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Unidades de I&D : Programa de Financiamento Plurianual : Avaliação 2007

Sessão Aberta para o utilizador: LABORATÓRIO DE INTELIGÊNCIA ARTIFICIAL E CIÊNCIA DE COMPUTADORES a
16-04-2007 16:49:00 | Terminar Sessão

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Group Description	
Research Unit:	LABORATÓRIO DE INTELIGÊNCIA ARTIFICIAL E CIÊNCIA DE COMPUTADORES **uID:**27	(L700027)
Group Name/Designation:	Distributed AI and Robotics Group
Principal Investigador:	Eugenio da Costa Oliveira
Time Interval:	(2007-2010)
Location of Group (Host Institution):	Universidade do Porto
Keywords:	Software Agents; Multi-Agent Systems; Agent-base simulation; Agent-based Robotics
Funding, source, dates:	Past funding refers to NIAD&R group. FCT: 28700 Pluriannual 2003 24800 Pluriannual 2004 21000 Pluriannual 2005 29000 Pluriannual 2006 FCT: 56600 Pluriannual 2007 (estimated) Ongoing projects: A. Electronic Institution including Electronic Contracting for Virtual Organizations Pr. Nr: POSI/EIA/57672/2004; Duration: May 2005 - April 2007. Funding Entity: FCT/POSI; Funding: 40 000 EUR; Coord. at LIACC: E. Oliveira B. ABSES - Agent Based Simulation of Ecological Systems Pr. Nr: FCT/POSC/EIA/57671/2004; Duration: Apr 2005 - Oct 2007 Funding Entity: FCT/POSC; Funding: 75000 EUR; Coord. at LIACC: Luis P. Reis C. Control Strategies Characterization for Heterogeneous MAS Pr. Nr: GRICES/CAPES PROJECT; Duration: March 2005- March 2008 Funding Entity: GRICES (Pt) / CAPES (Br); Funding: Missions.; Coord. at LIACC: E. Oliveira D. RESCUE: Coordination of Heterogeneous Teams in Search and Rescue Scenarios Pr. Nr: FCT/POSC/EIA/63240/2004; Duration: May 2005 - Apr 2007 Funding Entity: FCT/POSC; Funding: 32800 EUR; Coord. at LIACC: Luis P. Reis

PI and Researchers
Researchers in the Group (Ph.D. Only)
(CV) Ana Paula Cunha da Rocha
(CV) Andreia Malucelli
(CV) Eugenio da Costa Oliveira
(CV) Francisco Jose de Oliveira Restivo
(CV) Luís Miguel Martins Nunes
(CV) Luis Paulo Goncalves Reis
(CV) Maria Benedita Campos Neves Malheiro
(CV) Rosaldo José Fernandes Rossetti

Other Researchers in the Group (Ph.D. Only)
n/a

Other Researchers in the Group (non Ph.D.)
(CV) Alexessander da Silva Couto Alves
(CV) André Monteiro de Oliveira Restivo
(CV) António Jesus Monteiro de Castro
(CV) António Manuel Correia Pereira
(CV) CÉLIA TALMA MARTINS DE PINHO VALENTE
(CV) Daniel Augusto Gama de Castro Silva
(CV) Henrique Daniel de Avelar Lopes Cardoso
(CV) Joaquim Fernando Fernandes da Silva
(CV) Luis Antonio Diniz Fernandes de Morais Sarmento
(CV) Luis Henrique Ramilo Mota
(CV) Pedro Manuel Correia de Abreu
(CV) Pedro Ricardo da Nova Valente
(CV) Rodrigo A Marques Braga
(CV) Rui Jorge Canelhas Bastos Neves
(CV) Vasco Hugo Vinhas Gonçalves Moreira

Objectives and Achievements

General Objectives

Distributed Artificial Intelligence & Robotics is LIACC's group affiliated with the Faculty of Engineering at UP. Our team includes, for the next period, 5 (plus 3 non residents) PhDs and about 15 Researchers. NIAD&R (the portuguese acronym for DAI&R) is mostly devoted to research in the area of Distributed AI and Agent-based Systems.

Although both the theoretical and practical aspects of Autonomous Agents as well as Multi-Agent Systems have been our broad areas of interest, our main motivation relies on improving models for agent-based systems interoperability, coordination and applications. Specific topics inside these areas are shown below:

(i) Developing an "Electronic Institution" for agent-based B2B operations, a software platform enabling safe and trusted agent-based business operations. This objective includes the development of appropriate models for B2B Adaptive Negotiation and Monitoring processes as well as to provide mechanisms enabling Agents' interoperability in the context of Virtual Enterprises Life Cycle .

(ii) Agents' Adaptation, Learning and Emotion-like architectures; Agents' intelligent processes mostly rely on learning capabilities and sophisticated architectures. The main goals of this research issue is to find answers to the following questions: 1-"(How) can several different, heterogeneous, Learning Agents improve their performance by exchanging information during their own learning process?"; 2-"Will it be possible to escape from usual utility-based decision functions, by using emotion-like features, in what agents decision-making is concerned?".

(iii) Multi-Agent teams' coordination and simulation; Strategies for coordinating teams of autonomous (or semi-autonomous) agents that perform in rich, dynamic, both cooperative and adversarial environments. For this objective, we are exploring new coordination protocols as well as methodologies for analyzing team behavior in a way that can be generalized for different application domains.

(iv) Multi-agent Systems applications and Intelligent Text Mining. We intend to develop algorithms to mine very large Data Bases of Portuguese text through semantic analysis and learning techniques. We also intend to use the Agent oriented programming paradigm to specify and implement solutions for application domains like airlines operations and Traffic Control.

Main Achievements

Main achievements in the previous referred period were:

(i) Current version of our proposed Agent-based software platform for Virtual Enterprises life cycle, already includes: Adaptive Negotiation protocol, Ontology-based services and preliminary Electronic Contracting. A prototype is running. The same negotiation protocol has been included in a Software Broker for the insurance domain.

(ii) Best paper award in Holonic and Multi-agent Technologies for Industrial Systems. Holonic and MAS track at INCOM'06, "An Approach to Inter-Organizational Workflow Management in an Electronic Institution". (Henrique L. Cardoso, Paulo Leitão, Eugénio Oliveira).

(iii) We have proposed a suitable architecture for "Emotion-like" based Agents. We have simulated a practical application in firefighting and we have proposed a new logic formalism for specifying E_BDI Agents that are simultaneously guided, in their

decision-making capabilities, by "Beliefs, Desires, Intentions" plus Emotion-like mechanisms.

(iv) We presented our conclusions on Multi-Agent Learning through advice. We have identified in which circumstances this kind of joint learning procedure is effective. A PhD thesis was successfully submitted (L. Nunes)

(v) Implementation of agent-based common framework suitable for controlling teams of cooperative robots for Robosoccer; very good performance at the Robosoccer competitions (in collaboration with IEETA/Aveiro U.): Simulation League 3D (World Champion 2006; European Champion 2006); Simulation League 2D (2nd Place European contest 2006); Coach Competition(2nd place World contest 2003, 2nd place 2004); Rescue Simulation League (European Champion 2006).

(vi) Design of realistic multi-agent simulator: EcoDynamo- Coastal Ecosystems Simulator;

(vii) We were able to design a new and promising direction for investigation for coping with Semantic analysis for information extraction purposes from text corpora.

(viii) We have designed a suitable Multi-Agent System for a real application on Operations control recovery for crew and plane scheduling .

(ix) We have successfully supervised 4 PhD theses and 11 Master of Sciences theses.

(X) We have published our work in some of the best conferences in the domain (AAMAS)

Productivity

Publications in peer review Journals (3000 ca.)
(Up to a max of 10. Always indicate at the end of the citation, impact factor of the journal (IF=) and number of citations (nº C=). Give title and full citation in original language. DO NOT translate)

IF= Impact Factor at ISI; NC=Nr of Citations ISI+Google Scholar Excluding Self-citations

1- Srinivasan, Ashwin; Page, David; Camacho, Rui; King, Ross. "Quantitative Pharmacophore Models with Inductive Logic Programming", Machine Learning Journal, Vol. 64, N. 1/2/3, pp 65-90, 2006, ISSN 0885-6125.
IF: 3.108; NC=0+1

2- Cardoso, Henrique; Oliveira, Eugénio; "Institutional Reality and Norms: Specifying and Monitoring Agent Organizations", International Journal of Cooperative Information Systems (IJCIS), Special Issue on "Emergent Agent Societies", World Scientific Publishing Company, Vol. 16, No. 1, pp. 67-95, ISSN 0218-8430.
IF: 1.371;

3- Nunes, Luís and Oliveira, Eugénio; "Advice-Exchange Between Evolutionary Algorithms and Reinforcement Learning Agents: Experiments in the Pursuit Domain", in Adaptive Agents and Multi-Agent Systems III: Adaptation and Multi-Agent Learning, Daniel Kudenko, Dimitar Kazakov, Eduardo Alonso (eds.), Lecture Notes in Computer Science, V. 3394, pp.185-204, 2005.
IF: 0.402 ; NC:1+1

4- Sarmento, Luís. "SIEMÊS - a Named-Entity Recognizer for Portuguese Relying on Similarity Rules", in R. Vieira, P. Quaresma, M. das Graças Volpe Nunes, N. J. Mamede, C. Oliveira e M. C. Dias, (eds) Proceedings of the 7th International Workshop on Computational Processing of the Portuguese Language, PROPOR 2006, Lecture Notes in Computer Science V. 3960, Springer, pp. 90-99, 2006
IF: 0.402; NC=0+4

5-Oliveira, E. and Sarmento, L., "Emotional Advantage for Adaptability and Autonomy", in Autonomous Agents and Multiagent Systems (AAMAS03), pp.305-312, Eds. J.Rosenschein, T.Sandholm, M.Wooldridge, M.Yokoo, ACM Press, Melbourne, Australia, July 2003.
NC=0+10

6-Cardoso, Henrique Lopes; Oliveira, Eugénio, Towards an Institutional Environment using Norms for Contract Performance, in M. Pechoucek, P. Petta & L. Z. Varga (eds.), Multi- Agent Systems and Applications IV - 4th International Central and Eastern European Conference on Multi-Agent Systems (CEEMAS 2005), Lecture Notes in Artificial Intelligence, V. 3690, Springer, ISBN 3-540-29046-X, pp. 256-265, 2005.
IF: 0.402 ; NC=0+5

7- Nunes, Luís and Oliveira, Eugénio,"Cooperative learning using Advice Exchange", Lecture Notes in Artificial Intelligence- Hot Topics Sub-Series, V.2636, pp.33-48, Eds. E.Alonso, D.Kazakov, D.Kudenko, Springer, 2003.
IF: 0.302; NC: 1+3

8- Malucelli, Andreia and Oliveira, Eugénio. "Ontology-Services to Facilitate Agents' Interoperability", in Intelligent Agents and Multi-Agent Systems, Eds. J. Lee, Mike Barley Lecture Notes in Artificial Intelligence 2891. pp. 170-181. Springer, November 2003. (CI-ISI)
IF: 0.302; NC: 1+3

9- Nogueira, Luis and Oliveira, Eugénio, "A Multi-Agent System for E-Insurance Brokering", in Agent technologies, Infrastructures, tools and Applications for e-Services, Eds. R.Kowalczyk, R.Muller, H.Tianfield, R.Unland, Lecture Notes in Artificial Intelligence, V.2592, Springer, 2003.

IF: 0.302 ; NC: 2+3

10- Cardoso, Henrique Lopes; Oliveira, Eugénio; Virtual Enterprise Normative Framework within Electronic Institutions, in M.-P. Gleizes, A. Omicini & F. Zambonelli (eds.), Engineering Societies in the Agents World V, (also in Lecture Notes in Artificial Intelligence V. 3451, Springer, pp.14-32), 2005.

IF: 0.302; NC: 0+5

Other publications (3000 ca.)

(Include only Books, chapters or full papers published in conference proceedings up to max of 10. Give title and full citation in original language)

NC Nr. of Citations in Google Scholar Excluding Self-citations.

1- Malucelli, Andreia; Palzer, Daniel; Oliveira, Eugénio. "Ontology-based Services to help solving the heterogeneity problem in e-commerce negotiations". in Journal of Electronic Commerce Research and Applications - Special Issue Electronic data engineering: the next frontier in

e-commerce. Vol. 5(1), pp. 29-43, Elsevier, 2006.

2- Sarmento,Luís; Pinto, Ana Sofia; Cabral, Luís. "REPENTINO - A collaborative widescope gazetteer for Entity Recognition in Portuguese", in R. Vieira, P. Quaresma, M. das Graças Volpe Nunes, N. J. Mamede, C. Oliveira e M. C. Dias, (editors) Proceedings of the 7th International Workshop on Computational Processing of the Portuguese Language, PROPOR 2006, Lecture Notes in Computer Science, V. 3960, Springer, pp. 31-40, 2006. IF: 0.402; NC=1

3- Malucelli, Andreia and Oliveira, Eugénio, Towards to Similarity Identification to help in the Agents' Negotiation, in Advances on Artificial Intelligence, LNAI, Vol. 3171, pp. 536-545, Springer-Verlag, 2004. IF=0.302 NC=3

4- Rossetti, R.J.F.; Liu, R. "An agent-based approach to assess drivers' interaction with pre-trip information systems". Journal of Intelligent Transportation Systems: Technology, Planning, and Operations, V.9, n.1, pp.1-10, 2005.

5- Oliveira, Eugénio and Nunes, Luis," Learning by Exchanging Advice, in Design of Intelligent Multi-Agent Systems", Ed. R. Khosla, N. Ichalkaranje, L. Jain, Studies in Fuzziness and Soft Computing Series, Chapter 9, pp. 279-314, Springer, 2004. IF=0.402 NC=1

6-Nunes, Luís and Oliveira, Eugénio, "On Learning by Exchanging Advice", AISB JOURNAL, The Interdisciplinary Journal of Artificial Intelligence & the Simulation of Behaviour, V. 1, Nr. 3, London, 2003. NC=2

7-Cardoso, Henrique Lopes; Oliveira, Eugénio; Assisting and Regulating Virtual Enterprise Interoperability through Contracts, in K. Fischer, A. Berre, K. Elms & J. P. Muller (eds.), Proceedings of AAMAS2005 Workshop Agent-based Technologies and applications for enterprise interOPerability, pp. 1-12, Utrecht, The Netherlands, July 25th 2005.NC=1

8- Nunes, Luís; Oliveira, Eugénio, Learning from Multiple Sources, Proc. of the 3rd International Joint Conference on Autonomous Agents and Multiagent Systems, NY USA, ACM Press, pp. 1106-1114, July 2004. NC=2

9- Certo, João; Cordeiro,Nuno; Reinaldo, Francisco; Reis, Luís Paulo; Lau, Nuno. "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.

10-Nogueira, Luís and Oliveira, Eugénio, "Brokering in Electronic Insurance Markets", in Multi-Agent Systems and Applications III, Eds V.Marik, Jorg Muller, M.Pechoucek, Lecture Notes on Artificial Intelligence 2691, pgs.574-584, Springer, 2003. IF=0.302 NC=1

Master and Ph.D. thesis completed (3000 ca.)

PhD Thesis completed:

1- Nunes, Luis, "Learning from Multiple Sources in Heterogeneous Groups of Agents", PhD

in Computer Science and Engineering, Faculty of Engineering at the University of Porto, April 2006 (Supervisor Eugénio Oliveira).

2- Reis, Luís Paulo, Coordination in Multi-Agent Systems: Applications to University Administration and Robsoccer (Coordenação em Sistemas Multi-Agente: Aplicações à gestão Universitária e ao Futebol Robótico). PhD in Electrical and Computers Engineering, Faculdade de Engenharia da Universidade do Porto, 2003. (Supervisor, Eugénio Oliveira).

3- Malucelli, Andreia, "Ontology-based Services for Agents Interoperability", PhD in Computer Science and Engineering, Faculty of Engineering, University of Porto, October 2006 (Supervisor Eugénio Oliveira).

4- Fonseca, Nuno A. "Exploiting Parallelism in Inductive Logic". PhD in Computer Sciences, Faculty of Sciences, University of Porto, October 2006, (Co-supervisor Rui Camacho).

Master Thesis completed

5- Moura, Daniel Cardoso. "Learning Capabilities of Emotion-based Agents". MSc in Artificial Intelligence and Intelligent Systems, (FEUP, FEP), 2006, (Supervisor Eugénio

Oliveira).

6- Raimundo, Marta. "Sistema de Aprendizagem Baseado na Educação Real S.A.B.E.R", MSc in Artificial Intelligence and Intelligent Systems, (FEUP,FEP), 2006, (Supervisor Eugénio

Oliveira).

7- Cardoso, Paulo César Basto. "Personal Assistant for Selecting VoIP Services", MSc in Redes e Serviços de Comunicação (FEUP), July 2006, (Co-supervisor L.P.Reis).

8- Restivo, André Monteiro Oliveira. "Dynamic Scenario Simulation Optimization", MSc in Artificial Intelligence and Intelligent Systems (FEUP, FEP), October 2006, (Supervisor L.P.Reis).

9- Cardoso, Nuno Francisco Pereira Freire. "Avaliação de Sistemas de Reconhecimento de Entidades Mencionadas", MSc in Artificial Intelligence and Intelligent Systems, (FEUP,FEP),

December 2006, (Supervisor Eugénio Oliveira).

10- Pereira, Guilherme. "Agent-mediated Travel Agency". MSc in Artificial Intelligence and Intelligent Systems, Master in Artificial Intelligence and Computer Science (FEUP,FCUP,FEP) 2006,(Supervisor Eugénio Oliveira).

11- Sarmento, Luis Morais, "An Emotion-Based Agent Architecture", MSc on Artificial Intelligence

and Computer Science, (FEUP,FCUP,FEP) University of Porto, 2004. (Supervisor, Eugénio Oliveira).

12- Alves, Alexessander Couto, "Internet Traffic Engineering: An Artificial Intelligence Approach",

MSc in Informatics, Faculty of Sciences UP, Porto, 2004. (Supervisors, Eugénio Oliveira and Rui Camacho).

13- Louro, Sérgio, "MAICC: Sistema Multi-Agente para Controlo de Câmaras Inteligentes" (MAICC: Multi- Agent System for Intelligent camera control), MSc on Artificial Intelligence

and Computer Science, (FEUP,FCUP,FEP) University of Porto, 2004. (Supervisors, Eugénio Oliveira and Luis P. Reis).

14- Dias, Pedro José, Adaptive Multi-Agent System for Traffic Control Management (Sistema Multi-Agente para Gestão de trânsito em cenários de complexidade média), Master Thesis, submitted to University of Trás-os Montes e Alto-Douro, December 2003. (Supervisor, Eugénio Oliveira).

15- Proença, Hugo Pedro Martins C., MARCS- Multi-Agent System for Train Traffic Control (MARCS-Sistema Multi-Agente para controlo de tráfego Ferroviário), MSc on Artificial Intelligence and Computer Science, (FEUP,FCUP,FEP), University of Porto, November 2003. (Supervisor, Eugénio Oliveira).

Patents/propotypes (2000 ca.)

It is not usual in our research area, for academic researchers to submit patents. However, we have specified and design models as well as implemented software systems in the form of prototypes that have been demonstrated and reported.

- ForEV V.2.0: Virtual Enterprise Formation Platform. An Agent-based tool and platform enabling multi-attribute, adaptive negotiation between enterprises aiming at forming

a temporary consortium (V. E.) Now in JADE and Java. A.P. Rocha, H.L.Cardoso, E.Oliveira,R.Neves, (new version), 2006.

- PyroSim V.1.3. A simple Graphical Simulator for "Emotion-like" based Agents evolving in a

Fire Combat scenario. L. Sarmento, D. Moura, (new version), 2006.

- Agent-based Ontology Services, A. Malucelli, (new), 2006.

- "Dynamic Scenario Simulation Optimization", A. Restivo, L. P. Reis(new), 2006.

- "AFRANCI Tool" – Tool for easy development of behavior- based agent architectures, F.Reinaldo,

M. Siqueira, R. Camacho and L. P. Reis (new), 2006.

- "FC Portugal 2D" - Simulation 2D League Team - RoboCup - Version 2006. L. P. Reis and N. Lau, in collaboration with IEETA/UA, (new version), 2006.

- "FC Portugal 3D" - Simulation 3D League Team - RoboCup, L. P, Reis, N. Lau, J. Silva and A. Guimarães, (new version), 2006.

- "EcoDynamo" - Agent Based Coastal Ecosystems Simulator, P. Duarte, A. Pereira, L. P. Reis, in collaboration with CEMAS/UFP, (new version), 2006.

- "FC Portugal Rescue Team", J. Certo, N. Cordeiro, L. P. Reis, N. Lau, (new version), 2006.

- "BIAS- Brokerage in Insurance: An Agent-based System". Tool including a Broker Agent in the Insurance domain. V1.2, 2004. Nogueira, L. and E. Oliveira.

- " SIGA - Soccer Intelligent Game Analysis System". July 2005, A. Sousa, S. Torres, J. Bento

and L. P. Reis.
- FCPx - Rescue Teams Evaluation Tool, December 2005. N. Cordeiro, J. Certo and L. P. Reis.
- PyramidNet Tool - Modular and Hierarchic Neural Network-based Systems, December 2005. F. Reinaldo, R. Camacho, L. P. Reis.
- Virtual 3D: a Multi-Agent System for Visualizing RoboCup Simulation League Games with Intelligent Camera Control. 2004. S. Louro.
- MARCS- Multi-Agent Simulation System for Train Traffic Control, 2004. H. Proença.
- FCPortugal Coach 2003: A Coach for MAS simulated Robosoccer Team. 2003. Reis, Luís P.; Lau, N.
- Visual Debugger v2.0 - Agent Behavior Analysis Tool. 2003. Lau, N. and Reis, L. P.

Organization of conferences (2000 ca.)

- IEEE/WIC /ACM International Conference on Intelligent Agent Technology, Hong Kong, Dec2006 (Vice Co-Chair Eugénio Oliveira).
- 17th European Conference on Machine Learning and the 10th European Conference on Principles and Practice of Knowledge Discovery in Databases, Berlin, September 2006. (R. Camacho, Steering Committee).
- AAMAS04 Workshop "Learning and Evolution in Agent Based Systems", Columbia University,
New York, 2004 (Organisation Committee , Eugénio Oliveira).
- BESAI2004 - Binding Environmental Sciences and Artificial Intelligence. ECAI Workshop, Valencia, Spain, 2004. (Organisation Committee , Eugénio Oliveira).
- "Special Track" in "Holonic and Multi-Agent Technologies for Industrial Systems", 12nd IFAC Simposium on "Information Control Problems in Manufacturing", Saint Etiènne, May, 2006. (Co-Chair Eugénio Oliveira)
- IROBOT2005 - 1st International Workshop on Intelligent Robotics, EPIA - Portuguese Conference on AI, Covilhã, Portugal, December, 2005 (Workshop Chair L. P. Reis).
- MASTA2005 - 3rd Workshop on Multi-Agent Systems Theory and Applications, EPIA - Portuguese Conference on AI, Covilhã, Portugal, December,2005 (Workshop Chair L. P. Reis).
- BAOSW- Introduction to Building and Applying Ontologies for the Semantic Web, EPIA - Portuguese Conference on AI, Covilhã, Portugal, December,2005 (Workshop Chair A. Malucelli).
- IEEE/WIC/ACM International Conference on Intelligent Agent Technology, WIC-IAT, Compiègne, France, September, 2005. (Vice-Chair Eugénio Oliveira).
- AC 2005- Workshop on Affective Computing, EPIA - Portuguese Conference on AI, Covilhã, Portugal, December,2005 (Organisation Committee, Eugénio Oliveira).
- Encontro Nacional de Robótica, Porto, 2004 (Luis Paulo Reis).
-"Agents and Multi-Agent Systems" in 10th ISPE Int. Conference on Concurrent Engineering - Enhanced Interoperable Systems, July 2003, Madeira Island. (Track Chair, E.Oliveira).
- Concurso Encontro Nacional de Programação em Lógica e Funcional/ Meeting of Logic and
Functional Programming. Faculty of Engineering of Porto, May 5-7 2006 (Co-organizer, L. P. Reis).
- 1st Conference on Scientific Research Methodologies (CoMIC'06), Doctoral Program in Informatics Engineering, 9th January 2006, FEUP, Portugal. (H. Cardoso, L. Sarmento, C. Martins).

Industry contract research (2000 ca.)

TAP- Portuguese Airlines: Joint research on Multi-Agent Systems paradigm applied to crew and plane scheduling disturbances management.
I2S- Information Systems for the Insurance Domain. We made our BIAS (Agent-based Broker for the Insurances domain) available to that large regional software company.

Internationalization (2000 ca.)
(Collaborative publication, Research, Graduate Training Networks or other forms of participation of the Research Group at the international level)

Co-founders of AgentLink Network of Excellence funded by the E. U. We were pro-actively involved in two different SIGs : Agent Mediated Electronic Commerce and Agents that Learn Adapt and Discover.
L. Sarmento was in Norway at SINTEF and at the U. of Amsterdam with ILPS group. He is now, for six months, with GOOGLE in NY.
With SINTEF, Norway, we collaborate through joint supervision of MSc theses.
We belong to the Editorial Board of the following Journals: "Autonomous Agents and Multi-agent Systems", (E. Oliveira); "Agent Oriented Software Engineering", (E. Oliveira); "Computational Intelligence", "Enformatika", (L.P. Reis); "Frontiers in AI and its

Applications" sub-series (E. Oliveira);

FCPortugal Robosoccer teams are well known in the international arena. Luís P. Reis belonged to the Technical Committee in 2003 for the RoboCup Simulation League . He also gave an invited talk at Mexican Robotics Conference, 2005.

With Brazilian Universities we organize conferences and supervise PhDs (U. Católica Curitiba, U. Minas Gerais, UFRGS). We coordinated a bi-lateral project with Prof. Ana Bazzan's group at UFRGS.

We have co-organized workshops collocated with the main congress on agents (AAMAS) together with Prof. Sandip Sen "Learning and Evolution in Agent Based Systems", NY, 2004, with Dr. Klaus Fisher "ATOP- Agent-based Technologies and applications for enterprise interOPerability, Utrecht, 2005. Also with Prof. M. Oprea BESAI- Binding Environmental Sciences and Artificial Intelligence, Valencia, (ECAI2004).

Collaboration with the Univ. of York (D. Kudenko), U.Berlin (HD Burkhard),ENMSE,France(O.Boissier), Sobolev Inst. of Mathematics, Russian Academy of Sciences, Novosibirsk.

Joint work is being carried out with U. Leeds, UK, by R. Rossetti on agent-based traffic management. Several papers on ILP have been co-authored by R. Camacho and international colleagues.

Recognition was obtained through the Best paper award at INCOM'06 (E. Oliveira et al) and the nomination for the best paper at CIA'03- Cooperating Information Agents Workshop, Helsinki, 2003. (L.Nunes and E.Oliveira).

Students from the University of Trier in Germany and from U. Madrid, have done their graduation thesis in our group.

Eugénio Oliveira gave an Invited talk at ISAPS, Greece 2003, and Invited Seminars at CGII-ENM Saint-Étienne, France, and DFKI, Saarbrucken, Germany 2003.

We have also participated in 55 PCs of International Scientific meetings.

Participation in "`Join the RoboLution BEST Course"', September 2006. (L.P.Reis, E. Oliveira).

One of our students was at the Imperial College with Igor Alexander group on Neural Networks and a joint paper has been published.

Future Research

Objectives

Improving models for agent-based systems interoperability coordination and applications. Specific topics inside these areas:

- Electronic Institution for agent-based B2B interoperability

Research direction: Developing further an Electronic Institution (EI) for safe and trusted agent-based business operations.

Research goals:

- To deliver a web-based EI (using JADE) comprising services assisting agents' interaction during Virtual Enterprise life-cycle: negotiation mediation, ontology mapping, contract drafting, contract monitoring and enforcement, and reputation indices.

- To define a computational representation of electronic contracts suitable for automatic B2B operations monitoring in the context of the EI

- Instantiating the generic contract model considering appropriate case-studies.

- To develop partners' trust and reputation models to be included in the EI platform. Studying of learning processes for Norm evolution.

- Agents' Adaptation, Learning and Emotions

Research direction: Multi-agent learning processes on one hand and, on the other hand, "emotion-like features" driven architectures.

Research goals:

- To study the effects of communication during learning in teams of agents for a Traffic Control simulation based on real data.

- Modeling emotion-based agent architectures; After introducing E_BDI Logics we intend to validate the approach both for agent's decision-making and for the overall agents' team performance.

- Multi-Agent Coordination, Simulation and Cooperative Robotics

Research direction: Coordinating teams of agents that perform in rich, dynamic, both cooperative and adversarial environments.

Research goals:

- Improving EcoDynamo calibration agent for Coastal Ecosystems Simulator.

- Graphical tool for designing team strategies with an associated source code generator enabling a generalized use of our agent's strategic layer in the context of RoboCup and other cooperative domains.

- Intelligent Robotics

Research directions: In cooperation with IETTA, to develop real and simulated robot teams for competitions, and methodologies for analyzing individual and team performance in complex tasks. To design an intelligent wheelchair for individuals with cerebral paralysis and quadriplegia.

Research goals:

- participation in the next RoboCup and European RoboCup with our simulated and robotic teams for soccer and rescue competitions.

- methodologies for automatic game analysis and player models automatic creation. Improvement of players detection and tracking system.

- Improvement of the wheelchair vision system to better perform in outdoor environments or rough lighting conditions.

- Text Mining and Agent-based Systems applications

Research directions: We intend to build up algorithms to mine very large Data Bases of portuguese text. Research goals:

- To develop machine learning based methods for semantic analysis, namely sets of rules, specialized lexicons and gazetteers. We will focus on bootstrapping methods generalizing from a set of seed examples.

- development of automatic question-answering systems.

- Control Strategies for Heterogeneous MAS

Research goals:

- To extract good Traffic control strategies emerging from heterogeneous agent s interaction.

- Modeling driver behaviors in simulated scenarios. To test and assess different control strategies.

- A New Agent Architecture as well as an improved AOSE methodology suitable for Disruption Management for Air Traffic.

Funding, source, dates

(2007): FCT Pluriannual: 56,600

Ongoing projects:

A. Electronic Institution including Electronic Contracting for Virtual Organizations

Pr. Nr: POSI/EIA/57672/2004; Duration: May 2005 - April 2007.

Funding Entity: FCT/POSI; Funding: 40 000 EUR; Coord. at LIACC: E. Oliveira

B. ABSES - Agent Based Simulation of Ecological Systems

Pr. Nr: FCT/POSC/EIA/57671/2004; Duration: Apr 2005 - Oct 2007

Funding Entity: FCT/POSC; Funding: 75000 EUR; Coord. at LIACC: Luis P. Reis

C. Control Strategies Characterization for Heterogeneous MAS

Pr. Nr: GRICES/CAPES PROJECT; Duration: March 2005- March 2008

Funding Entity: GRICES (Pt) / CAPES (Br); Funding: Missions.; Coord. at LIACC: E. Oliveira

D.RESCUE: Coordination of Heterogeneous Teams in Search and Rescue Scenarios

Pr. Nr: FCT/POSC/EIA/63240/2004; Duration: May 2005 - Apr 2007

Funding Entity: FCT/POSC; Funding: 32800 EUR; Coord. at LIACC: Luis P. Reis

Waiting for Funding decision:

E.SMARTER: Software for Multiple Autonomous Robots Technology for Exploration and Rescue Applications

Dur.: 36 m; Fund. Entity: European Union; Fund.: 220 000 EUR; Coord. at LIACC: E. Oliveira.

F+G+H. 3 projects submitted to FCT in 2006.

Previous publications in the area

- Cardoso, Henrique; Oliveira, Eugénio; "Institutional Reality and Norms: Specifying and Monitoring Agent Organizations", International Journal of Cooperative Information Systems (IJCIS), Special Issue on "Emergent Agent Societies", World Scientific Publishing Company, Vol. 16, No. 1, pp. 67-95, ISSN 0218-8430.

- Certo, João; Cordeiro,Nuno; Reinaldo, Francisco; Reis, Luís Paulo; Lau, Nuno. "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.

- Sarmento, Luís. "SIEMÊS - a Named-Entity Recognizer for Portuguese Relying on Similarity Rules", in R. Vieira, P. Quaresma, M. das Graças Volpe Nunes, N. J. Mamede, C. Oliveira e M. C. Dias, (eds) Proceedings of the 7th International Workshop on Computational Processing of the Portuguese Language, PROPOR 2006, Lecture Notes in Computer Science V. 3960, Springer, pp. 90-99, 2006

- Pereira, D.; Oliveira E.; Moreira, N. "Modelling Emotional BDI Agents", in Formal Approaches to Multi-Agent Systems, Barbara Dunin-Keplicz and Rineke Verbrugge (eds.), ECCAI Workshop Proceedings, pp.47-62., Riva del Garda, Italy.

- Rossetti, R.J.F.; Liu, R. "An agent-based approach to assess drivers' interaction with pre-trip information systems". Journal of Intelligent Transportation Systems: Technology, Planning, and Operations, V.9, n.1, pp.1-10, 2005.

Special Requirements

We need more FCT scholarships for researchers working in projects as well as for PhD

students and Post-docs.
LIACC groups still are disperse in different locations and campuses. We could benefit from a single premiss for our joint research.