Intelligent Robotics

A. Program

1. Subject, justification and Motivation

Research in robotics has traditionally emphasized low-level sensing and control tasks, path planning, and actuator design and control. In contrast, several Artificial Intelligence researchers are more concerned with providing real/simulated robots with higher-level cognitive functions that enable them to reason, act and perceive in an autonomous way in dynamic, inaccessible, continuous and non deterministic environments. Combining results from traditional robotics with those from AI and cognitive science will be thus essential for the future of intelligent robotics, showing the increased importance of informatics and computer science research on this area.

The purpose of Intelligent Robotics in MAP-I is to prepare researchers in the application of Artificial Intelligence (AI) techniques in real/simulated robotics. The discipline will also promote discussion on two specific topics:

- Simulated vs. Real Robotics: How to bridge the gap between simulation and real robotics?
- Benefits and dangers of robotic competitions to promote scientific progress?

These topics will be the subject of invited talks by known researchers with vast experience in organizing/participating in national/international real or simulated robotic competitions and on migrating approaches tested on simulators to real robotic platforms.

The discipline will also emphasize cooperative robotics and application in a domain where the proponents are known as lead world researchers: RoboCup – Robotic Soccer. In the last ten years RoboCup has increasingly become as a testbed for research in cooperative/intelligent robotics and multi-agent systems. Teams from the best companies and universities in the world compete in nine major leagues, including seven cooperative leagues. The research developed during the development of FC Portugal robosoccer teams, that regularly compete in four of these leagues (2D Simulation, 3D Simulation, Rescue and Legged League), conducted the Universities of Aveiro and Porto to win three RoboCup world championships and four European championships in different leagues. The research focus was on the development of a

formal model for the concept of strategy, for a team of heterogeneous agents, in a competition and generic coordination and communication mechanisms, general enough for other cooperative tasks. These are research topics that are still unexplored in intelligent/cooperative robotics and may easily lead to worldwide recognized PhD thesis as the number of PhD students supervised by this proposal proponents, including several international students, clearly indicates.

There are several similar teaching projects in other universities. However, the focus, teaching methods and learning outcomes are different. The proposed teaching project, compared with other competitors, benefits from the availability of robotic platforms, internationally recognized base codes and simulators, previously developed by the proponents, very useful for fulfilling the goals of the teaching project.

Briefly mentioning similar projects, the course "CSCI 854 - Control and Learning in Mobile Robots and Multi-Robot Systems" from the University of Southern California, which gives credits the PhD program (IS track), follows a similar approach emphasizing the robotic agent architectures (reactive, hybrid, behavior-based), Navigation and Cooperation between Robots, it also includes Human-Robot Interaction issues, which are not included in this proposal. The course "82778 CIS 6930 - Introduction to AI Robotics" taught by Prof. Robin Murphy at the University of South Florida, includes a graduation section, and is focused on the relation between AI and Robotics, the Biological Inspirations of robotics, Sensing, Navigation, Planning and Multi-Agent Systems, the approach is similar to the current proposal, only the focus as been changed in some aspects from the biological inspirations issue to the development of robotic teams, while this proposal follows different high-level approaches to the development of this type of teams. There is also a course at the University of Lund, Department of Computer Science, Postgraduate Studies named "DAT125/EDA135 - Artificial Intelligence for Robots" with a very similar approach as the one proposed in this document but, again limited by the unavailability of the above-mentioned platforms, base codes and simulators.

2. Objectives

Intelligent robotics course main objectives are:

- To understand the basic concepts of Robotics and the context of Artificial Intelligence in Robotics.

- To study methods of perception and sensorial interpretation (emphasizing computer vision), which allow to create precise world estates and mobile robots' control methods.

- To study the methods which allow mobile robots to navigate in familiar or unfamiliar environments using Planning and Navigation algorithms.

- To study the fundamentals of cooperative robotics and of the robots teams construction.

- To analyze the main national and international robotic competitions, the more realistic robot simulators and the more advanced robotic platforms available in the market (emphasizing the robots AIBO ERS210A and ERS-7)

3. Learning Outcomes

A successful learner from this discipline will be able to:

- Acquire knowledge of current state and trends in intelligent robotics and practical knowledge from programming real/simulated robots;

- Demonstrate an understanding of main challenges of the discipline and be enabled to select appropriate techniques to solve them;

- Have a broad critical understanding of how Artificial Intelligence may be applied generally to intelligent and cooperative robotics;

- Appreciate the problems associated with programming and controlling simulated/real robotic platforms with different perception and action capabilities;

- Understand the challenges behind cooperative robotics and the construction of robotic teams that operate in dynamic, inaccessible, non-deterministic environments;

- Reference the sources used in their work in the context of intelligent robotics, being aware of the best projects/research works in this area around the world. Students must use accurately the standard referencing styles within the text of all written work for all sources used.

4. Detailed Program

1. Introduction
   - 1.1) Artificial Intelligence
   - 1.2) Basic concepts of Robotics
   - 1.3) Artificial Intelligence in Robotics
   - 1.4) History, Evolution, and Current Trends in Intelligent Robotics
2. Architectures for Robotic Agents
   - 2.1) Reactive, Deliberative, Hybrid
   - 2.2) Belief, Desire and Intentions (BDI)
   - 2.3) Cooperative Architectures
3. Perception and Sensorial Interpretation
   - 3.1) Proximity sensors: Sonar or ultrasonic, infrared (IR), touch, light and feel sensors
   - 3.2) Computer Vision: CCD cameras, Digital Image, Colour Models, Image Processing, Image Analysis
   - 3.3) Odometry, Rotation and Compass Sensors
   - 3.4) Sensor Fusion Techniques
4. Localization and Mapping
   - 4.1) Creation, representation and updating of World States.
   - 4.2) Markov and Gaussian Localization
   - 4.3) Grid and Monte-Carlo Localization
   - 4.4) Mapping: Occupancy Grid and SLAM
   - 4.5) World Exploration
5. Mobile robots control: locomotion and action.
   - 5.1) Gears, Speed, Torque
   - 5.2) Robot locomotion simulation
6. Plan Automatic Generation:
   - 6.1) Means-Ends Analysis, Linear, non-linear, hierarchic and partially oriented planning
   - 6.2) Planning and Learning: Plan generality
7. Navigation
   - 7.1) Algorithms of navigation in known/unknown environments
   - 7.2) Voronoi Diagrams
   - 7.3) A* and D* Algorithms
   - 7.4) Cellular Decomposition
8. Cooperative Robotics
   - 8.1) Introduction to the cooperation between robots for teamwork
   - 8.2) Joint Intentions, TAEMS, Role-Based, Social Rules
   - 8.3) Communication and Mutual Modeling
   - 8.4) Locker-Room, Strategical Coordination, Partial Hierarchical
9. Applications

9.1) National and International Robotic Competitions: RoboCup, RoboOlympics, Fira Cup, DARPA Grand-Challenge, Portuguese Robotics Open, Autonomous driving, Micro-Mouse (Micro-Rato) and fire fighting Robots

9.2) Robotic simulators: Soccerserver 2D and 3D, RoboCup Rescue, Virtual Rescue, Ciber-Mouse

9.3) Robotic Platforms: MindStorms, Nao, Bioloid, ERS210A e ERS-7 (Sony Aibos): Hardware, Software Architectures and Robotic Programming Languages.

5. Teaching Methods

Main teaching techniques will be focused on:

- Challenging students to higher level learning as is appropriate in a PhD program of this type. Of course low level learning, i.e., comprehending and remembering basic information and concepts is important. However emphasis of intelligent robotics will be on problem solving, decision making, critical thinking/design, and creative thinking/design.

- Use active learning such as the use of simulators and real robotic platforms. Exposition will be made mostly with interaction in theoretical classes. Some learning will of course be passive, i.e., listening and reading. However, high level learning requires active learning and thus the use of appropriate material/platforms/simulators. Thus the discipline will use simulators for mobile robots navigation ("ciber-mouse", "soccerserver") and cooperative robotics ("robosoccer" and "robocup rescue"). It will also use humanoid platforms (Nao, Bioloid, Robonova) and mobile robotic platforms (ERS210A e ERS7 –Sony AIBOs) available at our labs and appropriate software for high-level programming of robots: OPEN-R SDK (ERS210A e ERS7), FC Portugal base code for Soccer-Server (2D e 3D) and RoboCup Rescue.

- 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 foundation 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 correctly!".

This high-level teaching method will enable student not only to increase their skills in researching about intelligent robotics but also in all other areas related to informatics and computer science.

Some of the exercises with simulators and real robots will be supported by documentation that will be produced specifically for this course.

6. Evaluation System

This is a research discipline, intended first to teach the students the state of the art in intelligent robotics, and then to help them to do a simple project and a paper of publishable quality in an international conference about this subject. There will be a significant amount of reading/analysis of quality research papers that will be handed out. The evaluation of students will be based on:

- Analysis of a selected scientific paper about intelligent robotics;

- Oral presentation of a selected new trend on intelligent robotics;

- Mid-term written examination;

- Practical Project with demonstration, oral defence and production of a publishable scientific paper.

7. Bibliography

Robin R. Murphy; An Introduction to AI Robotics, Bradford Book, MIT Press, Cambridge, Massachussets, London England, 2000. ISBN: 0-262-13383-0

Sebastian Thrun, Wolfram Burgard, Dieter Fox ;Probabilistic Robotics, MIT Press, Cambridge, Massachussets, London England, 2005. ISBN: 0-262-20162-3

Howie Choset, Kevin M. Lynch, Seth Hutchinson, George Kantor, Wolfram Burgard, Lydia E. Kavraki, Sebastian Thrun ;Principles of Robot Motion : Theory, Algorithms, and Implementations, Bradford Book, MIT Press, Cambridge, Massachussets, London England, 2005. ISBN: 0-262-03327-5

Stuart J. Russell and Peter Norvig, Artificial Intelligence: A Modern Approach (International Edition), Pearson US Imports & PHIPEs, 2003, ISBN: 0130803022,

Luis Paulo Reis, Coordination in Multi-Agent Systems: Applications in University Management and Robotic Soccer, PhD Thesis, Faculty of Engineering of the University of Porto, 2003

Ronald C. Arkin, Behavior-Based Robotics MIT Press, 1998, ISBN 0-262-01165-4

J., M. Holland, Designing Autonomous Mobile Robots: Inside the Mind of an Intelligent Machine, 2003, ISBN 0750676833

RoboCup Series (1999, 2000, 2001, 2002 e 2003, 2004, 2005, 2006 and 2007), Springer, LNAI, Vols. 1604, 1856, 2019, 2377, 2752, 3020, 3276 and 4020

B. Teaching Staff

1. Summary

Teaching staff is responsible by a leading world Project – FC Portugal that won 3 World and 4 European RoboCup – Robotic soccer championships. Team is also supervising about 15 PhDs in the area, including several international PhD students attracted by the international visibility of the RoboCup project. More than fifty papers about intelligent robotics have been published, by teaching staff members, in the previous six years.

2. Resumed CVs

Luís Paulo Reis

Name: Luís Paulo Gonçalves dos Reis

Place and Date of Birth: Cedofeita, Porto, October**,** 15th of 1970

Address: Faculty of Engineering of Univ. Porto, Rua Dr. Roberto Frias, s/n, 4200-465, Porto

Phone:+351919455251   **Fax:**+351225081443

E-Mail: lpreis@fe.up.pt   **HomePage:** www.fe.up.pt/~lpreis

Academic Degrees:

- Phd, Sep 2003, Eng. Electrotécnica e de Computadores, FEUP, Artificial Intelligence (MAS)

- MSc, Dec 1995, Eng. Electrotécnica e de Computadores, FEUP, Industrial Informatics (Very Good), 18.3 Val (out of 20)
- Licenciatura (5 Year BSc), Jul 1993, Eng. Electrotécnica e de Computadores, FEUP, Informatics and Systems, 18 Val (out of 20)

Present Position:

- Professor Auxiliar at FEUP-DEI, since Apr 2006
- Researcher at LIACC - Artificial Intelligence and Computer Science Lab., since Dec 1995
- Member of the Directive Board of LIACC, since Oct 2007

Past Positions:

- Professor Auxiliar Convidado at FEUP, Oct 2003 – Apr 2006
- Assistente Convidado at FEUP, Dec 2001 – Feb 2004
- Mestre Assistente Convidado at Univ. Fernando Pessoa – Porto, Oct 2001 – Sep 2002
- Mestre Assistente at Univ. Fernando Pessoa – Porto, Oct 1998 – Sep 2001
- Mestre Assistente Convidado at Univ. Fernando Pessoa – Porto, Oct 1996 – Sep 1998
- Researcher at INEB – Instituto de Eng. Biomédica, Sep 1994 – Oct 1995
- Monitor at FEUP – Faculdade de Engenharia da Univ. Porto, Oct 1991 – Nov 1993

Pedagogical and Divulgation Activities at FEUP:

- 2002/03, 2003/04 and 2004/05 Disciplines: Logic Programming, Artificial Intelligence, Robotics, Intelligent Robotics, Intelligent Agents, Planning and Scheduling Methodologies, Database Laboratory, Basic Informatics, Computational and Communication Systems, Alg. And Data Structures, Programming 2. Pedagogical classifications over: 4.0 Val (out of 5.0) in all disciplines (T, TP e P). Average: 4.2 Val.
- PhD Programs Disciplines: Intelligent Robotics (MAP-I), Planning and Scheduling Methodologies (PRODEI-FEUP), Advanced Methods for Simulation and Modeling (PRODEI-FEUP), Robotics (PRODEI-FEUP)
- Participation in more than 20 divulgation actions at FEUP (including Feira de Ciência e Tecnologia, Mostras de Ciência, Ensino e Inovação da UP, Exposição Ciência e Robótica – Arrábida Shopping, Semanas Abertas da FEUP and Talks in Superior/Secondary Schools).

PhD Supervising at FEUP (6+14):

- 6 PhD Thesis supervised finished (3 about Intelligent Robotics):
  - Pedro Miguel do Vale Moreira, *Intelligent Optimization Methodologies Applied to the Visualization of Virtual Environments,* Doutoramento em Eng. Electrotécnica e de Computadores, FEUP, March 9, 2009
  - Vasco Hugo Vinhas G. Moreira, *BioStories - Geração de Conteúdos Multimédia Dinâmicos Mediante Informação Biométrica da Audiência/ BioStories - Realtime Dynamic Multimedia Storyline Based on Online Audience Biometric Information,* Doutoramento em Eng. Informática (PRODEI), FEUP, October 15, 2010
  - Francisco António Fernandes Reinaldo, *AFRANCI: A Multi-Layer Architecture for Cognitive Agents,* Doutoramento em Eng. Electrotécnica e de Computadores, FEUP, November 15, 2010
  - Rodrigo António Marques Braga, *Plataforma de Desenvolvimento de Cadeiras de Rodas Inteligentes/ Intelligent Wheelchairs' Development Platform,* Doutoramento em Eng. Informática (PRODEI), FEUP, November 26, 2010
  - António Manuel Correia Pereira, *Intelligent Simulation of Coastal Ecosystems,* Doutoramento em Eng. Informática (PRODEI), FEUP, December 6, 2010.

- Pedro Manuel H. Cunha Abreu, *Artificial Intelligence Methodologies Applied in the Analysis and Optimization of Soccer Teams Performance,* Doutoramento em Eng. Informática, FEUP, March 23, 2011
- 14 ongoing PhD Thesis under supervision (8 about Intelligent Robotics/Simulation)

MSc Supervising at FEUP (62):

- 12 MSc Thesis finished: Pedro Miguel Teixeira Faria, Nov2000 ; Pedro Nuno Macedo Leite da Silva, Dec2000 ; Sérgio Fernando Grilate Louro, Sep2004 ; Paulo César Basto Cardoso, July2006 ; André Monteiro Oliveira Restivo, Oct2006 ; Darya Alexandrovna Barteneva, Apr2007 ; Filipe Manuel Miranda da Cruz, Nov2008; ; Rui Manuel Figueiredo de Almeida, Mar2009; Pedro Ricardo da Nova Valente, Mar2009; Rui Filipe Lourenço Guedes, May2009; Luís Filipe Gonçalves Lemos, May2009; José Carlos Pinto Miranda, Dec2009

- 50 Integrated MSc Thesis – Bologna finished: Marcelo Roberto Petry, Feb2008 ; João Pedro Bugalho Certo, Mar2008; Jorge Filipe Pinheiro Guerra de Ribeiro Teixeira, Mar2008; João Manuel Pinto Marques de Oliveira, Mar2008 ; Dinis Alexandre Marialva Felix, Mar2008 ; Péricles Filomeno Monteiro Pinto, May2008; António Pedro da Silva Mota, May2008; João Carlos Leite Ferreira, Jun2008; João Manuel Lobato Dias da Silva Oliveira, Jul2008; Pedro Miguel Candeias de Castro Malheiro, Jul2008; Márcio Miguel Couto de Sousa, Jul2008; Marco Filipe Chaves Pinto da Silva, Jul2008; José Miguel Neves Leão de Campos, Jul2008; Ricardo Nuno Nóbrega Silva, Jul2008; Daniel Tiago de Jesus Coutinho, Jul2008; André Miguel Coelho de Oliveira Rodrigues, Jul2008; Pedro Melo Campos, Jul2008; Rui André Teixeira de Sousa Sêca, Jul2008; Pedro Daniel da Cunha Mendes, Jul2008; Duarte Miguel Faria Ferreira Cabral, Jul2008; João Nuno Boavista Taborda, Jul2008; Luís Ângelo de Sá Barbosa, Jul2008; Hugo Rafael de Brito Picado, Dec2008; Nuno Filipe dos Reis Almeida, Dec2008; Pedro César Fonseca Gonçalves Alves, Jan2009; Luís Pedro da Cunha Brandão Martinho, Mar2009; José Maria Rosa de Sousa de Mendonça e Moura, Jul2009; Mário Joaquim Firmino Leite Faria, Jul2009; Antero Silva, Jul2009; Rui Lopes, Jul2009; Catarina Santiago, Jul2009; Nuno Cruz, Jul2009; Ricardo Mestre, Jul2009; Frederico Cunha, Mar2010; Vitor Pereira, Mar2010; Carlos Nunes, Mar2010; Filipe Marques, Jul2010; Pedro Daniel Sousa, Jul2010; Abel Santos, Jul2010; João Paulo Portela, Jul2010; Luis Teófilo, Jul2010; Hugo Peixoto, Jul2010; Pedro Gomes, Jul2010; Hugo Mendes, Jul2010; Miguel Oliveira, Dec2010; José Luís Rei, Feb2011; Ivo Gomes, Feb2011; Sérgio Vasconcelos, Feb2011; André Vidal, Feb2011; Paulo Martins, Feb 2011

- 12 MSc ongoing thesis in supervision.

Supervising of Final Projects/Scholarships concluded (83):

- 22 Monographs University Fernando Pessoa – (1997-2004)
- 17 Internships FEUP/LEIC (2004-2006) – 2 supervisor LIACC, 9 supervisor FEUP
- 26 PSTFC FEUP/LEEC – Final Projects (2003-2006) – 20 LIACC, 1 INESC
- 2 Final Degree Projects Univ. Aveiro (2002-2003) – Eng. Computadores e Telemática
- 15 Research Scholarships (2004-2006) – 10 FCT, 2 LIACC, 1 Santander, 2 IAESTE

Research Interests:

- Intelligent Robotics, Cooperative Robotics, Robotic Soccer, Artificial Intelligence (Multi-Agent Systems, Intelligent Agents, Coordination in Multi-Agent Systems, Simulation, Constraint Logic Programming).

Research Projects FCT/FEUP:

- *Portus – A Common Framework for Cooperation in Mobile Robotics* (FCT - POSI/SRI/41315/2001, 20000 EUR, 2002 – 2005, Proposal/Final Report Responsible, PR: António Paulo Moreira)
- *FC Portugal: New Coordination Methodologies Applied to the Simulation League* (FCT – POSI/ROBO/43910/2002, 27800 EUR, Oct 2003 – Oct 2004, Principal Researcher)

- *LEMAS – Learning in MAS in the RoboCup Sony Legged League* (FCT POSI/ROBO/43926/2002, 32908 EUR, Oct 2003 – Dec 2004, Proposal/Final Report Responsible, PR: Eugénio Oliveira)
- *Rescue: Coordination of Heterogeneous Teams in Search and Rescue Scenarios* (FCT/POSC/EIA/63240/2004, 32800 EUR, Apr 2005 – Mar 2007, Principal Researcher FEUP)
- *ABSES - Agent Based Simulation of Ecological Systems* (FCT/POSC/EIA/57671/2004, 75000 EUR, Apr 2005 – Oct 2007, Principal Researcher)
- *ACORD - Adaptative Coordination of Robotic Teams* (FCT/PTDC/EIA/70695/2006, 95000 EUR, Jan 2008 – Dec 2009, Principal Researcher)
- *Intellwheels - Intelligent Wheelchair with Flexible Multimodal Interface,* (FCT/PTDC/EEA-CRO/98664/2008, 94500 Eur, begin in July 201) - Principal Researcher)
- *ERAS - Expeditious Reconstruction of Virtual Cultural Heritage Sites,* (FCT/PTDC/EIA-EIA/114868/2009, 118549 Eur, Begin in December 2010) - (PI: A.A.Sousa, Responsible at FEUP/LIACC: L.P.Reis)

Organization of International Scientific Meetings:

- *RoboCup Tutorial – The RoboCup International Initiative: AI Meets Robotics to Create RoboSoccer Teams*, EPIA2001 – 10th Port. Conf. on Artificial Intelligence, Seminário de Vilar, Porto, Dec. 2001
- *MASTA 2001 – 2nd Workshop on Multi-Agent Systems Theory and Applications,* Seminário de Vilar, Porto, 19 Dec 2001 – OC Member (Chair: Eugénio Oliveira)
- *Robótica 2004, Festival Nacional de Robótica – Portuguese Robotics Open,* Pavilhão Rosa Mota, Palácio de Cristal, Porto, 22-25 Apr 2004
- *Encontro Científico do Robótica 2004 – Scientific Meeting of the Portuguese Robotics Open,* Biblioteca Almeida Garrett, Palácio de Cristal, Porto, 23-24 Apr 2004
- *MASTA'2005 – 3rd Workshop on Multi-Agent Systems Theory and Applications,* EPIA – Portuguese Conference on Artificial Intelligence, Covilhã, 7-8 Dec 2005
- *IROBOT'2005 – 1st International Workshop on Intelligent Robotics,* EPIA – Portuguese Conference on Artificial Intelligence, Covilhã, 5 Dec 2005
- *CeNPLF 2006: Portuguese National Logic and Functional Programming Contest,* Porto, FEUP, 7-9 Mai 2006
- *Roboludens'2006, RoboCup Dutch Open tournament, Simulation Rescue Organizer*, Eindhoven, 7-9 Abril, 2006
- *BEST Course: Wake Up, Join the Robolution!* Porto, Portugal, (with BEST – Board of European Students on Technology da FEUP) 1-15 Setembro de 2006
- *MASTA'2007 – 4th Workshop on Multi-Agent Systems Theory and Applications,* EPIA – Portuguese Conference on Artificial Intelligence, Guimarães, Dec 2007
- *IROBOT'2007 – 2nd International Workshop on Intelligent Robotics,* EPIA – Portuguese Conference on Artificial Intelligence, Guimarães, Dec 2007
- *IROBOT'2008 – 3rd International Workshop on Intelligent Robotics,* held at IBERAMIA 2008 - 11th Ibero-American Conference on Artificial Intelligence, ISCTE, Lisbon, October 14th, 2008
- *IROBOT'2009 – 4th International Workshop on Intelligent Robotics,* held at EPIA'2009 – Portuguese Conference on Artificial Intelligence, Aveiro, October 12-15, 2009
- *CISTI'2009 - 4ª Conferência Ibérica de Sistemas e Tecnologias de Informação,* Póvoa de Varzim, June 17-20, 2009

Edition of Proceedings and Book Chapters:

- *2 Conference Proceedings and 4 Book/proceedings chapters*

Publications and Communications:

- *2 Thesis, 20 Papers in International Journals/Book Chapters, 8 Papers in National Journals, more than 150 Papers in International Conferences, 30 Invited Talks*

Program/Scientific Committee in Conferences:

- WAF'2001 (Madrid, Spain), Bal.React. and Soc.Delib. in MAS 2001 (Springer LNAI Vol. 2103), RoboCup Sim. Tech. Committe (2001-2003), RoboCup 2004 Int. Symposium (Lisbon, Portugal), CENPL'2004 (Lisboa, Portugal), Tékhne – Rev. Estudos Politécnicos (2004-...), Robótica 2005 (Coimbra, Portugal), Enformatika (2005), CENPLF'2005 (Bragança, Portugal), MASTA'2005 (Covilhã, Portugal), IROBOT'2005 (Covilhã, Portugal), Robótica'2006 (Guimarães, Portugal), CENPLF'2006 (Porto, Portugal), RoboCup 2006 Int. Symposium (Bremen, Germany), CISTI'2006 (Esposende, Portugal), COMIC'2006 (Porto, Portugal), IBERAMIA/SBIA'2006 (Ribeirão Preto, Brazil), AAMAS'2006 (Hakodate, Japan), Robotica'2007 (Algarve, Portugal), VIPImage'2007 (Porto, Portugal), CISTI'2007 (Porto, Portugal), COMIC'2007 (Porto, Portugal), AAMAS'2007 (Hawai, USA), ASM'2007 (Palma de Mallorca, Spain), RoboCup 2007 Int. Symposium (Atlanta, USA), Robotica'2008 (Aveiro, Portugal), CISTI'2008 (Orense, Spain), DSIE'2008 (Porto, Portugal), AAMAS'2007 (Hawai, USA), MASTA'2007 (Guimarães, Portugal), IROBOT'2007 (Guimarães, Portugal), AIASTS 2007 (Guimarães, Portugal), SDIA 2007 (Guimarães, Portugal), AAMAS'2008 (Estoril, Portugal), ASM'2008 (Corfu, Greece), RoboCup 2008 Int. Symposium (China), ECAI 2008 (Greece), SBIA 2008 (Salvador, Brazil), IBERAMIA'2008 (Lisboa, Portugal), IACe-T'2008 (Amman, Jordan, 2008), ISVC'2008 (Las Vegas, 2008), ICAART'2009 (Porto, 2009), Robotica 2009 (Castelo Branco, Portugal, 2009), VIPImage'2009 (Porto, Portugal, 2009), RoboCup'2009 Int. Symposium (Graz, Austria, 2009), IROBOT'2009, MASTA'2009, CISTI'2009, RoboCup'10, ICAART'10, Robotica'10, ASM'10, AIS'10, CISTI'10, WSIA@CISTI10, SOCO'10, LARS/EnRI'2010, KDIR'10, AISSAI'10, ITSC@ATSS'10, DSIE'10

- Journals Ed. Board: IJI - Int. J. Imaging, ISSN: 0974-0627, CESER Publications, ICT'AE – Inf. and Comm. Tech. for the Adv. Enterprise: An Int. J. ISSN: 1647-1407, Tékhne – Polyt. Studies Review, ISSN: 1645-9911, RISTI - Iberian J. Inf. Syst. Tech., ISSN: 1646-9895, Int. J. of Computational Intelligence Techniques, ISSN: 0976–0466)

Principal Awards and Prizes:

- *APRP Award* – Ass. Port. Rec. Padrões – Best Paper at RECPAD'94, Lisboa, 25 Mar 1994
- *Eng. António Almeida Award* – Fundação Eng. António Almeida, 21 Nov 1994
- *National Engineering Prize* – Ordem dos Engenheiros, 26 Nov 1994
- *Prémio Centenário FEUP* – Faculdade de Engenharia da Univ. Porto – 20 Mar 1996
- *Inovation Award Micro-Rato 1999* – Univ. Aveiro – Robot D.Dinis, 19 Mai 1999
- *Winner of European RoboCup 2000* Amsterdam – RoboCup Federation, FC Portugal, Jun 2000
- *Winner of RoboCup 20000 – Simulation League*, Melbourne – RoboCup Federation, FC Portugal, Sep 2000
- *Winner of Ciber-Rato 2001* – Univ. Aveiro – Robot Micro-Pessoa, Mai 2001
- *Winner of GermanOpen 2001 RoboCup – Simulation League*, Paderborn, FC Portugal, Jun 2001
- *Winner of GermanOpen 2001 RoboCup – Small Size league* (3rd middle size), Paderborn, 5DPO, Jun 2001
- *3rd Place at RoboCup 2001 – Simulation League*, Seattle, EUA – RoboCup Federation, FC Portugal, Aug 2001
- *Winner of Coach Competition, RoboCup 2002,* Fukuoka, Japan – RoboCup Federation, Jun 2002
- *2nd Place at Coach Competition, RoboCup 2003,* Padua, Italy – RoboCup Federation, Jul 2003
- *2nd Place at Coach Competition, RoboCup 2004,* Lisboa – RoboCup Federation, Jul 2004
- *Winner of European RoboCup (RoboCup Rescue, and Simulation 3D leagues)*, Eindhoven, Holand, FC Portugal, Apr 2006
- *Winner of RoboCup – Simulation 3D League*, Bremen, Alemanha, FC Portugal, Jun 2006
- *Best Paper Award at COMIC 2007 (Supervision/Co-Author)*
- *Winner of RoboCup German Open 2007, 3D Simulation League,* RoboCup Federation, Hannover, Germany, Apr 2007

- *2nd Place in RoboCup World Championship 2007, PV-League (Mixed Reality League)*, RoboCup Federation, Atlanta, USA, Jul 2007
- *8 other awards in RoboCup competitions 2008-2011*

Some Relevant Publications:

- Luís Paulo Reis and Nuno Lau, *FC Portugal Team Description: RoboCup 2000 Simulation League Champion,* in Peter Stone, Tucker Balch and Gerhard Kraetzschmar, editors, RoboCup-2000: Robot Soccer World Cup IV, Springer LNAI, Vol. 2019, pp.29-40, Berlin, 2001, ISBN 3-540-42185-8
- Luis Paulo Reis, Nuno Lau and Eugénio C. Oliveira, *Situation Based Strategic Positioning for Coordinating a Team of Homogeneous Agents,* in M.Hannebauer, J.Wendler and E. Pagello Eds, Balancing Reactivity and Social Deliberation in Multi-Agent System – From RoboCup to Real-World Applications, Springer LNAI, Vol. 2103, pp. 175-197, Berlin, 2001, ISBN 3-540-42327-3
- Luís Paulo Reis and Nuno Lau, *COACH UNILANG – A Standard Language for Coaching a (Robo) Soccer Team,* in Andreas Birk, Silvia Coradeschi and Satoshi Tadokoro, editors, RoboCup-2001: Robot Soccer World Cup V, Springer Lecture Notes in AI, Vol. 2377, pp.183-192, Berlin, 2002, ISBN 3-540-43912-9
- Nuno Lau and Luís Paulo Reis, *FC Portugal 2001 Team Description: Configurable Strategy and Flexible Teamwork,* in Andreas Birk, Silvia Coradeschi and Satoshi Tadokoro, editors, RoboCup-2001: Robot Soccer World Cup V, Springer Lecture Notes in AI, Berlin, 2002, ISBN 3-540-43912-9
- Francisco Reinaldo, Marcus Siqueira, Rui Camacho and Luís Paulo Reis, *A tool for Multi-Strategy Learning,* in Gelbukh, A. and Reyes-Garcia, C. eds, Special Issue: Advances in Artificial Intelligence, Research in Computing Science, Vol. 26, pp.51-60, November 2006, ISSN: 1870-4069
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- Pedro Abreu, J. Moura, Daniel C. Silva, Luis Paulo Reis, Julio Garganta (2010). Football Scientia – An Automated Tool for Professional Soccer Coaches. In Proceedings of the 2010 IEEE International Conference on Cybernetics and Intelligent Systems (CIS 2010), June 28–30 2010, Singapore (pp. 126–131): IEEE (
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- Marcelo R. Petry, A. P. Moreira, Rodrigo A.M. Braga, Luis Paulo Reis, Shared Control for Obstacle Avoidance in Intelligent Wheelchairs, In Proceedings of the 2010 IEEE Conference on Robotics, Automation and Mechatronics (RAM 2010), June 28–30 2010, Singapore (pp. 182-187): IEEE
- Luis Paulo Reis, Rodrigo A.M. Braga, M. Sousa, A.P. Moreira, IntellWheels MMI: A Flexible Interface for an Intelligent Wheelchair, RoboCup-2010: Robot Soccer World Cup XII, LNAI 5949, 2010 Lecture Notes in Computer Science, pp. 296-307, Jun 29- Jul 05, Graz, Austria, Springer, Heidelberg.

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- Pedro Abreu, I. Costa, D. Castelão, Luis Paulo Reis, Julio Garganta, Human vs. Robotic Soccer: How Far are They? A Statistical Comparison, RoboCup 2010: Robot Soccer World Cup XIII, LNAI 6556, pp. 242-253, Springer, Heidelberg (ISI)
- Nima Shafii, Luis Paulo Reis, Nuno Lau, Biped Walking using Coronal and Sagittal Movements based on Truncated Fourier Series. RoboCup-2010: Robot Soccer World Cup XIII, LNAI 6556, pp. 324-335, Springer, Heidelberg.
- Luís Mota, Luís Paulo Reis and Nuno Lau, Multi-robot Coordination using Setplays in the Middle-size and Simulation Leagues, Mechatronics, Elsevier, ISSN: 0957-4158, DOI: 10.1016/j.mechatronics.2010.05.005, (accepted in May 2010) (in press)
- Pedro Abreu, I.Costa, D.Castelão, J.Moreira, Luis Paulo Reis, Julio Garganta, Human vs. Virtual Robotic Soccer: A Technical Analysis about two Realities, European Journal of Sport Science, Taylor & Francis, ISSN: 1746-1391 (accepted in November 2010)
- Daniel Silva, Rodrigo A.M. Braga, Luis Paulo Reis, Eugenio Oliveira. Designing a Meta-Model for a Generic Robotic Agent System using GAIA Methodology. Information Sciences, Elsevier, ISSN: 0020-0255 (accepted in December 2010)
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- Luis Lemos, Luis Paulo Reis, Light 3D Mapping for Search and Rescue Operations, Robotica - Automação Controlo Instrumentação, Publindustria, Produção de Comunicação Lda, Nº 80, pp. 10-15, ISSN: 0874-9019, September, 2010.
- Brigida Mónica Faria, Luis Paulo Reis, Nuno Lau, G. Castillo, Classification of FC Portugal Robotic Soccer Formations: A Comparative Study of Machine Learning Algorithms, Robotica - Automação Controlo Instrumentação, Publindustria, Produção de Comunicação Lda, ISSN: 0874-9019, (accepted in March 2010)

Detailed CV:

More detailed CV at: http://www.fe.up.pt/~lpreis

Nuno Lau

Name: José Nuno Panelas Nunes Lau

Place and Date of Birth: Oporto, November 28, 1970

Address: Universidade de Aveiro – DETI, Campo de Santiago, 3810-193 Aveiro, Portugal

Phone: +351 234 370524   **Fax:**   +351 234 370545

Email: nunolau@ua.pt   **Homepage:** http://www.ieeta.pt/~lau

Academic Degrees:

- PhD, Dec 2003, Electrical Engineering, Universidade de Aveiro
- DEA, Set 1994, Biomedical Engineering, Université Claude Bernard – Lyon I
- Graduation, Electrical and Computers Engineering, Fac. Eng. Uni. Porto, 17 val.

Present Position:

- Auxiliar Professor, Aveiro University, since Dec 2003
- Researcher of IEETA, Transversal Activity on Intelligent Robotics, since 1999

Past Positions:

- Assistant Researcher, Aveiro University, 1995-2003
- Stagiary Assistant, Aveiro University, 1994-1995
- Monitor, FEUP, 1991-1993
- INESC-Aveiro researcher, 1994-1999

Teaching courses:

- Aveiro University: Distributed Artificial Intelligence, Distributed Systems and Operating Systems, Computer Architecture I, Computer Architecture II, Operating Systems, Programming I, Programming II, Introduction to Informatics, Project, Programming Systems and Software Engineering, Seminar
- Porto University: Programming I, Programming II
- MAP-I: Intelligent Robotics

Supervising experience:

- 6 PhD, Aveiro University (4) and Porto University (2)
- 18 MSc, Aveiro University (11 finished, 2 ongoing), Porto University, 5 finished)
- 16 Final Year Projects in the, 8 in the area of Robotics, Electrical Engineering and Computer Science graduations, Aveiro University, co-supervisor
- 2 Final Year Projects in the area of Robotics, Porto University, co-supervisor
- 9 Research Scholarships, 7 FCT, 2 IEETA

Area of Scientific Activity:

- Intelligent Robotics, Coordination of Multi-Agent Systems, Reconfigurable Systems

Research Projects:

- FC Portugal: New Coordination Methodologies Applied to the Simulation League (FCT – POSI/ROBO/43910/2002, 27800 EUR, Out 2003 – Out 2004, Coordinator at Aveiro University)
- Rescue: Coordination of Heterogeneous Teams in Search and Rescue Scenarios (FCT/POSC/EIA/63240/2004, 32800 EUR, Abr 2005 – Mar 2007, Principal Investigator)
- POCTI/DIV/2005/00132 - Concurso MicroRato da Universidade de Aveiro: Actividades de Divulgação da Robótica Móvel (member of research team), Jul 2005-Jul 2007
- POSI/ROBO/43908/2002 - CAMBADA - Cooperative and Autonomous Robots with Advanced Distributed Architecture (research team member)
- POSI/CHS/43140/2001 - Confibest - Methods and Models for Problem Oriented Reconfigurable Systems
- PTDC/EIA/70695/2006 - ACORD - Adaptative Coordination of Robotic Teams (member or research team)
- FCT RIPD/ADA/109636/2009 - INTELLWHEELS - Intelligent Wheelchair with Flexible Multimodal Interface, 2010-2012 (coordinator at Aveiro University)
- QREN/ADI - LUL - Living Usability Lab, 2010-2012 (member of research team)

Organization of Scientific Meetings:

- Micro-Mouse Robot Contest, Aveiro University, member of Organizing Committee, 2001-2006

- 5th Inter-University Programming Marathon, member of Technical Organizing Committee, Out 2005
- 1st Inter-University Programming Contest, member of Scientific Committee, Mar 2005.
- IROBOT'2005 – 1st International Workshop on Intelligent Robotics, EPIA – Portuguese Conference on Artificial Intelligence, Covilhã, member of Organizing Comittee, 5 Dez 2005
- CiberMouse@RTSS2006 Robotic, Cyber Robotic Competition at Real-Time Systems Symposium, Rio de Janeiro, Brazil, 2006
- IROBOT'2007 – 2nd International Workshop on Intelligent Robotics, EPIA – Portuguese Conference on Artificial Intelligence, Guimarães, Dec 2007
- CiberMouse@RTSS2007, Cyber Robotic Competition at Real-Time Systems Symposium, Tucson, USA, 2007
- Festival Nacional de Robótica 2008, member of the Organizing Committee, Universidade de Aveiro, 2-6 April 2008, http://robotica.ua.pt/robotica2008/
- IROBOT'2008 – 3rd International Workshop on Intelligent Robotics, IBERAMIA – 11th edition of the Ibero-American Conference on Artificial Intelligence, Lisbon, Portugal, Oct 2008
- CiberMouse@RTSS2008, Cyber Robotic Competition at Real-Time Systems Symposium, Barcelona, Spain, 2008
- EPIA 2009 – 14th Portuguese Conference on Artificial Intelligence, Aveiro, 12-15 October 2008, member of the Organizing Committee, http://epia2008.appia.pt
- CyberRescue@RTSS2009, Cyber Robotic Competition at Real-Time Systems Symposium, Washington DC, USA, 2009

Publications and Communications:

- 1 Thesis, 5 international journal papers, 14 book chapters/series, 17 national journal papers, 60 papers in conference proceedings

Program/Scientific Committee in Conferences:

- MASTA2011, IROBOT2011, AI4Games2011, IWANN2011, ICAART2010, CISTI2010, IRSC2009, MASTA2009, IROBOT2009, IWANN2009, CISTI2009, ICAART2009, IbPria2009, IROBOT2008, CISTI2008, AAMAS2008, Robótica2008, MASTA 2007, IROBOT 2007, AAMAS 2007 (Honolulu, Haway), CISTI 2007, AAMAS 2006 (Hakodate, Japan), Robótica 2006 (Guimarães, Portugal), CISTI 2006, IROBOT 2005 (Covilhã, Portugal), MASTA 2005 (Covilhã, Portugal), Robótica 2004 (Porto, Portugal), IROBOT 2007 (Guimarães, Portugal), MASTA 2007 (Guimarães, Portugal)

Reviewer in Journals / other conferences:

- IROS2011, RoboCup2011, Transactions on Industrial Informatics, Journal of Autonomous Agents and Multi-Agent Systems, European Journal of Sports Science, Neurocomputing Journal, 9th RoboCup Symposium (Fukuoka, Japan), 8th RoboCup Symposium (Lisbon, Portugal), World Automation Congress 2004 (Sevilla, Spain).

Principal Awards and Prizes:

- *Best Paper Award, 11th International Conference on Mobile Robots and Competitions, Robotica 2011, Lisboa, 2011*
- *Winner of Portuguese Robotics Open 2011 MSL League, Festival Nacional de Robótica, Lisboa, 2011*
- *2nd Place in RoboCup German Open 2011, 3D Simulation League, RoboCup Federation, Magdeburg, Germany, 2011*
- *2nd Place in RoboCup German Open 2011, 2D Simulation League, RoboCup Federation, Magdeburg, Germany, 2011*

- *3rd Place in RoboCup World Championship 2010, MSL League, RoboCup Federation, Singapore, 2010*
- *2nd Place in RoboCup German Open 2010, MSL League, RoboCup Federation, Magdeburg, Germany, 2010*
- *2nd Place in RoboCup German Open 2010, 2D Simulation League, RoboCup Federation, Magdeburg, Germany, 2010*
- *2nd Place in RoboCup German Open 2010, 2D Simulation League, RoboCup Federation, Magdeburg, Germany, 2010*
- *Winner of Portuguese Robotics Open 2010 MSL League, Festival Nacional de Robótica, Leiria, 2010*
- *3rd Place in RoboCup World Championship 2009, MSL League, RoboCup Federation, Graz, Austria, 2009*
- *Winner of Portuguese Robotics Open 2009 MSL League, Festival Nacional de Robótica, Castelo Branco, 2009*
- *Winner of RoboCup 2008 MSL League, Robot World Cup Soccer Games and Conferences, RoboCup Federation, China, 2008*
- *Winner of Portuguese Robotics Open 2008 MSL League, Festival Nacional de Robótica, Aveiro, 2008*
- *2nd Place in RoboCup World Championship 2007, PV-League (Mixed Reality League), RoboCup Federation, Atlanta, USA, 2007*
- *Winner of RoboCup German Open 2007, 3D Simulation League, RoboCup Federation, Hannover, Germany, 2007*
- *Winner of RoboCup World Championship 2006, 3D Simulation League, RoboCup Federation, Bremen, Germany, 2006*
- *Winner of RoboCup Dutch Open 3D Simulation League RoboCup Federation, Eindhoven, Holland, 2006*
- *Winner of RoboCup DutchOpen Rescue Simulation League RoboCup Federation, Eindhoven, Holland, 2006*
- *2nd in Coach Competition Simulation League at 8th RoboCup International Competitions and Conferences, RoboCup Federation, Lisbon, 2004*
- *2nd in Coach Competition Simulation League at The 7h RoboCup Int. Competitions and Conferences, RoboCup Federation, Pisa, 2003*
- *Winner of Coach Competition Simulation League at The 6th RoboCup Int. Competitions. and Conferences, RoboCup Federation, 2002*
- *Winner of RoboCup German Open 2001, Simulation League, RoboCup Federation, 2001*
- *3rd Place in Simulation League at The Fifth Robot World Cup Soccer Games and Conferences, RoboCup Federation, 2001*
- *Winner of Simulation League, The Fourth Robot World Cup Soccer Games and Conferences, RoboCup Federation, Seattle, 2000*
- *Winner of EuRobocup 2000 Simulation League RoboCup Federation, Amsterdam, 2000*
- *Innovation Prize at Micro-Mouse Contest, Aveiro, 1999*
- *Best paper at RECPAD 94, Associação Portuguesa de Reconhecimento de Padrões, 1994*

Selected publications:

- Nuno Lau, Luis Seabra Lopes, Gustavo Corrente, Nelson Filipe, Ricardo Sequeira, "Robot team coordination using dynamic role and positioning assignment and role based setplays", Mechatronics, Elsevier, Vol. 21, n 2, pp. 445-454, ISSN 0957-4158, 2011
- Joao Silva, Nuno Lau, Antonio J.R. Neves, Joao Rodrigues, Jose Luis Azevedo, "World modeling on an MSL robotic soccer team", Mechatronics, Elsevier, Vol 21, n 2, pp. 411-422, ISSN 0957-4158, 2011

- Luis Mota, Luis Paulo Reis, Nuno Lau, "Setplay usage in the Middle Size League", Mechatronics, Elsevier, ISSN 0957-4158, Vol 21, n 2, pp. 434-444, 2011
- Nima Shafii, Luís Paulo Reis and Nuno Lau, "Biped Walking using Coronal and Sagittal Movements based on Truncated Fourier Series", RoboCup 2010: Robot Soccer World Cup XIV, LNCS, Springer, June 25, 2010
- Hugo Picado, Marcos Gestal, Nuno Lau, Luis P. Reis, and Ana M. Tomé, "Automatic generation of biped walk behavior using genetic algorithms", Bio-Inspired Systems: Computational and Ambient Intelligence 10th InternationalWork-Conference on Artificial Neural Networks, IWANN 2009 Salamanca, Spain, June 10-12, 2009 Proceedings, Part I, University of Salamanca, Spain, pp. 805-812, June 9-12, LNCS 5517, Springer-Verlag Berlin Heidelberg, 2009
- Nuno Lau, Luís Seabra Lopes, Nelson Filipe, and Gustavo Corrente, "Roles, Positionings and Set Plays to Coordinate a MSL Robot Team", In: Progress in Artificial Intelligence, 14th Portuguese Conference on Artificial Intelligence, EPIA 2009, Aveiro, Portugal, October 12-15, 2009, Proceedings, LNAI 5816, pp 323-337, Springer, October 12-15, 2009
- Nuno Lau, Luís Seabra Lopes, Gustavo Corrente, "CAMBADA: Information Sharing and Team Coordination", Proc. of the 8th Conference on Autonomous Robot Systems and Competitions, Portuguese Robotics Open - ROBÓTICA'2008, April, Aveiro, 2008, pp. 27-32
- Nuno Lau, Luís Paulo Reis e João Certo, Understanding Dynamic Agent's Reasoning, In Progress in Artificial Intelligence, 13th Portuguese Conference on Artificial Intelligence, EPIA 2007, Guimarães, Portugal, December 3-6, 2007, Springer LCNS, Vol. 4874, pp. 542-551, 2007
- João Figueiredo, Nuno Lau, Artur Pereira, "Multi-agent Debugging and Monitoring Framework", 1st IFAC Workshop on Multivehicle Systems (MVS\'06), Bahia Convention Center, Salvador, Brazil, October 2 – 3, 2006
- Luís Paulo Reis, Nuno Lau, Francisco Reinaldo, Nuno Cordeiro and João Certo. "FC Portugal: Development and Evaluation of a New RoboCup Rescue Team". 1st IFAC Workshop on Multivehicle Systems (MVS'06), Bahia Convention Center, Salvador, Brazil, October 2 – 3, 2006
- Luís Paulo Reis, Carlos Carreto, Eduardo Silva and Nuno Lau, "IROBOT'05: 1st International Workshop on Intelligent Robotics", In C. Bento, A. Cardoso and G. Dias (eds.) Proc. Portuguese Conference on Artificial Intelligence, IEEE – Institute of Electrical and Electronics Engineers, Inc., University of Beira Interior, Covilhã, Portugal, p. 225, December, 2005, ISBN 0-7803-9365-1
- Francisco Reinaldo, João Certo, Nuno Cordeiro, Luís P. Reis, Rui Camacho, Nuno Lau, "Applying Biological Paradigms to Emerge Behaviour in RoboCup Rescue Team", Actas do 1st Workshop on Intelligent Robotics – IROBOT'05, Springer, 2005
- Hugo Marques, Nuno Lau and Luís Paulo Reis, "FC Portugal 3D Simulation Team: Architecture, Low-Level Skills and Team Behaviour Optimized for the New RoboCup 3D Simulator", Actas do Encontro Científico – 4º Festival Nacional de Robótica – Robótica 2004, págs 31-38, Porto, Abril, 2004
- Cláudio Teixeira, Nuno Lau and Luís Paulo Reis, "FC Portugal 2003 Shoot Evaluation Based on Goalie Movement Prediction", Actas do Encontro Científico – 4º Festival Nacional de Robótica – Robótica 2004, págs 149-155, Porto, Abril, 2004
- Nuno Lau, Artur Pereira, Andreia Melo, António Neves, João Figueiredo, "Ciber-rato: uma competição robótica num ambiente virtual", Actas do Workshop Entretenimento Digital e Jogos Interactivos – Games 2004, Lisboa, Julho (2004)
- Luis Paulo Reis and Nuno Lau, "COACH UNILANG - A Standard Language for Coaching a (Robo)Soccer Team", RoboCup-2001: Robot Soccer World Cup V, Andreas Birk, Silvia Coradeshi, Satoshi Tadokoro editors, LNAI 2377, págs. 183-192, Springer Verlag, Berlim, 2002

- Luis Paulo Reis and Nuno Lau, "FC Portugal Team Description: RoboCup 2000 Simulation League Champion", RoboCup-2000: Robot Soccer World Cup IV, Peter Stone, Tucker Balch and Gerhard Kraetzschmar editors, LNAI 2019, págs. 29-40, Springer Verlag, Berlim, 2001
- Luis P. Reis, Nuno Lau, Eugénio C. Oliveira, "Situation Based Strategic Positioning for Coordinating a Team of Homogeneous Agents", Balancing Reactivity and Social Deliberation in Multi-Agent Systems, Markus Hannebauer, Jan Wendler, Enrico Pagello, editors, LNCS 2103, págs. 175-197, Springer Verlag, 2001
- Edited by Peter Stone, with Minoru Asada (humanoid), Tucker Balch (workshop), Raffaelo D'Andrea (Cornell team), Masahiro Fujita (legged), Bernhard Hengst (UNSW team), Gerhard Kraetzschmar (mid-size), Pedro Lima (engineering challenge), Nuno Lau (FC Portugal team), Henrik Lund (RoboCup Jr.), Daniel Polani (scientific challenge), Paul Scerri (simulation), Satoshi Tadokoro (rescue), Thilo Weigel (CS Freiburg team), and Gordon Wyeth (small-size), "RoboCup-2000: The Fourth Robotic Soccer World Championships", AI Magazine, Vol. 22, nº1, págs. 11-38, Spring, 2001

Detailed CV:

More detailed CV at: http://www.ieeta.pt/~lau