

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. The research conducted on the University of Minho robotic middle size league team of RoboCup, conducted this university to win also several international awards including two second places in European championships. 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, 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 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, Massachusetts, 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.

Teaching staff for 2007/2008 will include members from the three universities with very high research activity in the area of Intelligent Robotics (Luis Paulo Reis – University of Porto, Nuno Lau – University of Aveiro and Fernando Ribeiro - University of Minho)

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 Divulcation 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), 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 (18):

- 15 PhD Thesis (10 Supervisor , 5 Co-Supervisor, 11 about Intelligent Robotics/Simulation) – see detailed CV

MSc Supervising at FEUP (42):

- 12 MSc Thesis (6 concluded, 6 ongoing) – see detailed CV

- 30 Integrated MSc Thesis – Bologna (5 concluded, 25 ongoing)

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:

- Artificial Intelligence (Multi-Agent Systems, Intelligent Agents, Coordination in Multi-Agent Systems, Simulation, Intelligent Robotics, Robotic Soccer, 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 - Adaptive Coordination of Robotic Teams* (FCT/PTDC/EIA/70695/2006, 95000 EUR, Jan 2008 – Dec 2009, Principal Researcher)

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, April 7-9, 2006
- *BEST Course: Wake Up, Join the Robolution!* Porto, Portugal, (with BEST – Board of European Students on Technology da FEUP), September 1-15, 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

Edition of Proceedings and Book Chapters:

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

Publications and Communications:

- *2 Thesis, 22 Papers in International Journals/Book Chapters/Series, 3 Papers in National Journals, 80 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), Tékhné – 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 (Hawaii, 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 (Hawaii, 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)

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

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. 2103, 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
- Reis, Luís Paulo et al. Editores, *Actas do Encontro Científico do Robótica 2004 (Proceedings of the Scientific Meeting of the Portuguese Robotics Open)*, FEUP Edições, Coleção Colectâneas, Vol. 14, April 23-24, 2004, ISBN 972-752-066-9
- Luís Paulo Reis, Nuno Lau, Carlos Carreto, Eduardo Silva: *Introduction to IROBOT 2005*, In Carlos Bento, Amílcar Cardoso, Gaél Dias (Eds.): Progress in Artificial Intelligence, 12th Port. Conf. on AI, EPIA 2005, Covilhã, Portugal, December 5-8, 2005, Proceedings. Vol. 3808, Springer LCNS, 2005, ISBN 3-540-30737-0
- Rui André Ferreira, Luís Paulo Reis and Nuno Lau, *Situation Based Communication for Coordination of Agents*, Reis, L.P. et al. editores, Proceedings of the Scientific Meeting of the Portuguese Robotics Open 2004, FEUP Edições, Coleção Colectâneas, Vol. 14, pp.39-44, April 23-24, 2004, ISBN 972-752-066-9
- Luis Mota, Luís Paulo Reis and Hans-Dieter Burkhard. *Communication Challenges Raised by Open Co-Operative Teams in RoboCup*. Estela Bicho et al. (eds.) Proceedings of the Scientific Meeting of the Portuguese Robotics Open 2006, Guimarães, Portugal, April, 2006
- André Scolari Conceição, A. Paulo Moreira, Luís Paulo Reis and Paulo J. Costa. *Architecture of Cooperation for Multi-Robot Systems*, 1st IFAC Workshop on Multivehicle Systems (MVS'06), Bahia Convention Center, Salvador, Brazil, October 2 – 3, 2006
- 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
- João Certo, Nuno Cordeiro, Francisco Reinaldo, Luís Paulo Reis and Nuno Lau, *FCPx: A Tool for Evaluating Teams' Performance in RoboCup Rescue Simulation League*, in Gelbukh, A. and Reyes-Garcia, C. eds, Special Issue: Advances in Artificial Intelligence, Research in Computing Science, Vol. 26, pp.137-148, November 2006, ISSN: 1870-4069
- Pedro Miguel Faria, Rodrigo A. M. Braga, Eduardo Valgôde e Luís Paulo Reis. *Interface framework to drive an intelligent wheelchair using facial expressions*. IEEE International Symposium on Industrial Electronics (ISIE 2007). pp. 1791-1796. Vigo, Spain. June 4–7, 2007. ISBN: 1-4244-0755-9
- Pedro Miguel Faria, Rodrigo A. M. Braga, Eduardo Valgôde e Luís Paulo Reis. *Platform to Drive an Intelligent Wheelchair using Facial Expressions*. Proceedings 9th International Conference on Enterprise Information Systems - Human-Computer Interaction (ICEIS 2007). pp. 164-169. Funchal-Madeira, Portugal. June 12–16, 2007. ISBN: 978-972-8865-92-4

- 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

Detailed CV:

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

Nuno Lau

Name: José Nuno Panelas Nunes Lau

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Email: lau@det.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

Supervising experience:

- 1 Phd student, Porto University
- 1 Msc Students, Aveiro University
- 1 Msc Student, Porto University
- 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)

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 Committee, 5 Dez 2005
- CiberMouse@RTSS2006 Robotic, Cyber Robotic Competition at Real-Time Systems Symposium, Rio de Janeiro, 2006
- IROBOT'2007 – 2nd International Workshop on Intelligent Robotics, EPIA – Portuguese Conference on Artificial Intelligence, Guimarães, Dec 2007

Publications and Communications:

- 1 Thesis, 2 international journal papers, 7 book chapters/series, 12 national journal papers, 33 papers in conference proceedings

Program/Scientific Committee in Conferences:

- 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)

Principal Awards and Prizes:

- 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, 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
- Rui André Ferreira, Luís Paulo Reis and Nuno Lau, "Situation Based Communication for Coordination of Agents", Actas do Encontro Científico – 4º Festival Nacional de Robótica – Robótica 2004, págs 39-44, 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 Coradeschi, 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, Minoru Asada, Tucker Balch, Raffaelo D'Andrea, Masahiro Fujita, Bernhard Hengst, Gerhard Kraetzschmar, Pedro Lima, Nuno Lau, Henrik Lund, Daniel Polani, Paul Scerri, Satoshi Tadokoro, Thilo Weigel and Gordon Wyeth, "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>

A. Fernando Ribeiro

Name: Antonio Fernando Macedo Ribeiro

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Academic Degrees:

- PhD, 1995 in Rapid Prototyping using metals, at Cranfield University, Cranfield (United Kingdom), PhD thesis "Rapid Prototyping using Gas Metal Arc Welding", awarded with the "Rolls Royce Aerospace group prize"
- MSc, 1992, at Cranfield Institute of Technology, Cranfield (United Kingdom) on Industrial Robotics with the thesis "Development of Image Processing Tools for Measurement of Beam Straightness".
- Licenciatura, 1988, in Information Technology & Computer Science / Applied Mathematics at Universidade Portucalense in Oporto (Portugal)

Present Position:

- Associate Professor at MINHO University (DEI), since April 2003
- Researcher at Algoritmi centre, since December 1995
- Co-Director of the Algoritmi research centre

Past Positions:

- Invited Associate Professor at Universidade Portucalense, until Oct 1998

Pedagogical and Divulgation Activities:

- Disciplines: Industrial Robotics, Logic Programming, Microprocessors II, Labs and Integrated Practical works (I and II).
- Participation in more than 20 divulgation actions at University of Minho (including Feira de Ciência e Tecnologia, Mostras de Ciência, Ensino e Inovação da UM, Exposições, Semanas Abertas da UM and Talks in Superior/Secondary Schools).

Supervising experience:

- 2 PhD Thesis, 4 MSc Thesis, 12 Integrated MSc Thesis – Bologna, 57 final degree (licenciatura) projects

Research Interests:

- Autonomous Robotics, Industrial Robotics, Robotic Soccer, Intelligent Robotics, Logic Programming.

Research Projects:

- AutoReb – rebarbagem automática de peças metálicas – Projecto orçado no valor de 80 mil contos. Participou na proposta deste projecto e no seu desenvolvimento durante dois anos. Este projecto tinha como objectivo uma aplicação industrial que através de processamento de imagem e de um robot de braço manipulador conseguisse retirar as rebarbas de peças metálicas saídas de uma fundição. Liderou dois bolseiros licenciados que trabalharam neste projecto durante dois anos. O projecto decorreu de 1998 a 2000 e foi financiado pelo Praxis.
- MINHO - Equipa de Robots Futebolistas - Lidera o projecto que decorre desde 1998, no Departamento de Electrónica Industrial, e auto-financiado, do qual é orientador e responsável. Este projecto consiste no desenvolvimento da parte mecânica, electrónica e informática, de um conjunto de robots móveis e autónomos capazes de cooperar entre si de modo a permitir um trabalho de equipa, com a finalidade de jogar futebol contra outras equipas. Este projecto permitiu já várias participações em competições internacionais, bem como várias entrevistas em canais de Televisão Portugueses e estrangeiros.
- Sistema de Comunicações sem fios para robots móveis autónomos - Projecto em conjunto com o Departamento de Sistemas de Informação, Projecto decorreu em 1999 e 2000 e foi financiado pelo Algoritmi.
- AUTOLASER - Sistema laser para medição de curvaturas usadas na caracterização de tensões residuais em filmes finos. Coordenador do projecto, desenvolvido para o Departamento de Física da Universidade do Minho com o Prof. Filipe Vaz e Prof. Manuel Victor Moreira.
- “PR-22” CRIANDO CAMINHOS DE FUTURO – Projecto financiado pela FCT no valor de 9,000€, e cujo responsável é Manuel Filipe Costa do Departamento de Física, e que visa a criação de um conjunto de equipas de construção de robots móveis autónomos para participar no RoboCup Junior League em 2004 em Portugal.
- “PR-15” CRESCER APRENDENDO. APRENDER CONSTRUINDO – Projecto financiado pela FCT no valor de 13,000€, e cujo responsável é Manuel Filipe Costa do Departamento de Física, e que visa a criação de um conjunto de equipas de construção de robots móveis autónomos para participar no RoboCup Junior League, em 2004 em Portugal.
- “PR-14” AVENTURAS À DESCOBERTA DO FUTURO – Projecto financiado pela FCT no valor de 9,500€, e cujo responsável é Manuel Filipe Costa do Departamento de Física, e que visa a criação de um conjunto de equipas de construção de robots moveis autónomos para participar na Iniciativa RoboCup Junior League que se realiza em 2004 em Portugal. No espírito do Programa Ciência Viva, a nossa actividade pedagógica centra-se em actividades de exploração experimental hands-on realizadas de forma autónoma e responsável pelos próprios alunos. Aos alunos será dada formação básica nos domínios da Robótica e Inteligência Artificial.
- Development of Robotic Football Team for participation in the RoboCup (Middle Size League) – Projecto POSI/ROBO/43892/2002 financiado pela FCT em 72000€ e responsável pelo projecto, e que visa a criação de uma equipas de futebol robótico através do uso de robots moveis autónomos Magellan da IRobot para participar no RoboCup’2004 que se realiza em 2004 em Portugal.
- "Hands-on Science" Projecto Europeu EU network referencia 110157-CP-1-2003-1-PT-COMENIUSC3, sendo o responsável Manuel Filipe Costa do Departamento de Física, e cujo objectivo deste projecto é promover o ensino experimental da ciência como uma forma de

melhorar a educação científica numa escola, e levar aprendizagem activa para a sala de aulas, através da realização de experiências "hands-on".

- Projecto proposto ao “Concurso de Ideias – Nortinov”, com o título “Veículos Totalmente Omnidireccionais”, no valor de 10,000€, tendo sido aceite. O Centro Algoritmi atribuiu verbas programáticas no valor de 66,666€ para ser usado nos anos 2005 e 2006, devido à notoriedade dos projectos de desenvolvimento em robótica móvel autónoma.
- “Robótica 2006” - Ciência Viva VI – número 1774, para a organização do Festival Nacional de Robótica – ROBÓTICA’2006, com o valor de 37,000€.
- “Robótica 2006” Projecto do Concurso Ciência Viva VI – número 1774, em colaboração com a Escola Secundária Francisco de Holanda de Guimarães, para a construção de vários robots móveis autónomos.
- “Robótica” Projecto do Concurso Ciência Viva VI – número 1684, em colaboração com a Escola Secundária Martins Sarmento de Guimarães, para a construção de vários robots móveis autónomos.

Organization of Scientific Meetings:

- Membro da Organização local do RoboCup’2004 a realizar em Portugal em Julho de 2004, exercendo as funções de local Chair da Middle Size League, desde 9 de Julho de 2001.
- Membro do RoboCup Organizing Committee (RoboCup’2003) realizado em Pádua (Itália) em Julho de 2003, exercendo as funções de RoboCup Middle Size League member desde Junho de 2002.
- Membro do RoboCup Organizing Committee (RoboCup’2004) realizado em Lisboa (Portugal) em Julho de 2004, exercendo as funções de RoboCup Middle Size League Local Chair, desde Julho de 2003.
- Membro do RoboCup Organizing Committee (RoboCup’2005) realizado em Osaka (Japão) em Julho de 2005.
- Chair do RoboCup’2007 Symposium, em Julho de 2007, Atlanta, EUA.
- Membro da Comissão Organizadora da Conferência RECPAD’96, realizada na Universidade do Minho, em Guimarães, de 21-22 de Março de 1996.
- Membro da Comissão Organizadora da Conferência Internacional 5th UK Mechatronics Forum International Conference and 3rd International Conference on Mechatronics and Machine Vision In Practice, realizada na Universidade do Minho, em Guimarães, de 18-20 de Setembro de 1996.
- Membro da Comissão Organizadora da Conferência Internacional do IEEE “ISIE’97”, realizada na Universidade do Minho, em Guimarães, 7 a 11 de Julho de 1997 (chairman em duas das sessões).
- Organizador da Workshop on Dynamic Approach to Behavioral, Neural and Robotics systems – Action, Perception and Cognition, realizada na Universidade do Minho, em Guimarães, de 22-31 de Julho de 1998.
- Levou a cabo durante 5 meses toda a organização logística de um “Festival Internacional de Ciência e Tecnologia” a realizar na Universidade do Minho em Guimarães, sendo forçado a desistir desta organização apenas por razões orçamentais. O orçamento previsto era da ordem dos 20 mil contos tendo conseguido financiamentos para cobrir cerca de metade do orçamento.
- Organizador da palestra de lançamento em Portugal dos LEGO MINDSTORMS, realizada na Universidade do Minho, em Guimarães, 20 de Outubro de 1999, e que contou com a presença do representante da LEGO Dinamarquês. Estiveram presentes as Escolas Secundárias do Concelho.
- Membro da Comissão Organizadora da Conferência Controlo’2000, realizada na Universidade do Minho, em Guimarães, de 4 a 6 de Outubro de 2000.
- Organizou e foi Chair de uma sessão especial sobre Mobile Robot Competitions, que contou com 5 artigos, na Conferência Controlo’2000, realizada na Universidade do Minho, em Guimarães, de 4 a 6 de Outubro de 2000.
- Organizador do 1º Campeonato Nacional de Futebol Robótico, realizado na Escola de Engenharia da Universidade do Minho, em Guimarães, a 17 de Novembro de 2000, e que contou com as equipas do Instituto Superior Técnico e da Faculdade de Engenharia do Porto.
- Organizador do Robótica’2001 - Festival Nacional de Robótica, realizado na Universidade do Minho, em Guimarães, de 25-28 de Abril de 2001, e que contou com a presença de 21 equipas nacionais das Universidades, Institutos Politécnicos e Escola Secundárias.
- Membro da Comissão Técnico-Científica do Robótica’2003 - Festival Nacional de Robótica, a realizar no Instituto Superior Técnico, em Lisboa, de 8-11 de Maio de 2003.

- Co-Organizador do 1º Encontro de Desporto Robótico, realizado no Multi-Usos de Guimarães, com a presença de dezenas de equipas de escolas secundárias, com provas de demonstração de robótica, de apuramento para participar no RoboCup'2004 Júnior.
- Membro do comité organizador do “1st International Conference on Dextrous Autonomous Robots and Humanoids”, May 19 - 21, 2005, Yverdon-les-Bains – Switzerland.
- Organizou actividades da semana temática da Electrónica Industrial inserida nas comemorações dos 25 anos da Escola de Engenharia, de onde se destaca a competição de Futebol Robótico.
- Membro da organização da FILTRUM organizada pelo Departamento de Electrónica Industrial da Escola de Engenharia da Universidade do Minho, realizada em 4 a 6 de Dezembro de 2002.
- Chair da organização do Robotica'2006 - Evento Nacional que recebeu mais de 800 participantes, e mais de 250 robots, e que decorreu de 128 de Abril a 1 de Maio de 2006, no pavilhão Multiusos de Guimarães.
- Organizador do Seminário "Robótica na Indústria e nos Serviços" com a revista ROBÓTICA, a 3 de Março de 2006 no auditório Nobre da Universidade do Minho (participação de mais de 300 pessoas).
- Organizou a palestra “Exploring Space” proferida pelo Prof. Calude Nicollier (Astronauta da ESA) que decorreu no auditório nobre da Universidade do Minho em 28 de Abril de 2006.
- Membro da organização do 3rd International Conference on “Hands on Science” HSci 2006, Portugal, 4 a 9 de Setembro de 2006, Universidade do Minho e IPJ (Braga). “...towards a better Science Education...”
- Chair da organização da primeira RoboParty, 23-25 de Março de 2007, pavilhão Desportivo da Universidade do Minho (Guimarães) - Evento Nacional que recebeu cerca de 400 participantes.
- Organizou a palestra sobre o “Microsoft Robotics Studio” dada pelo orador John Mandrell (CoroWare/Microsoft) em colaboração com a Sociedade Portuguesa de Robótica, que decorreu no dia 23 de Março de 2007 (com a participação de quase 600 pessoas).
- Co-chair do RoboCup'2007 Symposium, que decorreu a 9 e 10 de Julho de 2007 na cidade de Atlanta.
- Organizou no dia 21 de Março de 2007 o evento “prova de elegância robótica”, com transmissão televisiva em directo, onde foram exibidos 9 robôs móveis construídos na disciplina de Laboratórios e Prática Integrados I do 3º ano.

Publications and Communications:

- Edition of the RoboCup'2007 Symposium, Atlanta, EUA
- More than fifty Papers in International conferences and journals (see detailed CV)

Principal Awards and Prizes:

- Prémio Rolls-Royce - Aerospace Group Prize em Junho de 1996, atribuído à qualidade do seu trabalho de PhD na Universidade de Cranfield (Reino Unido).
- 27 de Setembro de 2003, recebeu o prémio Novas Tecnologias, na 1ª gala da juventude de Guimarães, organizada pela C.M.J.G / Cooperativa o Povo de Guimarães, prémio oferecido aos jovens vimaranenses que se destacam nas várias categorias, pelos trabalhos realizados em robótica.
- Prémio da Câmara Municipal de Guimarães – 24 de Junho de 2004 – Prémio impulso na educação pelo trabalho realizado nas novas tecnologias.
- Agraciado com o grau de Comendador da Ordem de Instrução Pública, atribuído por Sua Excelência O Presidente da República, Dr. Jorge Sampaio, em 10 de Junho de 2005, como reconhecimento da sua actividade científica e pedagógica na área da Robótica.
- Prémio Nortinov – Concurso de Ideias da Agência de Inovação, com o projecto “Veículos Totalmente Omnidireccionais” sendo um dos 30 projectos seleccionados de entre os 157 a concurso, com um prémio no valor de 10,000€.
- Prémio InventUMinho – 3º lugar - com o conceito criado no projecto “cadeira de rodas omnidireccional”, Junho de 2005.
- Prémio BES – área da saúde - 1º Classificado (entre 207 projectos) no Concurso Nacional de Inovação BES, com entrega do prémio no dia 5 de Dezembro de 2005 no Pavilhão de Portugal Parque EXPO, pelo Presidente do BES Dr. Ricardo Espírito Santo Silva Salgado e pelo Ministro da Economia e da Inovação Prof. Doutor Manuel Pinho.

- Medalha de mérito desportivo/científico, atribuída pela Câmara Municipal de Fafe, festa do desporto 2006, 4 de Outubro de 2006, pelo trabalho desenvolvido com a equipa de robots futebolistas.
- Prémio Eng. Jaime Filipe, Menção Honrosa, pelo trabalho desenvolvido com a cadeira de rodas omnidireccional, atribuído em 30 de Novembro de 2006.
- Third place at the GermanOpen 2004 RoboCup – Middle Size League, Paderborn, MINHO Team, April 2004
- Runner-up at the GermanOpen 2005 RoboCup – Middle Size League, Paderborn, MINHO Team, April 2005
- Runner-up at the GermanOpen 2006 RoboCup – Middle Size League, Paderborn, MINHO Team, April 2006
- Winner of Festival Nacional de Robótica – Robótica 2004 – Middle Size League, Porto, MINHO Team, April 2004
- Winner of Festival Nacional de Robótica – Robótica 2005 – Middle Size League, Coimbra, MINHO Team, April 2005
- Winner of Festival Nacional de Robótica – Robótica 2006 – Middle Size League, Guimarães, MINHO Team, April 2006
- Runner-up of Festival Nacional de Robótica – Robótica 2007 – Middle Size League, Paderne, MINHO Team, April 2007

Selected publications:

- Fernando Ribeiro, "RoboCup : The evolution of a Robotic Scientific Challenge", DARH'2005 – Dextrous Autonomous Robots and Humanoids, Yverdon-les-Bains, Switzerland, 19 - 22 May 2005, as invited paper.
- Fernando Ribeiro, "Robótica 2006", Revista Robótica, n.º. 63, 2º trimestre 2006, ISSN: 0874-9019, pag. 92-99.
- Fernando Ribeiro, Ivo Moutinho, Nino Pereira, Fernando Oliveira, José Fernandes, Nuno Peixoto, Antero Salgado "Cooperative Behaviour of specific tasks in multi-agent systems and robot control using dynamic approach", RoboCup2006 – Bremen, Team Description Paper, 2006.
- Paulo Flores, J. C. Pimenta Claro, Fernando Ribeiro, "Kinematics and Dynamics Study of a Hexapod Robotic System using Computational Packages' Capabilities", Revista Robótica, n.º. 66, 1º trimestre 2007, ISSN: 0874-9019, pag. 10-15.
- Fernando Ribeiro, "Empreender e Inovar em Portugal", Revista Robótica, n.º. 66, 1º trimestre 2007, ISSN: 0874-9019, pag. 24-25.
- Fernando Ribeiro, "ENIGMA – Cadeira de Rodas Omnidireccional ", Revista Robótica, n.º. 66, 1º trimestre 2007, ISSN: 0874-9019, pag. 50-51.
- Fernando Ribeiro, "Aprender a Brincar", e.ciência, CienciaNet.pt, publicação on-line, N.º 129, paginas 13-15, 8 de Março de 2007.
- F. Ribeiro, L.Tosini e G. Lopes, "Localization of a Mobile Autonomous Robot Based on Image Analysis", IEEE – The 7th Conference on mobile robots and competitions, Abril 2007, Paderne, Algarve, Portugal.
- Fernando Ribeiro, Ivo Moutinho, Nino Pereira, Fernando Oliveira, José Fernandes, Nuno Peixoto, Antero Salgado, "High accuracy navigation in unknown environment using adaptive control", RoboCup'2007 Symposium, Atlanta, USA, July 2007.
- Fernando Ribeiro, Nino Pereira, João Silva, Marco Ferreira, Tomé Silva, "Optimized robot strategy, ball filters and new referee whistle hardware filter", RoboCup2007 – Atlanta, Team Description Paper, 2007.

Detailed CV:

More detailed CV at: <http://www.dei.uminho.pt/~fernando/>