- José Ramón García Alvarado, México (IAESTE Mobility Programme, Mexico, Sept.-Dec., 2009): “GIS data modelling and traffic network ontologies.”
- Chrysi Filippidou, Greece (IAESTE Mobility Programme, Greece, Sept.-Dec., 2009): “Microscopic traffic simulation using Open-source SUMO.”

Undergrad Research Assistants (LIACC/DEI, FEUP, University of Porto)
- Fábio Lopez Correia (FCT BII scholarship, 2009-present): “Web knowledge discovery and data mining.”
- Rui Fernando Sousa Cardoso de Melo Amaro (FCT BII scholarship, 2009-present) “Web knowledge discovery and data mining.”
- José Luis Ferrás Pereira (FCT BII scholarship, 2009-present): “GIS data modelling and GUI programming for urban traffic simulation.”
- Miguel Ramos de Araújo (FCT BII Scholarship, 2009-present): “A Java-based API for multi-agent simulation of traffic systems.”
- Ivo José Pinto de Macedo Timóteo (FCT BII scholarship, 2009-present): “A Java-based API for multi-agent simulation of traffic systems.”
- Nuno Filipe Sousa da Silva (LIACC undergrad assistantship, 2009-present): “Traffic characterisation through GPS data acquisition.”

Term Projects (GSC, Atlântica University)
- Supervised, co-supervised and assessed more the 50 term projects (BSc Hons. in Systems Management and Computing, at Atlântica University, Lisbon, from 2002 to 2006).

## Professional Activities

*External Examiner (PhD Panels and Committees):*
- *Role*: External Examiner
  *Institution*: Department of Computer Architecture and Technology, Computing Sciences, and Artificial Intelligence, School of Computer Engineering, Rey Juan Carlos University, Madrid, Spain.
  *Date and place*: December 3, 2009. Madrid, Spain.

*Candidate*: Matteo Vasirani
*PhD Thesis Title*: Vehicle-centric coordination for urban road traffic management: a market-based multiagent approach.

- *Role*: External Examiner
  *Institution*: Programa Doutoral em Engenharia de Produção Instituição: Escola de Engenharia, Universidade Federal do Rio Grande do Sul, Porto Alegre-RS, Brasil.
  *Date and place*: April 26 3, 2011. Porto Alegre-RS, Brazil.
  *Candidate*: Carlos Oliva Preto
  *PhD Thesis Title*: Desenvolvimento de um Simulador da Interação entre Pedestres e Veículos
- *Role*: Internal Examiner
  *Institution*: Programa Doutoral em Engenharia Informática, ProDEI Instituição: Faculdade de Engenharia da Universidade do Porto, Porto, Portugal.
  *Date and place*: 26/Nov./2010. Porto, Portugal.
  *Candidate*: Rodrigo António Marques Braga
  *PhD Thesis Title*: Plataforma de Desenvolvimento de Cadeiras de Rodas Inteligentes
- *Role*: Internal Examiner
  *Institution*: Programa Doutoral em Engenharia Informática, ProDEI Instituição: Faculdade de Engenharia da Universidade do Porto, Porto, Portugal.
  *Date and place*: 6/Dec./2010. Porto, Portugal.
  *Candidate*: António Manuel Correia Pereira
  *PhD Thesis Title*: Intelligent Simulation of Coastal Ecosystems
- *Role*: Examiner
  *Institution*: MAP-tele, Doctoral Programme in Telecommunications, Combined degree by Universities of Minho, Aveiro and Porto.
  *Date and place*: 27/Julho/2010. Porto, Portugal.
  *Candidate*: Pedro Miranda d'Orey
  *PhD Thesis Proposal*: Social Optimal Vehicle Routing enabled by Vehicular Networks

*External Examiner (MSc Panels):*

- *Role*: External Examiner
  *Institution*: Department of Computer Science, Faculty of Sciences, University of Porto
  *Date and place*: November 19, 2009. Porto, Portugal.
  *Candidate*: Ricardo Jorge Fernandes
  *MSc Dissertation Title*: VANET – enabled in-vehicle traffic signs.

*External Auditor/Referee (Research Project Panels):*

- External Referee: Committee to assess research project proposals for the ICTRegie's 2010 Call, the Netherlands ICT Research and Innovation Authority, 2010.

*Editorial Boards and Program Committees:*

Journals (as Editor, Guest Editor, Reviewer)

- Guest Editor: IEEE Transactions on Intelligent Transportation Systems, Special Issue on Artificial Transportation System and Simulation, scheduled for 2010.
- Reviewer: International Journal of Simulation and Process Modelling (IJSPM), Inderscience Publishers Ltd.
- Reviewer: International Journal of Transportation Research (Part C): Emerging Technologies, Elsevier.
- Reviewer: International Journal of Intelligent Transportation Systems: technology, planning, and operations, Taylor & Francis.

Conferences/Workshops (as Reviewer, PC Member, Senior PC Member, Associate Editor)

- Co-organiser (with Henry Liu and Sharron Tang) 4th IEEE Workshop on Artificial Transportation Systems and Simulation (ATSS), collocated with the 13th IEEE International Conference on Intelligent Transportation Systems (IEEE ITSC), Madeira Island, Portugal, September 19-22, 2010.
- Co-organiser (with Constantinos Antoniou and Jorge Lopes) Special Session on Active Traffic Management, within the 13th IEEE International Conference on Intelligent Transportation Systems (IEEE ITSC), Madeira Island, Portugal, September 19-22, 2010.
- Co-organiser (with Franziska Klügl and Giuseppe Vizzari) 1st Workshop on Artificial Intelligence for Simulation | Simulation for Artificial Intelligence (AISSAI), collocated with the 19th European Conference on Artificial Intelligence (ECAI), Lisbon, Portugal, August 16-20, 2010.

- Co-organiser (with João Balsa) 2nd Workshop on Intelligent Systems and Applications (WISA), collocated with the 5th Iberian Conference on Information Systems and Technologies (CISTI), Santiago de Compostela, Spain, June 16-19, 2010.
- IPC Member for the 13th IEEE International Conference on Intelligent Transportation Systems (IEEE ITSC), Madeira Island, Portugal, September 19-22, 2010.
- IPC Member for the 9th International Conference on Autonomous Agents and Multiagent Systems (AAMAS), Toronto, Canada, May 10-14 2010.
- IPC Member for 6th Workshop on Agents in Traffic and Transportation (ATT), collocated with the 9th International Conference on Autonomous Agents and Multiagent Systems (AAMAS), Toronto, Canada, May 10-14 2010.
- IPC Member for the Advances in Computer Simulation (SIM) track, the 25th ACM Symposium on Applied Computing (SAC), Sierre, Switzerland, March 22-26, 2010
- IPC Member for the 8th annual Industrial Simulation Conference (ISC), Budapest, Hungary, June 7-9, 2010.
- IPC Member for the 3rd International Symposium on Agent Based Modeling and Simulation (ABModSim), collocated with the 20th European Meeting on Cybernetics and Systems Research (EMCSR), Vienna, Austria, April 6 - 9, 2010.
- IPC Member for the 2nd International Conference on Agents and Artificial Intelligence (ICAART), Valencia, Spain, January 22-24, 2010.
- Reviewer for the 7nd International Conference on Cooperative Design, Visualization and Engineering (CDVE), Mallorca, Spain, September 19-22, 2010.
- Co-organiser (with Sara Manzoni): International Workshop on Crowds & Pedstrian Behavior, The 2009 IEEE / WIC / ACM Conferences on Web Intelligence (WI'09) and Intelligent Agent Technology (IAT'09), Milano, Italy, September 15, 2009.
- Co-organiser (with Ronghui Liu, Elisabete Arsénio, and Jorge Lopes): Thematic Track on Artificial Intelligence in Transportation and Urban Mobility, the 14th Portuguese Conference on Artificial Intelligence, AITUM@EPIA 2009, Aveiro, Portugal, October 12-15, 2009.
- Co-organiser (with João Balsa): Workshop on Intelligent Systems and Applications, the 4th Iberian Conference on Information Systems and Technologies, WISA@CISTI2009, Póvoa de Varzim, Portugal, June 17-20, 2009.
- Associate Editor: IEEE Intelligent Transportation Systems Conference, IEEE ITSC 2009, St. Louis, Missouri, USA, October 3-7, 2009.
- PC Member: Special Track on Advances in Computer Simulation, the 24th ACM Symposium on Applied Computing, SAC 2009, Waikiki Beach, Honolulu, Hawaii, USA, March 8-12, 2009.
- PC Member: Thematic Track on Multi-Agent Systems: Theory and Applications, the 14th Portuguese Conference on Artificial Intelligence, MASTA@EPIA 2009, Aveiro, Portugal, October 12-15, 2009.
- PC Member: 7th Annual Industrial Simulation Conference, ISC 2009, Loughborough, UK, June 1-3, 2009.
- PC Member: International Conference on Agents and Artificial Intelligence, ICAART 2009, Porto, Portugal, January 19-21, 2009.
- Reviewer: The 8th International Conference on Autonomous Agents and Multiagent Systems, AAMAS, Budapest, Hungary, May 10-15, 2009.
- Reviewer: 2009 IEEE Intelligent Vehicles Symposium, IV'09, Xi'an, Shaanxi, China, June 3-5, 2009.
- Reviewer: The 6th International Conference on Cooperative Design, Visualization and Engineering, CDVE 2009, Luxemburg City, Luxemburg, September 20-23, 2009.
- Reviewer: The 35th Annual Conference of the IEEE Industrial Electronics Society, IECON, Porto, Portugal, November 3-5, 2009.
- Reviewer: Workshop on Complex Collective Systems, The 8th International Conference on Parallel Processing and Applied Mathematics, PPAM, Wroclaw, Poland, September 13-16, 2009.
- Reviewer: Workshop on Agents and Data Mining Interaction, The 8th International Conference on Autonomous Agents and Multiagent Systems, AAMAS, Budapest, Hungary, May 10-15, 2009.
- Co-organiser (with Ronghui Liu and Henry Liu): Workshop on Artificial Transportation Systems and Simulation, ATSS 2008, The 11th International IEEE Conference on Intelligent Transportation Systems, Beijing, China, October 12-15.
- Associate Editor: The 11th International IEEE Conference on Intelligent Transportation Systems, Beijing, China, October 12-15, 2008.
- IPC Member: 6th Annual Industrial Simulation Conference, ISC 2008, Lyon, France, June 9-11, 2008.
- IPC Member: The 11th Ibero-American Conference on Artificial Intelligence, IBERAMIA'08, Lisbon, Portugal, October 14-17, 2008.

- IPC Member: The 5th Workshop on Agents in Traffic and Transportation, ATT@AAMAS'08, Estoril, Portugal, May 13, 2008.
- IPC Member: Main Track, The 7th International Conference on Autonomous Agents and Multiagent Systems (AAMAS'08), Estoril, Portugal, May 12-16, 2008.
- IPC Member: The 23rd Annual ACM Symposium on Applied Computing, Track on Advances in Computer Simulation. Fortaleza-CE, Brazil, March 16-20, 2008.
- Co-organiser (with Ronghui Liu) and Chair: Special Session on Artificial Transportation Systems and Simulation, The 10th International IEEE Conference on Intelligent Transportation Systems, Seattle-WA, USA, Sep. 30-Oct. 3, 2007.
- Co-organiser (with José Telhada, Ronghui Liu, and Elisabete Arsénio): Workshop on Artificial Intelligence Applied to Sustainable Transportation Systems, The 13th Portuguese Conference on Artificial Intelligence, Guimarães, Portugal, Dec. 3-7, 2007.
- Senior PC Member: 2nd Conference on Methodologies for Scientific Research, Porto, Portugal, Feb. 1-2, 2007.
- Reviewer: IEEE/WIC/ACM Conferences on Web Intelligence (WI'09) and Intelligent Agent Technology (IAT'09), Silicon Valley, CA, November 2-5, 2007.
- IPC Member: 4th Workshop on Agents in Traffic and Transportation, AAMAS, May 9. Hakodate, Japan, 2006.
- IPC Member: 4th International Joint Conference on Autonomous Agents and Multi-Agent Systems, AAMAS, Utrecht, The Netherlands, July 25-29, 2005.
- IPC Member: 3rd Workshop on Agents in Traffic and Transportation, AAMAS, New York, USA, July 20, 2004.
- Reviewer: 34th Hawaii International Conference on System Sciences, Decision Technologies for Management Track, Island of Maui, Hawaii, January 3-6, 2001.

*Invited Talks and Lectures:*

- "Artificial Transportation Systems: concepts and research opportunities." Back-to-the-Basics Seminars, DEEC/FEUP, University of Porto, Portugal (June, 2010);
- "Evaluation of taxi service provision on airport terminal's curbside for picking up passengers: a problem presented by GlobalVia." The 74$^{th}$ European Study Group with Industry, University of Aveiro, Portugal (April, 2010);
- "Intelligent Transportation Systems: some issues related to demand modelling and the application of MAS." Department of Computer Architecture and Technology, Computing Sciences, and Artificial Intelligence, School of Computer Engineering, Rey Juan Carlos University, Spain (December, 2009);
- "Thinking about future urban transport." Fun Seminar Series, Porto City Council Primary and Secondary Schools, Portugal (April, 2009);
- "Multi-agent systems in pedestrian modelling and simulation." The 6$^{th}$ Meeting of the Transport Study Group, CITTA/FEUP, University of Porto, Portugal (January, 2009);
- "Intelligent Transportation Systems: some issues related to demand modelling and the application of MAS." Institute of Informatics, UFRGS University, Brazil (August, 2008);
- "Future Urban Transport: towards urban automation." MAP-i Doctoral Programme, University of Minho, Portugal (July, 2008);
- "ModP – Pedestrian Modelling: a framework for multimodal transport interfaces modelling and simulation." The 4$^{th}$ RCM Projects Workshop, Portugal (May, 2008);

*Membership of Scientific and Professional Societies:*

| | |
|---|---|
| 1999-present | Member of the Institute of Electrical and Electronics Engineers, Inc. (IEEE): IEEE Computer Society, IEEE Vehicular Technology Society, and IEEE Intelligent Transportation Systems Society; |
| 2003-present | Member of the Portuguese Association for Artificial Intelligence (APPIA); |
| 2004-present | Professional Member of the Association for Computer Machinery (ACM): ACM Special Interest Group in Artificial Intelligence (SIGART), and in ACM Special Interest Group in Simulation and Modeling (SIGSIM). |

## Research Experience

| | |
|---|---|
| May./11-present: | Researcher in the project "Bluetooth Sensing Technology, BST," IT Research Support Programme. Porto, Portugal. |
| Mar./10-present: | Researcher in the project "Distributed Routing and Infotainment through Vehicular Inter-Networking," Portugal-CMU Programme, international collaboration involving the University of Porto, the Institute of Telecommunications, and Carnegie Mellon University. |

Mar./05-Feb./07: Co-author and researcher in the project "Control Strategies Characterisation in Heterogeneous Multi-Agent Systems", International collaboration between the Artificial Intelligence and Computer Science Laboratory, University of Oporto, Porto, Portugal, and the Informatics Institute, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil.
Principal Investigators: Professor Eugénio Oliveira (Portugal) and Dr. Luis Lamb (Brazil).
Financially supported by GRICES/Portugal and CAPES/Brazil.

Oct./97-Set./99: Co-author and researcher in the project "CATE: Computational environment for urban traffic systems simulation", Informatics Institute, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil.
Principal Investigator: Dr. Sergio Bampi.
Financially supported by FAPERGS, Brazil.

Jul./97-Jul./98: Researcher in the project "CityZoom: Computational environment for urban planning", Informatics Institute, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil.
Principal Investigator: Professor Benamy Turkienicz.
Financially supported by CEI/UFRGS, Brazil.

Mar./93-Feb./95: Undergraduate Research Assistant in the project "ConCAD: computer aided design of concrete structures", Department of Structural Engineering, Centro de Tecnologia, Universidade Federal do Ceará, Fortaleza, Brazil.
Principal Investigator: Dr. Luis A. M. Carvalho.
Financially supported by CNPq, Brazil.

## Honours and Awards

June/2010: **OPT, S.A. – Prof. Vasco Sá Award 2010,** for the Best MSc Dissertation on Transport Related Topics. Title: "Geospatial data processing for GPS navigation systems," (*role: co-supervisor*);

June/2009: **OPT, S.A. – Prof. Vasco Sá Award 2009**, for the Best MSc Dissertation on Transport Related Topics. Title: "Specification and Implementation of an Artificial Transport System," (*role: supervisor*);

Oct./1998: **Best Paper Award** for the paper "A software environment to integrate urban traffic simulation tasks", presented at the 10th European Simulation Symposium, Nottingham, UK. Society for Computer Simulation Europe (*role: author*);

Aug./1991: **Academic Performance Honour** awarded by ASSECON-CE and Centro de Tecnologia, Universidade Federal do Ceará, Fortaleza-CE, Brazil (*role: student*).

*Scholarships*

Jan./99-Jul./00: Doctoral Research Internship, sponsored by CAPES.

Mar./98-Nov./02: Doctoral Scholarship, sponsored by CNPq.

Mar./96-Feb./98: Master's Scholarship, sponsored by CAPES.

Mar./94-Feb./95: Undergraduate Research Assistantship, sponsored by CNPq.

Mar./93-Dec./93: Undergraduate Research Assistantship, sponsored by UFC/IC.

## Tutorials and Training

Dec./2003: Computational Creativity (3 hours' tutorial)
11th Portuguese Conference on Artificial Intelligence, Beja, Portugal.
By Drs. Amílcar Cardoso and Penousal Machado

Oct./2000: Short Course on Traffic Flow Modeling and Control
3rd Annual IEEE Conference on Intelligent Transportation Systems, Dearborn-MI, USA.
By Professors Markos Papageorgiou and Petros Ioannou.

Jul./2000: Agents-oriented Software Engineering (4 hours' tutorial)
4th International Conference on Autonomous Agents – ACM, Barcelona, Spain.
By Drs. Mike Wooldridge and Nick Jennings.

Nov./97-Dec./97: JAVA Programming (15 hours' course)
Informatics Institute, UFRGS, Brazil.
By Dr. Stefan Schimpf fom Institut fuer Informatik, Univ. of Stuttgart, Germany.

Feb./1997: Unix Basics – System V (10 hours' course)
Super Computing National Centre, CESUP/UFRGS, Brazil.
By Dr. Luís Alberto Segóvia González.

Sep./1996: Algebraic Computing using MAPLE V (6 hours' course)
Super Computing National Centre, CESUP/UFRGS, Brazil.
By Dr. Rudnei Dias da Cunha.

## Research Interests

- **Current research interests:** Multi-agent Systems Modelling and Simulation, Artificial Intelligence applied to traffic and transportation, traffic network modelling and simulation, demand and drivers' behaviour modelling, Quantitative and Numerical Methods, Validation and Calibration of Computer Simulation Models, Social Simulation and Artificial Societies.

- **Broad interest areas:** Artificial Intelligence, Intelligent Transportation Systems, Computer Simulation and Modelling, Computer Graphics, and Scientific Visualisation.

## Publications

*Theses, Dissertations and Reports:*

1. Rossetti, R.J.F. A BDI-based approach for the assessment of drivers' decision-making in commuter scenarios. Porto Alegre: PPGC/UFRGS, Nov. 2002. (PhD Thesis).
2. Rossetti, R.J.F. Applying multi-agent systems to traffic modelling. Porto Alegre: PPGC/UFRGS, Set. 1999. (Qualification Exam Report EQ–055).
3. Rossetti, R.J.F. A software environment to support urban traffic systems. Porto Alegre: CPGCC/UFRGS, Mar. 1998. (MSc Dissertation – in Portuguese).
4. Rossetti, R.J.F. An object-oriented model for simulation and visualisation tools in urban traffic engineering. Porto Alegre: CPGCC/UFRGS, Dec. 1996. (Research Report TI–566 – in Portuguese).

*Journal Papers:*

1. Jan Bohacik, Karol Matiaško, Rosaldo Rossetti (2010) Summary of making fuzzy rules from decision trees based on cumulative information and classification ambiguity. Journal of Information Technologies (JIT), vol.3, no.1, p.1-17. (ISSN: 1337-7469)
2. Rossetti, R., Liu, R. (2005) An agent-based approach to assess drivers interaction with pre-trip information systems. Journal of Intelligent Transportation Systems: Technology, Planning, and Operations. v.9, p.1-10.
3. Rossetti, R., Bordini, R., Bazzan, A., Bampi, S., Liu, R., Van Vliet, D. (2002) Using BDI agents to improve driver modelling in a commuter scenario. Transportation Research, Part C (Emerging Technologies). v.10, p.373-398.
4. Rossetti, R., Bampi, S. (1999) A Software Environment to Integrate Urban Traffic Simulation Tasks. Journal of Geographic Information and Decision Analysis. v. 3, p. 56-63.

*Book Chapters:*

1. Paulo Ferreira, Edgar Esteves, Rosaldo Rossetti, Eugénio Oliveira (2009) Applying Situated Agents to Microscopic Traffic Modelling. In A.L.C. Bazzan and F. Kluegl (Eds.) Multi-agent systems for traffic and transportation. Hershey, PA: IGI Global. Chapte 5, pp.108-123.
2. Rossetti, R., Liu, R. (2005) Activity-based analysis of travel demand using cognitive agents. Harry Timmermans. (Ed.). Progress in Activity-Based Analysis. Oxford: Elsevier, p.139-160.
3. Rossetti, R., Liu, R. (2005) A dynamic network simulation model based on multi-agent systems. Franziska Klügl, Ana Bazzan, Sascha Ossowski. (Eds.). Applications of Agent Technology in Traffic and Transportation. Berlin: Birkhäuser, p.181-192.

*Conference/Workshop Papers:*

1. Catarina B. Santiago, Luís P. Reis, Rosaldo J. F. Rossetti, Armando Sousa (2011) Foundations for Creating a Handball Sport Simulator. In the 3rd Workshop on Intelligent Systems and Applications (WISA), 6th Iberian Conference on Information Systems and Technologies (CISTI'11), Chaves, Portugal, Jun. 15-18, 2011.
2. Lúcio S. Passos, Rosaldo J. F. Rossetti, Luis P. Reis (2011) Evaluation of taxi services on airport terminal's curbside for picking up passengers. In the 3rd Workshop on Intelligent Systems and Applications (WISA), 6th Iberian Conference on Information Systems and Technologies (CISTI'11), Chaves, Portugal, Jun. 15-18, 2011.
3. Lúcio S. Passos, Zafeiris Kokkinogenis, Rosaldo J. F. Rossetti (2011) Towards the next-generation traffic simulation tools: a first appraisal. In the 3rd Workshop on Intelligent Systems and Applications (WISA), 6th Iberian Conference on Information Systems and Technologies (CISTI'11), Chaves, Portugal, Jun. 15-18, 2011.
4. Nima Shafii, Luis P. Reis, Rosaldo J. F. Rossetti (2011) Two Humanoid Simulators: Comparison and Synthesis. In the 3rd Workshop on Intelligent Systems and Applications (WISA), 6th Iberian Conference on Information Systems and Technologies (CISTI'11), Chaves, Portugal, Jun. 15-18, 2011.
5. João E. Almeida, Rosaldo J. F. Rossetti, António Leça Coelho (2011) Crowd Simulation Modeling Applied to Emergency and Evacuation Simulations using Multi-Agent Systems.In the 6th Doctoral Symposium on Informatics Engineering, DSIE'11, Porto, Portugal, Jan. 27-28, 2011.
6. Zafeiris Kokkinogenis, Lúcio S. Passos, Rosaldo J. F. Rossetti, Joaquim Gabriel (2011) Towards the next-generation traffic simulation tools: a first evaluation. In the 6th Doctoral Symposium on Informatics Engineering, DSIE'11, Porto, Portugal, Jan. 27-28, 2011.
7. Marcelo Petry, Antonio Paulo Moreira, Luis Paulo Reis, Rosaldo Rossetti (2011) Intelligent Wheelchair Simulation: Requirements and Architectural Issues. In: Proceedings of the 11th International Conference on Mobile Robots and Competitions, TU Lisbon, Portugal, April 6th, 2011. pp.102-108.
8. Ivo J.P.M. Timóteo, Miguel R. Araújo, Rosaldo J.F. Rossetti, Eugénio C. Oliveira (2011) Using TraSMAPI for Developing Multi-Agent Intelligent Traffic Management Solutions. 9th International Conference on Practical Applications of Agents and Multi-Agent Systems. Salamanca, Spain, April 6-8, 2011.
9. Ivo J.P.M. Timóteo, Miguel R. Araújo, Rosaldo J.F. Rossetti, Eugenio C. Oliveira (2010) TraSMAPI: An API Oriented Towards Multi-Agent Systems Real-Time Interaction with Multiple Traffic Simulators. In: Proceedings of the 13th International IEEE Conference on Intelligent Transportation Systems, Madeira Island, Portugal, September 19-22, 2010. p.1183-1188.
10. Juan C. Pacheco, Rosaldo J.F. Rossetti (2010) Agent-Based Traffic Control: a Fuzzy Q-Learning Approach. In: Proceedings of the 13th International IEEE Conference on Intelligent Transportation Systems, Madeira Island, Portugal, September 19-22, 2010. p.1172-1177.
11. Tiago R. M. Freitas, António Coelho, Rosaldo J.F. Rossetti (2010) Correcting Routing Information through GPS Data Processing. In: Proceedings of the 13th International IEEE Conference on Intelligent Transportation Systems, Madeira Island, Portugal, September 19-22, 2010. p.706-711.
12. Lúcio S. Passos, Rosaldo J.F. Rossetti, Eugénio C. Oliveira (2010) Ambient-Centred Intelligent Traffic Control and Management. In: Proceedings of the 13th International IEEE Conference on Intelligent Transportation Systems, Madeira Island, Portugal, September 19-22, 2010. p.224-229.
13. Pedro Miguel Ferreira, Rosaldo J.F. Rossetti, António Coelho (2010) Information Systems for Public Transport Users. In: Proceedings of the IEEE ITSC 2010 Workshop on Artificial Transportation Systems and Simulation (ATSS'2010), Madeira Island, Portugal, September 19, 2010.
14. Sara Carvalho, Luís Sarmento, Rosaldo J.F. Rossetti (2010) Real-Time Sensing of Traffic Information in Twitter Messages. In: Proceedings of the IEEE ITSC 2010 Workshop on Artificial Transportation Systems and Simulation (ATSS'2010), Madeira Island, Portugal, September 19, 2010.
15. Fábio Aguiar, Rosaldo J.F. Rossetti, Eugénio C. Oliveira (2010) MAS-based Crowd Simulation Applied to Emergency and Evacuation Scenarios. In: Proceedings of the IEEE ITSC 2010 Workshop on Artificial Transportation Systems and Simulation (ATSS'2010), Madeira Island, Portugal, September 19, 2010.
16. Lúcio S. Passos, Rosaldo J.F. Rossetti (2010) Analyzing Classifiers for Web Content Related to Traffic Information. In: Proceedings of the 2010 IEEE Conference on Automation Science and Engineering, Toronto, Ontario, Canada, August 21-24, 2010. p.307-312.
17. José R.G. Alvarado, José L.F. Pereira, Rosaldo J.F. Rossetti (2010) PostGIS in data modeling: case of study MAS-T2er Lab project. In: The 2nd Open Source GIS UK Conference, OSGIS 2010, Nottingham, UK, June 21-22, 2010.

18. Lúcio S. Passos, Rosaldo J.F. Rossetti (2010) Traffic light using reactive agents. In: Proceedings of the 5th Iberian Conference on Information Systems and Technologies, CISTI 2010, Santiago de Compostela, Spain, June 16-19, 2010.
19. Fábio L. Correia, Rui Amaro, Luís Sarmento and Rosaldo J.F. Rossetti (2010) AllCall: An Automated Call for Paper Information Extractor. In: Proceedings of the 5th Iberian Conference on Information Systems and Technologies, CISTI 2010, Santiago de Compostela, Spain, June 16-19, 2010.
20. Juan C. Pacheco, Rosaldo J.F. Rossetti and Cesar H. Rodriguez (2010) A Fuzzy Q-Learning Approach to Simulate Intelligent Traffic Control. In: Proceedings of the Industrial Simulation Conference, ISC 2010, Budapest, Hungary, June 7-9, 2010. p.257-261.
21. José R.G. Alvarado, José L.F. Pereira, Rosaldo J.F. Rossetti (2010) A scalable data support model for traffic simulation in GIS. In: M. Painho, M.Y. Santos, H. Pundt (Eds.) Proceedings of AGILE 2010, the 13th AGILE International Conference on Geographic Information Science, Guimarães, Portugal, May 10-14, 2010. 5p. (ISBN: 978-989-20-1953-6)
22. José R.G. Alvarado, José L.F. Pereira, Rosaldo J.F. Rossetti (2010) A network data model for traffic simulation. In: M. Haklay, J. Morley, H. Rahemtulla (Eds.) Proceedings of the GIS Research UK, 18th Annual Conference, GISRUK 2010, London, UK, April 14-16, 2010. p.511-516.
23. Fábio L. Correia, Rui F. S. Amaro, Luís Sarmento, Rosaldo J.F. Rossetti (2010) AllCall : An Automated Call for Paper Information Extractor. In: The 3nd Meeting of Young Researchers at UP, IJUP. Porto, Portugal, February 17-19, 2010. p.201.
24. Miguel Araújo, Ivo Timóteo, Rosaldo J. F. Rossetti (2010) TraSMAPI – An Application Programming Interface (API) for Multi-Agent Systems Real-Time Interaction with Multiple Traffic Simulators. In: The 3nd Meeting of Young Researchers at UP, IJUP. Porto, Portugal, February 17-19, 2010. p.203.
25. Tiago Freitas, António Coelho, Rosaldo Rossetti (2009) Improving Digital Maps Through GPS Data Processing. In the 12th International IEEE Conference on Intelligent Transportation Systems, ITSC'09, St.Louis, USA, Oct. 4-7, 2009. pp.480-485.
26. Miguel C. Figueiredo, Rosaldo J. F. Rossetti, Rodrigo A. M. Braga, Luis Paulo Reis (2009) An Approach to Simulate Autonomous Vehicles in Urban Traffic Scenarios. In the 12th International IEEE Conference on Intelligent Transportation Systems, ITSC'09, St.Louis, USA, Oct. 4-7, 2009. pp.322-327.
27. Pedro F. Q. Loureiro, Rosaldo J. F. Rossetti, Rodrigo A. M. Braga (2009) Video Processing Techniques for Traffic Information Acquisition Using Uncontrolled Video Streams. In the 12th International IEEE Conference on Intelligent Transportation Systems, ITSC'09, St.Louis, USA, Oct. 4-7, 2009. pp.127-133.
28. Gabriela Soares, Rosaldo Rossetti, Nuno Flores, Ademar Aguiar, Hugo Sereno Ferreira (2009) A Cooperative Personal Agenda in a Collaborative Team Environment. In Yuhua Luo (Ed.): Cooperative Design, Visualization, and Engineering, 6th International Conference, CDVE 2009, Luxembourg, Luxembourg, September 20-23, 2009. LNCS 5738, Springer. pp.193-196.
29. José L.F. Pereira, Rosaldo J.F. Rossetti, Eugénio C. Oliveira (2009) Towards a Cooperative Traffic Network Editor. In Yuhua Luo (Ed.): Cooperative Design, Visualization, and Engineering, 6th International Conference, CDVE 2009, Luxembourg, Luxembourg, September 20-23, 2009. LNCS 5738, Springer. pp.236-239.
30. João F. B. Gonçalves, Edgar F. Esteves, Rosaldo J. F. Rossetti, Eugénio C. Oliveira (2009) Simulating Communication in a Service-Oriented Architecture for V2V Networks. In Luís Seabra Lopes, Nuno Lau, Pedro Mariano, Luís Mateus Rocha (Eds.): Progress in Artificial Intelligence, 14th Portuguese Conference on Artificial Intelligence, EPIA 2009, Aveiro, Portugal, October 12-15, 2009. LNCS 5816, Springer. pp.15-26.
31. Fábio L. Correia, Rui F. S. Amaro, Rosaldo J. F. Rossetti (2009) Task Management and Itenerary Planning - An Integrated View based on Multi-Agent Systems. In Joaquim Filipe, Ana L. N. Fred, Bernadette Sharp (Eds.): ICAART 2009 - Proceedings of the International Conference on Agents and Artificial Intelligence, Porto, Portugal, January 19 - 21, 2009. INSTICC Press. pp.361-364.
32. Edgar F. Esteves, Rosaldo J. F. Rossetti, Paulo A. F. Ferreira, Eugénio C. Oliveira: Conceptualization and implementation of a microscopic pedestrian simulation platform. In Sung Y. Shin, Sascha Ossowski (Eds.): Proceedings of the 2009 ACM Symposium on Applied Computing (SAC), Honolulu, Hawaii, USA, March 9-12, 2009. ACM. pp.2105-2106.
33. Rocha, NMG; Santos, DFL; Rossetti, RJF (2009) In URBAN TRANSPORT XV, the 15th International Conference on Urban Transport and the Environment, Bologna, Italy, June 22-24, 2009. v.107, pp.177-183.
34. Filipe C. dos Santos, Rosaldo J. F. Rossetti (2009) Ubiquitous Computing Applications in Health. In the 4th Iberian Conference on Information Systems and Technologies, Povoa de Varzim, Portugal, June 17-20, 2009. pp.615-620.
35. João F. B. Goncalves, Rosaldo J. F. Rossetti, Edgar F. Esteves, Eugénio C. Oliveira (2009) Towards a Microscopic Traffic Simulation Framework to Assess Vehicle-to-Vehicle Networks. In Vahid

Nassehi, Diganta Bhusan Das, Lipika Deka (eds.): ISC'2009 - Industrial Simulation Conference, Loughborough, United Kingdom, June 1-3, 2009. pp.183-190.
36. Edgar F. Esteves, Rosaldo J. F. Rossetti, Eugénio C. Oliveira (2009) A Software Environment for Microscopic Pedestrian Simulation. In Vahid Nassehi, Diganta Bhusan Das, Lipika Deka (eds.): ISC'2009 - Industrial Simulation Conference, Loughborough, United Kingdom, June 1-3, 2009. pp.173-177.
37. Lúcio Sanchez Passos, Rosaldo J. F. Rossetti (2009) Intelligent Transportation Systems: a Ubiquitous Perspective. In New Trends in Artificial Intelligence: the 14th Portuguese Conference on Artificial Intelligence, EPIA 2009, Aveiro, October 12-15, 2009. pp.27-38.
38. José Luis F. Pereira, Rosaldo J. F. Rossetti (2009). A Cooperative Traffic Network Editor. The 2nd Meeting of Young Researchers at UP, IJUP. Porto, Portugal, February 25-27, 2009. Pg.47.
39. Nuno G. Rocha1, Douglas F. L. Santos, Rosaldo J. F. Rossetti (2009) myTIS: a MAS-based architecture for public transport users' trip planning. The 2nd Meeting of Young Researchers at UP, IJUP. Porto, Portugal, February 25-27, 2009. Pg.48.
40. Fabio L. Correia, Rui F. S. Amaro, Rosaldo J. F. Rossetti (2009) iPal: Integrating Task Management and Itinerary Planning. The 2nd Meeting of Young Researchers at UP, IJUP. Porto, Portugal, February 25-27, 2009. Pg.49.
41. Rosaldo Rossetti, Paulo Ferreira, Rodrigo Braga, Eugénio Oliveira (2008) Towards an artificial traffic control system. In: Proceedings of the 11th International IEEE Conference on Intelligent Transportation Systems (ITSC), Beijing, China, October 12-15, 2008. p.14-19.
42. Paulo Ferreira, Edgar Esteves, Rosaldo Rossetti, Eugénio Oliveira (2008) A Cooperative Simulation Framework for Traffic and Transportation Engineering. In: Yuhua Luo (Ed.): Cooperative Design, Visualization, and Engineering, 5th International Conference (CDVE), Calvià, Mallorca, Spain, September 21-25, 2008. Lecture Notes in Computer Science 5220, Springer. p.89-97.
43. Paulo Ferreira, Edgar Esteves, Rosaldo Rossetti, Eugénio Oliveira (2008) Extending microscopic traffic modelling with the concept of situated agents. In: The 5th Workshop on Agents in Traffic and Transportation (ATT), 7th International Conference on Autonomous Agents and Multi-Agent Systems, Estoril, Portugal, May, 13, 2008.
44. Rodrigo Braga, Rosaldo Rossetti, Luis Paulo Reis, Eugénio Oliveira (2008) Applying multi-agent systems to simulate dynamic control in flexible manufacturing scenarios. Agent-Based Modeling and Simulation Symposium (ABModSim), 19th European Meeting on Cybernetics and Systems Research, Vienna, Austria, March 25-28, 2008.
45. Rosaldo Rossetti, Eugénio Oliveira, Ana Bazzan (2007) Towards a specification of a framework for sustainable transportation analysis. Workshop on Artificial Intelligence Applied to Sustainable Transportation Systems (AIASTS), 13th Portuguese Conference on Artificial Intelligence, Guimarães, Portugal, December 3-4, 2007.
46. Duarte, N., Rossetti, R., Oliveira, E. (2006) A communication-based model for perception and action in car traffic simulation. Agent-Based Modeling and Simulation Symposium (ABModSim), 18th European Meeting on Cybernetic Science and Systems Research, Vienna, Austria, 2006. p.731-736.
47. Oliveira, D., Bazzan, A., Silva, B., Basso, E., Nunes, L., Rossetti, R., Oliveira, E., Silva, R., Lamb, L. (2006) Reinforcement learning based control of traffic lights in non-stationary environments: a case study in a microscopic simulator. 4th European Workshop on Multi-Agent Systems (EUMAS), Lisbon, Portugal, 2006. p.31-42.
48. Rossetti, R., Liu, R. (2004) A dynamic network simulation model based on multi-agent systems. 3rd Workshop on Agents in Traffic and Transportation (ATT), New York-NY, p.88-93.
49. Rossetti, R., Liu, R. (2003) A multi-agent approach to assess drivers responses to pre-trip information systems. Workshop on Behavioural Responses to ITS. Eidenhoven, The Netherlands.
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**Porto, May 23rd 2011**

Rosaldo J. F. Rossetti

# Annex 1: Abstract of the Doctoral Thesis

**A BDI-based approach for the assessment of drivers' decision-making in commuter scenarios**
By Rosaldo J. F. Rossetti

The rapid growth of urban areas has a significant impact on traffic and transportation systems. New management policies and planning strategies are clearly necessary to cope with the more than ever limited capacity of existing road networks. The concept of Intelligent Transportation System (ITS) arises in this scenario; rather than attempting to increase road capacity by means of physical modifications to the infrastructure, the premise of ITS relies on the use of advanced communication and computer technologies to handle today's traffic and transportation facilities. Influencing users' behaviour patterns is a challenge that has stimulated much research in the ITS field, where human factors start gaining great importance to modelling, simulating, and assessing such an innovative approach.

This work is aimed at using Multi-Agent Systems (MAS) to represent the traffic and transportation systems in the light of the new performance measures brought about by ITS technologies. Agent features have good potentialities to represent those components of a system that are geographically and functionally distributed, such as most components in traffic and transportation. A BDI (beliefs, desires, and intentions) architecture is presented as an alternative to traditional models used to represent the driver behaviour within microscopic simulation allowing for an explicit representation of users' mental states.

Basic concepts of ITS and MAS are presented, as well as some application examples related to the subject. This has motivated the extension of an existing microscopic simulation framework to incorporate MAS features to enhance the representation of drivers. This way demand is generated from a population of agents as the result of their decisions on route and departure time, on a daily basis. The extended simulation model that now supports the interaction of BDI driver agents was effectively implemented and different experiments were performed to test this approach in commuter scenarios.

MAS provides a process-driven approach that fosters the easy construction of modular, robust, and scalable models, characteristics that lack in former result-driven approaches. Its abstraction premises allow for a closer association between the model and its practical implementation. Uncertainty and variability are addressed in a straightforward manner, as an easier representation of humanlike behaviours within the driver structure is provided by cognitive architectures, such as the BDI approach used in this work. This way MAS extends microscopic simulation of traffic to better address the complexity inherent in ITS technologies.

**Keywords**: multi-agent systems; BDI architecture; decision-making; intelligent transportation systems; traffic modelling; microscopic traffic simulation.

# Annex 2: Abstract of the Master's Dissertation

**A Software Environment to Support Urban Traffic Systems Simulation**
By Rosaldo J. F. Rossetti

Urban traffic systems are often submitted to analysis by simulation. Dealing with a large number of variables, the models used to represent them follow two approaches: i) the system can be viewed at a microscopic level, describing the movement under an individual analysis of the vehicles as they move through the network; or ii) the system can be viewed at a macroscopic level, describing the movement in a global way. In both approaches, the use of software systems becomes increasingly necessary. However, traditional tools are oriented to specific problems. Although they address some of the user's goals in a satisfactory way, those tools do not offer the user a friendly interaction. Moreover, such tools are limited and closed to evolution and the exchange of information with other tools is not possible. This closed nature of several tools forces the user to resort to many and different tools in order to study complex traffic problems.

This work presents the specification and the implementation of a CATE (Computer Aided Traffic Engineering) environment, called CATIA. Such an environment constitutes a set of integrated tools around the application domain data model. Based on the object-oriented paradigm, the model aims to offer a hierarchical structure as it allows the system representation in various abstraction levels, from the macroscopic to the microscopic point of view. The use of VIS (Visual Interactive Simulation) and VIM (Visual Interactive Modeling) concepts aims to promote visual interactive facilities to aid the user task in the simulation process. DELPHI language was used for its implementation in PC platforms under Windows95. The CATIA environment is based on three main features:

- an object-oriented data model promotes the urban traffic representation in an intuitive hierarchical structure. This allows the macroscopic as well as the microscopic view of the system;
- the application integration capability facilitates the exchange of information among traditional analysis tools and may allow the addition of new tools as the user's needs evolve;
- the interactive tools increase the productivity in the various simulation process steps.

**Keywords**: simulation, visual interactive modeling, visual interactive simulation, object-oriented modeling and design, simulation environment, traffic engineering, urban traffic.

# Curriculum vitæ

## Dados biográficos

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## Funções actuais

Professor Auxiliar no Departamento de Electrónica, Telecomunicações e Informática da Universidade de Aveiro.

## Formação académica

Doutorado, especialidade em Engenharia Electrotécnica, pela Universidade de Aveiro, em Maio de 2003.

Concluiu as Provas de Aptidão Pedagógica e Capacidade Científica, provas, à época, necessárias à progressão na carreira docente universitária, em Janeiro de 1993, com a classificação de Muito Bom.

Licenciado em Engenharia Electrónica e de Telcomunicações pela Universidade de Aveiro, em 1984, com a classificação de 16 valores.

## Carreira Profissional

Desde Maio de 2003 é Professor Auxiliar no Departamento de Electrónica, Telecomunicações e Informática da Universidade de Aveiro.

De Janeiro de 1993 a Maio de 2003 foi Assistente no mesmo Departamento.

De Março de 1988 a Janeiro de 1993 foi Assistente Estagiário no mesmo Departamento.

De Janeiro de 1985 a Março de 1988 foi Assistente Estagiário no Departamento de Sistemas e Informática da Universidade do Minho.

## Actividade docente

Na Universidade de Aveiro, tem leccionado aulas práticas e aulas teóricas de várias disciplinas, em geral, nas áreas da Ciência e Tecnologia da Programação e da Arquitectura dos Sistemas Computacionais. No âmbito dessa actividade produziu vários documentos de apoio às aulas. O suporte das suas aulas é feito sempre usando código aberto.

Ainda na Universidade de Aveiro, tem, desde 1989, orientado ou co-orientado projectos de final de curso, das Licenciaturas em Engenharia Electrónica e de Telecomunicações e em Engenharia de Computadores e Telemática, e seminários, da licenciatura em Ensino de Electrónica e Informática. Desde a reformulação dos cursos resultante do processo de Bolonha, tem orientado e co-orientado várias dissertações no âmbito dos Mestrados Integrados em Engenharia Electrónica e Telecomunicações e Engenharia dos Computadores e Telemática. Nos últimos anos, a maior parte dos trabalhos orientados enquadram-se na área da robótica autónoma e móvel.

Durante a sua permanência na Universidade do Minho foi regente a duas disciplinas, *Sistemas de Microcomputadores* e *Sistemas de Transmissão de Dados*, e leccionou aulas práticas de *Sistemas Lógicos*, *Programação*, baseada na linguagem Fortran 77, e *Electrónica*.

## Actividade de investigação

Em 2002, integra a ATRI (Actividade Transversal em Robótica Inteligente), uma das linhas de investigação do IEETA (Instituto de Engenharia Electrónica e Telemática de Aveiro). É neste contexto que, nos últimos anos, realiza a sua actividade, no âmbito de diversos projectos.

O projecto CAMBADA (Cooperative Autonomous Mobile roBots with Advanced Distributed Architecture) tem como principal objectivo o desenvolvimento de uma equipa de futebol robótico, para participação na liga de médios. Trata-se de uma liga onde uma equipa de robôs joga futebol autonomamente. A equipa CAMBADA ficou em 1º lugar no *RoboCup World Championship'2008*, tendo ficado em 3º lugar na edição de 2009. Em termos nacionais, a equipa mantém-se campeã há 5 anos consecutivos.

A participação no projecto Micro-Rato dá-se em diferentes vertentes. É, desde 2002, membro da equipa organizadora do concurso Micro-Rato, um concurso de robótica autónoma e móvel que se realiza na Universidade de Aveiro desde 1995. É co-autor das ferramentas de suporte a uma das modalidades deste concurso (modalidade Ciber-Rato), que decorre em ambiente virtual. Estas ferramentas foram transformadas num projecto no *source forge*, com a designação de CPSS (Cyber Physical Systems Simulator).

Com ligações ao Micro-Rato, o projecto *Concurso Micro-Rato da Universidade de Aveiro – Actividades de Divulgação da Robótica Móvel*, um projecto ligado ao Ciência Viva, teve como objectivo desenvolver iniciativas de carácter duradouro de divulgação científico-tecnológica associada à robótica móvel. A sala *Sítio dos Robôs*, a funcionar na Fábrica Ciência Viva de Aveiro, foi desenvolvida no âmbito deste projecto. Durante a segunda metade do projecto foi o elemento coordenador do projecto.

É membro da equipa do projecto ROTA (RObô Triciclo para condução Autónoma), projecto com uma forte componente de ensino, cujo objectivo é o desenvolvimento de um robô-carro para participação nas provas de condução autónoma do Festival Nacional de Robótica. O robô ROTA foi 2º classificado na edição de 2007 e 3º nas de 2006, 2010 e 2011.

É membro da equipa do projecto IntellWheels – Cadeira de Rodas Inteligente com Interface Multimodal Flexivel, projecto liderado pela FEUP e envolvendo várias intituições, cujo objectivo é o desenvolvimento de uma arquitectura genérica para uma cadeira de rodas inteligente que torne fácil a adopção de novas estratégias e algoritmos de comando.

É membro da equipa de uma das intituições participantes no projecto "Living Usability Lab – Laboratório Vivo de Utilização de Tecnologias Inovadoras para as Redes de Nova Geração", responsável pelo desenvolvimento de um assistente robótico.

É membro da equipa do projecto ICARO, projecto pluridisciplinar da Universidade de Aveiro, enquadrando trabalhos em áreas como mecânica, electrónica, sistemas de informação e informática, que tem por objectivo a participação anual de uma equipa da universidade na prova Eco-Maratona Shell que decorre em França.

De 1995 a 2003 trabalhou na área dos circuitos assíncronos, no desenvolvimento de metodologias de síntese automática a partir de especificações em redes de Petri e grafos de estados. O seu trabalho de doutoramento decorreu no âmbito desta área.

Participou no projecto HCM – Network of Excellence on "Behavioural Methodologies for Digital Systems". Co-organizou o sexto workshop realizado no âmbito do projecto e que decorreu em Aveiro de 9 a 10 de Outubro de 1997.

De 1992 a 1995 participou no projecto ESPRIT 7225 – Working Group on "Asynchronous Circuit Design"' (ACiD). Este projecto reuniu diversos centros de investigação que na Europa se dedicam ao tema dos circuitos assíncronos. Co-organizou o workshop deste projecto, que teve lugar em Aveiro em Setembro de 1994, sendo um dos co-editores das respectivas actas.

De 1990 a 1996 participou no projecto "AICI – Acção para o Acesso da Industria a Circuitos Integrados" (ESPRIT 5691 – Special Action in Microelectronics for Portugal), cuja principal missão era a divulgação da microelectrónica junto das pequenas e médias empresas portuguesas. De Janeiro a Setembro de 1991 actuou como representante da Universidade de Aveiro no referido projecto. Co-organizou um dos seminários de divulgação, realizados no âmbito do projecto, e que teve lugar em Aveiro.

## Actividade de gestão e extensão universitária

É, desde Fevereiro de 2009, membro da Comissão Científica do Centro de Ciência Viva de Aveiro (Fábrica Ciência Viva).

É, desde 2005, responsável pelo pelouro "Rede informática do DETI", que trata da infraestrutura de rede e do parque informático do Departamento de Electrónica, Telecomunicações e Informática da Universidade de Aveiro.

É actualmente membro da comissão de equivalências da Licenciatura em Tecnologias e Sistemas de Informação. É ainda membro de duas comissões de reconhecimento de graus do mesmo Departamento.

Foi vogal da Comissão Pedagógica do Departamento de Electrónica e Telecomunicações de Outubro de 1990 a Outubro de 1992.

## Outra actividade

Fez parte da comissão organizadora do Festival Nacional de Robótica, edição de 2008, que decorreu em Aveiro.

Fez parte da equipa organizadora das competições CiberMouse@RTSS, competições de robótica simulada enquadrada no RTSS (IEEE Real-Time Systems Symposium), nos anos de 2006, 2007, 2008 e 2009, que decorreram respectivamente em Rio de Janeiro, Tucson, Barcelona e Washington DC.

Fez parte da Comissão Técnica da MIUP'2005 (Maratona Inter-Universitária de Programação), que decorreu na Universidade de Aveiro, em Outubro de 2005.

Prestou colaboração técnica na 1ª edição do livro "O Livro dos Números", tradução portuguesa do original "The Book of Numbers" de John H. Conway e Richard K. Guy, editado pela Copernicus (Springer-Verlag New York, Inc.). A tradução foi feita pelo Prof. Dr. José Joaquim de Sousa Pinto.

Prestou colaboração técnica na 1ª edição do suplemento do Dicionário da História de Portugal, edição da Livraria Figueirinhas, sob coordenação do Professor António Barreto.

**Júris** Nos últimos anos tem sido arguente de várias provas de dissertação de mestrado, decorridas na FEUP (Faculdade de Engenharia na Universidade do Porto) e no IST (Instituto Superior Técnico).

## Publicações

Segue-se uma listagem das publicações dos últimos anos. Incluem-se alguns textos escritos para apoio à leccionação das disciplinas em que esteve envolvido:

João Cunha, António J. R. Neves, José Luis Azevedo, Bernardo Cunha, Nuno Lau, Artur Pereira; *A mobile robotic platform for elderly care*; AAL workshop, BIOSTEC 2011, Rome, Italy, 2011.

António J. R. Neves, José Luís Azevedo, Bernardo Cunha, Nuno Lau, João Silva, Frederico Santos, Gustavo Corrente, Daniel A. Martins, Nuno Figueiredo, Artur Pereira, Luís Almeida, Luís Seabra Lopes, Armando J. Pinho, João Rodrigues and Paulo Pedreiras; *CAMBADA - Cooperative Autonomous Mobile roBots with Advanced Distributed Architecture*, In Vladan Papic (Ed.), Robot Soccer, Robot Soccer, ISBN 978-953-307-036-0, 2010, pp. 19-45.

Nuno M. Figueiredo, António J. R. Neves, Nuno Lau, Artur Pereira, Gustavo Corrente. *Control and Monitoring of a Robotic Soccer Team: The Base Station Application.* EPIA09, Aveiro, 2009.

Joaquim Fonseca, Flávio Fonseca, Artur Pereira, Paulo Dias. *Visualizador 3D para o Ciber-Rato.* in Revista do DETUA, vol. 5, nº 1, Junho de 2009.

Nuno Figueiredo, António Neves, Nuno Lau, José Azevedo, Artur Pereira e Gustavo Corrente. *The Base Station Application of the CAMBADA Robotic Soccer Team.* in Revista do DETUA, vol. 5, nº 1, Junho de 2009.

José Luís Azevedo, Artur Pereira, Bernardo Cunha, Luís Almeida. *ROTA: a Robot for the Autonomous Driving Competition.* Encontro Científico do Robótica 2007. Paderne, Portugal, 2007.

Artur Pereira. *Apontamentos de Linguagens Formais e Autómatos.* Departamento de Electrónica, Telecomunicações e Informática, Universidade de Aveiro. Aveiro, 2007.

João Figueiredo, Nuno Lau, Artur Pereira. *Multi-Agent Debugging and Monitoring Framework.* First IFAC Workshop on Multivehicle Systems (MVS'06). Salvador, Brasil, 2006.

Luís Almeida, José Luís Azevedo, Bernardo Cunha, Pedro Fonseca, Nuno Lau, Artur Pereira. *Micro-Rato Robotics Contest: Technical Problems and Solutions.*

in Controlo'2006: The 7th Portuguese Conference on Automatic Control. Lisboa, Portugal, 2006.

Artur Pereira. *Linguagens Formais e Autómatos: Guiões das Aulas Práticas.* Departamento de Electrónica, Telecomunicações e Informática, Universidade de Aveiro. Aveiro, 2006.

Artur Pereira. *Sistemas de Operação: Exercícios sobre Comunicação entre Processos.* Departamento de Electrónica, Telecomunicações e Informática, Universidade de Aveiro. Aveiro, 2005.

(Apoio às aulas práticas da disciplina de Sistemas de Operação.)

Artur Pereira. *Sistemas de Operação: O Sistema de Ficheiros SOFS.* Departamento de Electrónica, Telecomunicações e Informática, Universidade de Aveiro. Aveiro, 2005.

(Apoio às aulas práticas da disciplina de Sistemas de Operação.)

Alexandre Mota, Artur Pereira, Pedro Fonseca, Pedro Romão, Sandra Dinis, Bruno Gravato. *Controlo e Supervisão Industriais em GNU/Linux.* in CLME IV: 4º Congresso Luso-Moçambicano de Engenharia. Maputo, Moçambique, 2005.

Artur Pereira, Bernardo Cunha, José Luís Azevedo, Pedro Prata, João Silva, Flávio Neto, Pedro Caetano, Hugo Reis. *Robieeta: a Robotic Football Player in Autonomous Driving.* in Proceedings of *2005 Portuguese Conference on Artificial Intelligence.* Covilhã, Portugal, 2005.

Nuno Lau, Artur Pereira, Andreia Melo, António Neves, João Figueiredo. *CIBERRATO: Uma Competição Robótica Num Ambiente Virtual.* in Games 2004: Workshop Entretenimento Digital e Jogos Interactivos. Lisboa, Portugal, 2004.

Artur Pereira, António Rui Borges, António Ferrari. *Exclusion Relation of k out of n and the Synthesis of Speed-Independent Circuits.* in SBCCI 2003: 16th Symposium on Integrated Circuits and System Design. São Paulo, Brasil, 2003.

Artur Pereira. *Asynchronous Circuits with Conflicts: a Region-Based Synthesis Approach.* Tese de Doutoramento. Universidade de Aveiro, Aveiro, 2003.

Aveiro, 23 de Maio de 2011