

AJUDA

[Início](#) › [Avaliação de Unidades 2013](#) › Submissão de Candidatura**AVALIAÇÃO DE UNIDADES 2013****1. IDENTIFICATION OF THE R&D UNIT****Programas Doutoramento****Avaliação de Unidades 2013**

Registo de Unidade
 Confirmação na Equipa
 Confirmação na Fusão

Submissão de Candidatura**1. Identification**

2. Institutions

PART A

3. Achievements

4. Funding

5. Indicators

PART B

6. Scientific Component

7. Expected Indicators

8. Research Team

9. Research Groups

10. Thematic Lines

11. Budget 2015/2020

12. Budget Rationale

13. Reviewers proposed

14. Validation

15. Locking

Declarações de compromisso

Confirmar CV/ORCID

Documentação

Infraestruturas - Roteiro**Guia de Utilização****Delegadas pela Instituição:**

LIACC/UP

Delegação de Acesso**Projectos Estratégicos****Financiamento Plurianual**

1.0 Reference

27

1.1 Name of the R&D Unit

Artificial Intelligence and Computer Science Laboratory

1.2 Acronym

LIACC

1.3 Coordinator

Eugenio da Costa Oliveira

1.4
Multidisciplinary/interdisciplinary
R&D Unit

No

SCIENTIFIC AREASComputer Science and Engineering (**Main Scientific Area**)

1.5 Profile of the R&D Unit

10

% Basic research

90

% Applied research and/or Experimental development

1.6 Keywords

Multiagent Systems

Agents coordination and simulation

Software reliability and declarativeness

Text Mining

1.7 Link to the R&D Unit's page
on the Internet

http://www.liacc.up.pt/

1.8 Unit registration options

Keep

Continue

Fundação para a Ciência e a TecnologiaAvenida D. Carlos I, 126
1249-074 Lisboa - Portugal
+351 213 924 300 - pct@fct.pt

AJUDA

[Início](#) › [Avaliação de Unidades 2013](#) › Submissão de Candidatura

AVALIAÇÃO DE UNIDADES 2013

2. INSTITUTIONS AND THEIR ROLES

Programas Doutoramento

Avaliação de Unidades 2013

Registo de Unidade
 Confirmação na Equipa
 Confirmação na Fusão

Submissão de Candidatura

1. Identification

2. Institutions

PART A

3. Achievements

4. Funding

5. Indicators

PART B

6. Scientific Component

7. Expected Indicators

8. Research Team

9. Research Groups

10. Thematic Lines

11. Budget 2015/2020

12. Budget Rationale

13. Reviewers proposed

14. Validation

15. Locking

Declarações de compromisso

Confirmar CV/ORCID

Documentação

Infraestruturas - Roteiro

Guia de Utilização

Delegadas pela Instituição:

LIACC/UP

Delegação de Acesso

Projectos Estratégicos

Financiamento Plurianual

2.1 Main Host Institution

Universidade do Porto (UP)

2.2 Other(s) Host Institution(s)

2.3 Participating Institution(s)

INSTITUTION NAME	HOST INSTITUTION
Faculdade de Engenharia da Universidade do Porto (FE/UP)	Universidade do Porto (UP)
Faculdade de Ciências da Universidade do Porto (FCUP/UP)	Universidade do Porto (UP)

2.4 Institutional commitment

LIACC administrative management is done through the University of Porto Rectory services support. Overheads coming from the Research Unit's budget assure this service through a specific office for projects management. Both Faculty of Engineering and Faculty of Sciences at the University of Porto made available research laboratories to accommodate the academic staff and the PhD and MSc students involved in LIACC activities. The same happens with other institutions that collaborate with LIACC. Most of the equipment LIACC members are using has been obtained through LIACC funding either directly from annual budget or by means of projects' funding, and it is permanently available at the university labs. All LIACC members have access to the research laboratories at the University of Porto.

Continue

AJUDA

[Início](#) › [Avaliação de Unidades 2013](#) › Submissão de Candidatura

Programas Doutoramento

Avaliação de Unidades 2013

- Registo de Unidade
- Confirmação na Equipa
- Confirmação na Fusão
- Submissão de Candidatura**
 - 1. Identification
 - 2. Institutions
- PART A**
- 3. Achievements**
- 4. Funding
- 5. Indicators
- PART B**
- 6. Scientific Component
- 7. Expected Indicators
- 8. Research Team
- 9. Research Groups
- 10. Thematic Lines
- 11. Budget 2015/2020
- 12. Budget Rationale
- 13. Reviewers proposed
- 14. Validation
- 15. Locking
- Declarações de compromisso
- Confirmar CV/ORCID
- Documentação

Infraestruturas - Roteiro

Guia de Utilização

Delegadas pela Instituição:

LIACC/UP

Delegação de Acesso

Projectos Estratégicos

Financiamento Plurianual

AVALIAÇÃO DE UNIDADES 2013

3. R&D UNIT DESCRIPTION AND ACHIEVEMENTS

3.1 Description of the R&D Unit

Starting in 1988 with joint efforts of 5 PhDs in Computer Science and Artificial Intelligence, LIACC -Laboratory of Artificial Intelligence and Computer Science at the University of Porto, has been reconfigured at least twice along these 25 years. From the 5 pioneers, only one is still fully active at LIACC (three retired during 2010-11, one left in 2007). However, throughout the years, LIACC attracted researchers from several Universities and Institutes. In December 2012 LIACC included 21 PhDs (23 in 2013, 22 in 2014), 23 other researchers (28 in 2014), mostly PhD students, and 13 more loosely connected collaborators. All of them belong to one of the two former research groups (Computer Science-CS, and Distributed Artificial Intelligence & Robotics-DAI&R) mainly residing, respectively, at the Faculty of Sciences and at the Faculty of Engineering of the University of Porto. None of the researchers holding a PhD is doing full-time research, contrary to some of the other researchers, due to their heavy involvement in lecturing (between 8 and 12 hours per week). DAI&R, the former largest group, is now split into two groups to facilitate cohesion of researchers along specific research lines. Therefore LIACC includes three different groups: DAIAS- Distributed Artificial Intelligence and Agent-based Simulation, HMIC-Human-Machine Intelligent Cooperation and CS-Computer Science. Management of LIACC is done according to the FCT Multi-year Funding Program rules (Strategic Projects), through a Coordinating Board, a Scientific Council and an external Advisory Board. The Coordinating Board is composed of four senior researchers, one of which is the Director. The Scientific Council, responsible for the approval of annual reports and plans, is composed by all the researchers holding a PhD. Activities are periodically reviewed by an external Advisory Board. During 2013 the following LIACC members belong to the Coordinating Board: Eugénio Oliveira (Director, head of DAI&R and now DAIAS), António Porto (head of CS), Luís Paulo Reis (head of the new group HMIC) and Francisco Restivo. - Advisory Board: Carles Sierra (IIIA, CSIC, Barcelona), Claude Kirchner (INRIA, France). The existing groups have some differences regarding research methods, sensibility and scientific areas. While DAIAS and HMIC groups, mainly located at the Engineering Faculty, are more concerned with applied and problem-oriented research usually leading to modeling and prototyping, the CS group, mainly located at the Faculty of Sciences, is more devoted, though by no means exclusively, to theoretical research. All the groups are also heavily involved in post-graduation students' supervision and knowledge transfer. The DAIAS group includes 5 recent PhDs out of 11 integrated members, 10 PhD students and 4 other collaborators. It pursues research mentioned in ACM CCS, section: I.2.11- Distributed AI. Its main objective is to improve quality of research through software prototypes, publications, theses and project deliverables with potential applications in mind. Research lines are: a) MAS and agent-based interoperability for networking and cooperation; b) agent-based simulation; c) Text Mining; d) Cloud, Parallel computing and applications. For CS the main general aim is software and information processing reliability. The group, now including 5 integrated members, has always had an emphasis on fundamental research, ranging through computational complexity, automata and formal languages, algorithms, programming languages, semantics, and formal verification. But at the same time it has also shown a good record of directing fundamental results towards practical applications. CS members are experts on declarative programming and have a generic concern with reliability and effectiveness leading to an interest in testing and verification, supported by research on types that can capture behavioral semantics underlying target program properties. The Human-Machine Intelligent Cooperation Group (HMIC), the new group inside LIACC, is primarily concerned with the human factors of computing and machinery systems. HMIC focusses on creating methodologies that enable machines and software systems to think and interact like humans and have social capabilities similar to humans enabling them to be members of heterogeneous human/machine teams. HMIC pursues research topics dealing with Human-Machine interaction, coordination, distributed problem-solving, educational games and simulation. LIACC's research areas traditionally publish mainly in conferences and workshops which, in many cases, are tougher (or at least as tough) regarding the reviewing process than many journals. However, we have been trying to curb our flow of publications a bit more for the international journals. LIACC members have often also privileged software demos and participation in competitions (robot soccer, multilingual information access and evaluation) for the sake of showing the current performance of some

Fundação para a Ciência e a Tecnologia
Avenida D. Carlos I, 126
1249-074 Lisboa · Portugal
+351 21 304 300 · pct@fct.pt
Major achievements

of the outcomes. LIACC, as a whole, usually meets once a year for informal “brainstorming” about current and future research directions and reorganization. It is also an opportunity to find out possible cross-points leading to collaboration among different researchers.

LIACC, in time period 2008-13, has produced a very good number of relevant publications which can be confirmed by consulting the most important scientific databases (SCOPUS and ISI Web of Science). Publications of LIACC members in the same period have also been largely cited by other researchers. As examples, taken from google scholar citations since 2008, we depict: E. Oliveira: 1355, L.P.Reis: 1200, P.Leitão: 1119, F. Restivo: 547. Six papers got “best paper” awards in scientific meetings. A member of LIACC (J. Barbosa) was ranked 8th at Parallel Computing journal most downloaded articles in 2011. LIACC members also participated in projects and teams that won several prizes in different competitions: 5 distinct awards for the Intellwheels project and 10 awards for the FC Portugal project including European champion award, simulation 3D league, in both 2012 and 2013. Twenty nine PhD theses have been successfully concluded and 42 are now in progress. One of the PhD theses was awarded with Fraunhofer Portugal Challenge for PhD theses second prize. LIACC members also supervised 180 MSc theses during 2008-2012. Either previous or current LIACC members have built up startup companies during their stay at the Research Unit: V. Vinhas (EZ4U), A.Porto (SQIMI), A.P.Costa (Ludomedia), S.Sousa supervised students (EDUCED awarded by GSI Accelerators and now at Plug and Play Tech Center, Silicon Valley, USA). Also collaborative work was developed with major companies such as Microsoft or Google. After a stay at Google Labs, a (now ex-) LIACC member, Luis Sarmento, is now at Amazon.com in Seattle. Several software systems that have been developed in the 2008-13 period became available for the society such as VOXX, VERBETES, MÁQUINA DO TEMPO, TwitterEcho all for data analysis to be used by the social media. This work has been done in collaboration and justified the investment done by SAPO company in our UP/SAPO Labs. These products have been present in the social media several times. The first mathematically and mechanically modeled and proved SIL4 level (highest in the CENELEC standard) signaling system in the world (in collaboration) was released. Also, a fast 3D reconstruction method of the spine from biplanar radiographs for conventional radiological systems was developed. A MAS and SOA based solution for dynamic reconfiguration of shop-floor production systems. Also the use of the agent-based paradigm in the heart of the simulation processes and tools gave the possibility to approach several different domain applications. As a consequence one of LIACC members became member of the Board of Governors of IEEE ITS Society and co-chair of ATS & Simulation Technical Activities Committee. This is also the case, now concerning industrial applications of agents with another LIACC member as Chair of the IEEE IES Technical Committee on Industrial Agents and member of the IFAC TC 5.1 - Manufacturing Plant Control. LIACC members were also deeply involved in the creation and management of national/international scientific societies such as AISTI – Iberian Association for Systems and Technologies and SPR – Portuguese Society for Robotics, conferences such as CISTI, WorldCist or Robotica series and journals such as RISTI. From a more theoretical perspective, LIACC has proposed: - The definition of a recursive linear language. This theoretical result may have impact in the definition of resource aware functional languages applied to domains needing high control of computational resources such as embedded systems or real time computation; an implementation of a verifier to a low-level assembly language (ARM) based on denotational semantics and abstract interpretation to deal with the WCET analysis in multicore environments; a denotational semantics for Cube (structured Prolog); meta facilities for Compass (services system platform) application management implemented in Compass itself. Major achievements were also proof-of-concepts that enable LIACC to draw a strategy for the future considering their potential adaptation to important application domains. MASDIMA software system was developed for plan-disruption management at the airline control center level. After several demos to target companies, LIACC is now negotiating the model below the software for adapting to the logistics operations of an aircraft manufacturer besides a more direct application to TAP scenarios. ANTE software platform was created in order to facilitate B2B negotiation for partners selection, e-contract monitoring and building up trust models. We have largely publicized this achievement through publications and demos in several “fora”. Our approach has a relevant visibility in the international research community on “Agreement Technology” and there also are explicit interests in this platform application to several different scenarios. Joint research was started together with Honda Research Institute Japan on cooperative study on musical robotics for improvement of human-robot interaction techniques resulting already in a joint US Patent by J. L. Oliveira et al. “An Active Audition Framework for Auditory-driven Human-Robot Interaction”. Also our collaboration and work on Robot Dancing was described at major Portuguese TV channels and newspapers and at IEEE spectrum “HEARBO Robot Has Superhearing” By Angelica Lim, (<http://spectrum.ieee.org/automaton/robotics/artificial-intelligence/hearbo-a-robot-with-superhearing>), November, 2012 A complete Multi-Robot Coordination framework was developed, using Strategy, Tactics, Formations, Roles, Setplays, Situation Based Strategic Positioning, Dynamic Positioning and Role Exchange and several tools. Through an international project funded by the RoboCup federation these tools will be now open source and available to the community. These developments enabled us to create distinct Multi-Robot teams for participating in RoboCup, including Simulation 2D, Simulation 3D, Rescue Simulation and Standard Platform teams. FC Portugal teams Won 10 Awards during the 2009-2013 period, including European Champions at Euro RoboCup 2012 (Eindhoven) and Euro RoboCup 2013 (Magdeburg). At Intellwheels project, LIACC developed a fully functional Intelligent Wheelchair prototype (Intellwheels) a very realistic

simulator (IntellSim) a flexible multimodal interface and an automatic configuration tool based on user profiling and machine learning algorithms. Intellwheels Project won 5 Awards in the last two years (2011-2012). The project also had huge media coverage with several news on major TV channels (RTP, SIC and TVI), newspapers and at COMPETE.

KEY PUBLICATIONS

Daniel Silva, Rodrigo A.M. Braga, Luís P. Reis, Eugénio Oliveira. "Designing a Meta-Model for a Generic Robotic Agent System using GAIA Methodology". *Information Sciences*, Volume 195, pp. 190-210, July 2012, Elsevier, ISSN: 0020-0255, <http://dx.doi.org/10.1016/j.ins.2012.01.029>, (IF:2.84; SCImago Q1) (SCOPUS) (NC_SC=6, NC_ISI=5, NC_GS=8)

P. Leitão and F. Restivo (2008), "Implementation of a Holonic Control System in a Flexible Manufacturing System", *IEEE Transactions on Systems, Man and Cybernetics – Part C: Applications and Reviews*, vol. 38, nº 5, pp. 699-709 (DOI: 10.1109/TSMCC.2008.923881) (IF: 2.548; SCImago Q1) (ISI). (NC_ISI=22, NC_GS=42)

Daniel C. de Moura, Jonathan Boisvert, Jorge G. Barbosa, Hubert Labelle, João Manuel R. S. Tavares, (2011). "Fast 3D reconstruction of the spine from biplanar radiographs using a deformable articulated model", *Medical Engineering & Physics*, Vol.33 nº 8, pp.924-933. (IF: 1.779; Q2) (ISI) (SCOPUS) (NC_ISI=5, NC_SC=4, NC_GS=6)

Henrique Lopes Cardoso, Eugénio Oliveira (2008). "Electronic Institutions for B2B: Dynamic Normative Environments", *Artificial Intelligence & Law* (special issue on Agents, Institutions and Legal Theory), Springer, Vol. 16, No. 1, March 2008, pp. 107-128, ISSN 0924-8463. (SCImago Q1) (SCOPUS) (NC_SC=14, NC_GS=30)

Luis Mota, Luís Paulo Reis and Nuno Lau: Multi-Robot Coordination using Setplays in the Middle-size and Simulation Leagues, *Mechatronics*, Elsevier, Vol. 21, Issue 2, pp. 434-444, March 2011, ISSN: 0957-4158, DOI: 10.1016/j.mechatronics.2010.05.005 (ISI-JCR IF: 1.30; SCImago Q1)

Rodrigo A.M. Braga, Marcelo Petry, Luís Paulo Reis, A. Paulo .Moreira: IntellWheels: A Modular Development Platform for Intelligent Wheelchairs. *JRRD - Journal of Rehabilitation Research and Development*, Department of Veterans Affairs, USA, Vol. 48, Issue 9, pp. 1061-1076, December 2011, ISSN: 0748-7711, DOI:10.1682/JRRD.2010.08.0139 (ISI-JCR IF: 1.41; SCImago Q1)

João Lobato Oliveira, Matthew E. P. Davies, Fabien Gouyon, Luís Paulo Reis: Beat Tracking for Multiple Applications: A Multi-Agent System Architecture With State Recovery. *IEEE Transactions on Audio, Speech & Language Processing (TASLP)* Vol. 20(10): 2696-2706, DOI: 10.1109/TASL.2012.2210878, December 2012 (ISI-JCR IF: 1.67, SCImago Q1)

Andreia Teixeira, Armando Matos, Luís Antunes, Conditional Rényi Entropies. *IEEE Transactions on Information Theory*, 58(7): 4273-4277, 2012. (ISI, Scopus) (IF=2.621; SCImago Q1))

António Porto. A Structured alternative to Prolog with simple compositional semantics. *Theory and Practice of Logic Programming*, 27th Int'l. Conference on Logic Programming (ICLP'11) Special Issue 11(4-5), pp. 611-627, 2011. doi:10.1017/S1471068411000202. (IF 0.288; SCImago Q2) (ISI, Scopus)

KEY PUBLICATIONS

Jorge G. Barbosa, Belmiro Moreira (2011). "Dynamic scheduling of a batch of parallel task jobs on heterogeneous clusters", Parallel Computing, Elsevier, Vol.37 n° 8, pp.428-438, (IF: 1.214; SCImago Q2) (NC_ISI=1, NC_SC=6 , NC_GS=9)

3.3 External Advisory Committee Reports

R&D UNIT	FILE
LIACC-Laboratório de Inteligência Artificial e Ciência de Computadores	Adv_Com_REPORTS_2010_2012.pdf

3.4 Composition of the External Advisory Committee

R&D UNIT	MEMBER NAME	INSTITUTION
IIIA-Institut de Inteligencia Artificial	Carles Sierra	IIIA-Institut de Inteligencia Artificial - CSIC- Spain
INRIA	Claude Kirchner	INRIA-France

3.5 Brief description of the output indicators 2008/2012 of the research team of the new unit that support the vision and objectives of the strategic program

In this section we relevant figures, and then comment LIACC productivity on a qualitative basis. For the figures, besides those for 2008/12, we include the output in 2013 revealing the dynamics of increased productivity. We use the "+" sign to separate between 2008/12 and 2013 figures. In parentheses we supply figures for each group, and in brackets[] those indexed by Scopus or ISI. Concluded PhD theses: 22+9 (DAIAS 7+4, HMIC 11+4, CS 4+1) PhD theses in progress: 35 (DAIAS 16, HMIC 16, CS 3) Articles in journals: 78+20 [62+16] (DAIAS 25+8 [22+5], HMIC 38+11 [27+10], CS 15+1 [13+1]) Books (including proceedings) and book chapters: 42+18 [25+8] (DAIAS 17+6 [10+1], HMIC 21+12 [14+7], CS 4+0 [1+0]) Articles in proceedings: 413+93 [287+54] (DAIAS 195+61 [151+26], HMIC 187+31 [109+27], CS 31+1 [27+1]). For productivity figures per PhD, we averaged the number of integrated PhD members in the periods 2008-12 and 2008-13, yielding respectively 21.8 and 21.66, for which we obtain the following arrow-separated ratios: All publications: /PhD:24.45 [17.16] ? 30.66 [20.87]; /PhD/year:4.89 [3.43] ? 5.11 [3.48] Articles in journals: /PhD:3.58 [2.84] ? 4.52 [3.60]; /PhD/year:0.72 [0.57] ? 0.75 [0.60] From a qualitative perspective we point out the following. The number of publications indexed by SCOPUS or ISI databases is around 3.5 per PhD integrated member per year, a ratio we believe to indicate a good effort in LIACC research dissemination. Also, about 50% of the publications in international journals have an IF higher than 1, which is significant in our research area. For the 2008-13 period LIACC had 31 PhD theses concluded, about 1.4 per PhD member. It is worth noticing that for CS group, the difficulties of attracting PhD students are higher. Nevertheless we are now supervising 35 PhD theses. MSc theses supervised numbered 180+25. These figures reveal a deep concern with giving to the students, at 2nd and 3rd cycle levels, a scientific and technological perspective. Also, we have been able to attract funding for a large number of scholarships for PhD students and other researchers. We hope to continue this positive trend. A strong output indicator is the steady high number of software realizations. In section 5.1 they are classified as either prototypes or models. Regarding contracts with national and international boards, the figures do not refer contracts for grants. Including them gives a total number, for 2008-12, much higher: 123. DAIAS's main paradigm for guiding research is the use of Multi-Agent Systems for problems that are inherently distributed and decentralized in dynamic environments. Besides publishing in journals, books and conference proceedings, we implemented working prototypes for real problems. These efforts were awarded with prizes and have been applied, for ex. in a German company. Related patents were registered. MASDIMA motivated the interest for adapting the prototype to the needs of an airline company and an aircraft manufacturer justifying further research on the flexibility and adaptive capabilities of the system. ANTE framework became attractive for future adaptation to real situations. Recent contacts point to the need to develop more focused features to facilitate its more widespread use. Enhancement of the normative environment, computational Trust and Reputation models are some of the topics to be pursued next. On the text mining front, LIACC (DAIAS) association with UP/SAPO Labs, enable us to benefit from short term grants to continue with research on applying AI-based algorithms to knowledge extraction from text electronically available. Recent increase in value of several developed systems through their deployment as products, gives us confidence on the research work we are doing. DAIAS members are still involved in EU funded projects and willing to participate in future projects. Moreover, although in its infancy, our intention to analyze social networks seems promising and opening new research avenues. We will pursue a long-term research

direction on developing MAS-Ter Lab platform, an advanced artificial transportation model for the assessment and development of ITS-based solutions. DAIAS member responsible for this research is Associate Editor of IEEE Transactions on Intelligent Transportation Systems and Department Editor (ITS) for IEEE Intelligent Systems Magazine. He has been nominated and appointed as the IEEE ITS Society's Delegate for the IEEE Smart Cities Initiative. In the recent past, collaboration with more than ten industrial partners in the region led to the establishment of a long-term partnership with "Armis, Sistemas de Informação, Lda." to leverage the development of the MAS-Ter Lab. HMIC research work, that have been previously developed at the level of the former DAI&R group, together with DAIAS, have produced a very relevant quantity of publications some of which in good journals and conferences. The head of HMIC is extremely active in these supervision and in motivating other members and students through continuous successful participations in competitions (RoboCup, 10 awards). The derivative for growing is high and a few past realizations, like the "Intelligent Wheelchair" (awarded five times) and the recent Hearbot research work together with Honda Research Institute – Japan (which already output a patent and five journal papers) show the capabilities to put in practice excellent ideas. HMIC members are strongly involved in research projects that will last for the next future and are supervising a large number of PhD students which are good indicators for the continuation of a progressive increment of the productivity on distributed entities coordination and HMI research topics. The group also made a significant effort on scientific divulgation and dissemination. Group members gave keynote lectures in renowned conferences such as ICAART2012, LARS/SBR2013, and ICINCO2013, to cite a few. More than 50 TV, Radio, Magazine and Newspaper news about group projects were published in the last five years. CS group's research bets on the adequacy and power of declarative programming, in its logic and functional flavors, to achieve and exploit two major abilities for narrowing the gap between intentions and achievements: to tightly match software architecture to conceptual models of the world, and to significantly simplify reasoning about programs, by both humans and computers. For real-time systems we will continue researching on resource analysis, aimed at guaranteeing/verifying runtime properties of sequential and concurrent programs related to their use of memory, time or energy. On expressiveness front we shall try to devise methods to deal with conceptual abstractions. To make software more amenable to smooth evolution we intend to tackle the particular challenge of database scheme change, unavoidable in most real world information systems, by building on previous work on a high-level natural attributive framework.

[Continue](#)

AJUDA

[Início](#) › [Avaliação de Unidades 2013](#) › Submissão de Candidatura

AVALIAÇÃO DE UNIDADES 2013

4. FUNDING 2008/2012

Programas Doutoramento

Avaliação de Unidades 2013

- Registo de Unidade
- Confirmação na Equipa
- Confirmação na Fusão
- Submissão de Candidatura**
 - 1. Identification
 - 2. Institutions
 - PART A**
 - 3. Achievements
 - 4. Funding**
 - 5. Indicators
 - PART B**
 - 6. Scientific Component
 - 7. Expected Indicators
 - 8. Research Team
 - 9. Research Groups
 - 10. Thematic Lines
 - 11. Budget 2015/2020
 - 12. Budget Rationale
 - 13. Reviewers proposed
 - 14. Validation
 - 15. Locking
- Declarações de compromisso
- Confirmar CV/ORCID
- Documentação

Infraestruturas - Roteiro

Guia de Utilização

Delegadas pela Instituição:

LIACC/UP

Delegação de Acesso

Projectos Estratégicos

Financiamento Plurianual

4.1

DESCRIPTION	2008	2009	2010	2011	2012	TOTAL (€)
Pluriannual Programme/Strategic project	198.202	78.034	46.766	30.805	70.890	424.697
FCT-funded projects	267.349	63.950	298.101	146.168	45.680	821.248
European Commission-funded projects	0	0	105.448	105.448	224.221	435.117
Other international projects	0	0	0	0	0	0
Other national projects	4.000	0	20.000	20.000	0	44.000
National industry projects	0	13.000	72.782	9.097	0	94.879
International industry projects	45.000	45.000	0	0	0	90.000
Total (€)	514.551	199.984	543.097	311.518	340.791	1.909.941

Continue

Fundação para a Ciência e a Tecnologia

Avenida D. Carlos I, 126
 1249-074 Lisboa - Portugal
 +351 213 924 300 - pct@fct.pt

AJUDA

Início › **Avaliação de Unidades 2013** › Submissão de Candidatura

Programas Doutoramento

Avaliação de Unidades 2013

- Registo de Unidade
- Confirmação na Equipa
- Confirmação na Fusão
- Submissão de Candidatura**
 - 1. Identification
 - 2. Institutions
 - PART A**
 - 3. Achievements
 - 4. Funding
 - 5. Indicators**
 - PART B**
 - 6. Scientific Component
 - 7. Expected Indicators
 - 8. Research Team
 - 9. Research Groups
 - 10. Thematic Lines
 - 11. Budget 2015/2020
 - 12. Budget Rationale
 - 13. Reviewers proposed
 - 14. Validation
 - 15. Locking
- Declarações de compromisso
- Confirmar CV/ORCID
- Documentação

Infraestruturas - Roteiro

Guia de Utilização

Delegadas pela Instituição:

LIACC/UP

Delegação de Acesso

Projectos Estratégicos

Financiamento Plurianual

AVALIAÇÃO DE UNIDADES 2013

5. GENERAL INDICATORS 2008/2012

5.1

DESCRIPTION	2008	2009	2010	2011	2012	TOTAL (Σ)
No. of researchers	50	49	39	41	47	226
No. of integrated researchers	23	23	21	21	21	109
No. of technicians and administrative staff	2	2	1	1	1	7
PhD theses under the supervision of integrated members	1	2	8	7	13	31
Publications in international peer reviewed journals	13	8	8	20	29	78
Books and chapters of international distribution	5	6	8	10	13	42
Models	6	7	7	8	14	42
Patents	1	1	1	0	1	4
Prototypes	3	1	3	7	10	24
Industry research contracts	2	3	1	1	1	8
Research contracts with national or international bodies	2	2	5	5	6	20
MSc Theses supervised by LIACC members	41	32	33	37	37	180

5.2 Overall description of indicators and research outputs/Highlights

The average number of PhD members was 21.8 for the 2008-12 period (21.6 for 2008-13). It is interesting to notice that, although several members went out and others came into the research unit, the total numbers of the integrated PhDs in the period was: 23-23-21-21-21-(21). For 2014, the number of integrated members becomes 23 once again. LIACC groups: DAIAS (Distributed Artificial Intelligence and Agent-based Simulation), HMIC (Human-Machine Intelligent Cooperation) and CS (Computer Science), have different productivity and activity patterns resulting also in different outcomes. DAI&R was more directed towards realizations that include publications and software prototypes and CS, that became smaller, was directed towards more theoretical publications but also to concrete tools for program verification and for building declarative Information Systems. It is also known that, traditionally, researchers in computer science and informatics areas have privileged publication and oral presentation at international scientific meetings, with growing acknowledgement of the importance of international journals. Condensed numbers of publications for 08-12 (08-13) are: 4,89 (5,11)/PhD/Y for all publications and 0.72 (0,75)/PhD/Y for journals ; Publications Indexed by Scopus or ISI: 3,43 (3,48)/PhD/Y. LIACC was also able to keep some long-term research lines, attracting different researchers

Fundação para a Ciência e a Tecnologia
Avenida D. Carlos I, 126
1249-074 Lisboa · Portugal
+351 213 924 300 · pct@fct.pt

including young PhD and MSc students along the years. This was the case of our research on the model, algorithms and software system (framework) for enterprise networking facilities leading to the creation and further monitoring of electronic contracts for joint work. Also the case of our coordination in multi-agent systems project with applications on robotic soccer. A total of 31 PhD theses and 180 MSc Thesis were supervised by LIACC members during the period. It is worth mentioning that LIACC continues very attractive for new PhD students with 35 ongoing PhD theses supervised by group members. Several Prototypes were developed such as the ANTE software (Agreement Negotiation in Normative and Trust-enabled Environments) combining adaptive negotiation algorithms with normative environment facilities, ontology services and computational trust models is now being demonstrated as a “proof of concept” with two ideas in mind: to be accepted as a valuable proposal for organizations or institutions interested in joining different partners together, under a trustworthy environment, for working according to a reached e-contract; and to incentivize the need for adapting the framework, or some of its modules, to specific applications as it can be the case of the use of computational trust models for partners' selection. MASDIMA (MAS for Disruption Management) is now ready to be integrated in a real environment of an Airlines Operation Control as it is the case of TAP (Portugal Airlines). As a side effect LIACC is now negotiating the adaptation of the multi-agent and distributed problem-solving model to an aircraft manufacturer company Embraer scenario for airport logistics. Besides all the relevant publications and demos achieved, this work was also awarded with the 2003 Fraunhofer Institut Challenge for Phd Theses 2nd place. An important outcome of LIACC research efforts on Information retrieval and text mining has been the fruitful cooperation with other groups (Inesc-ID and Inesc Tec; Sapo, Lusa-Portuguese News Agency) and its decisive efforts to establish a protocol that gave birth to UP/SAPO Labs at FEUP. Several different research and development efforts resulted into products made available by SAPO (VOXX, Verbetes, Máquina do Tempo, Twitometro). Intellwheels – Intelligent Wheelchair with Flexible Multimodal interface developed 4 different prototypes (hardware, simulator, multimodal interface and patient automatic configuration tool) and achieved 5 distinct awards FC Portugal (coordination in multi-robot systems/robotic soccer) project achieved 10 awards, including European champion award, simulation 3D league, in both 2012 and 2013. The project also developed several generic methodologies such as a coordination framework and a complete setplay framework. A systematic effort to explore linearity in programming languages, more specifically in the lambda-calculus, led to many interesting results published in major venues, notably a closed reduction linear version of Gödel's system T which is as powerful as T. A research track on program verification led, in collaboration with a company, to the world's first mathematically and mechanically modeled and proved SIL4 level (highest in the CENELEC standard) signaling system. In a drive towards supporting the construction of declarative information systems, three major building blocks were consolidated: - Cube – compositional unification-based engine. A structural logic programming platform that is an alternative to Prolog, with simple compositional semantics. A fully functional professional-grade implementation was made, with useful libraries and debugging facilities. - NAF – natural attributive framework. A high-level solution for database management and interaction. Based on attributive modelling of concepts and on principles of natural language, it encompasses a modular scheme description language (NACS), a language for interaction with databases (NADI), and tools for database management. - Compass – concept-oriented modular and parametric architecture for service systems. A compositional architecture for building Web systems, implemented in Cube and using NAF; it provides a development environment and methodologies for rapid prototyping of organisational information systems. Regarding software we have considered it partially as prototypes and partially as models that can be generalized and adapted for diverse scenarios and application domains. We also considered the research contracts accountable during their complete time duration.

Continue

**Programas Doutoramento****Avaliação de Unidades 2013**

Registo de Unidade
 Confirmação na Equipa
 Confirmação na Fusão

Submissão de Candidatura

1. Identification
2. Institutions

PART A

3. Achievements
4. Funding
5. Indicators

PART B**6. Scientific Component**

7. Expected Indicators
8. Research Team
9. Research Groups
10. Thematic Lines
11. Budget 2015/2020
12. Budget Rationale
13. Reviewers proposed
14. Validation
15. Locking

Declarações de compromisso

Confirmar CV/ORCID

Documentação

Infraestruturas - Roteiro**Guia de Utilização****Delegadas pela Instituição:**

LIACC/UP

Delegação de Acesso**Projectos Estratégicos****Financiamento Plurianual****AVALIAÇÃO DE UNIDADES 2013****6. SCIENTIFIC COMPONENT – STRATEGIC PROGRAMME 2015/2020****6.1 Abstract in Portuguese for publication**

O LIACC inclui 23 membros integrados e 35 alunos de doutoramento. A gestão do laboratório é realizada de acordo com as regras do Programa de Financiamento Plurianual da FCT, através de um Conselho Coordenador, um Conselho Científico e um Conselho Consultivo Externo. Os objectivos gerais do LIACC para 2015-2020 dividem-se em três classes: 1) Contribuir para a investigação em: a) Sistemas de software distribuídos e descentralizados; b) Extração de conhecimento e informação; c) Cooperação inteligente homem-máquina; d) Programação declarativa para sistemas mais seguros. 2) Implementar sistemas como prova de conceitos levando à criação de protótipos e futuras aplicações. 3) Supervisionar o trabalho de investigação conducente a doutoramentos e mestrados nos temas acima mencionados. Seguindo essas linhas, o LIACC produz software e protótipos apoiados por publicações relevantes, além de ajudar jovens investigadores no desenvolvimento das suas teses. Para cumprir os objectivos gerais acima mencionados, a investigação do LIACC será centrada nas atividades principais da unidade, ajustada aos novos desafios de uma sociedade em rápida evolução, do desenvolvimento tecnológico, da proliferação de dispositivos em rede, onde todos são produtores e consumidores de informação. Outro objetivo é a automatização da decisão inteligente, não só para agentes individuais, incluindo artificiais (agentes, robôs) e seres humanos, mas também em redes e equipas, em ambientes distribuídos. Defendemos, também, a necessidade de esforços teóricos no desenvolvimento de métodos, na sua maioria do tipo declarativo, para levar do modelo à implementação. Para implementar o seu programa estratégico, o LIACC organiza-se em três grupos: DAIAS – Inteligência Artificial Distribuída e Simulação baseada em Agentes, HMIC- Cooperação Inteligente Homem-Máquina e CS– Ciência de Computadores. DAIAS inclui 11 membros integrados e realiza investigação sobre Sistemas Multi-Agente e interoperabilidade baseada em agentes, simulação baseada em agentes, mineração de textos, computação paralela e aplicações. CS inclui 5 membros integrados. O seu principal objetivo é a investigação fundamental para a confiabilidade no software e no processamento de informação, a complexidade computacional, autómatos e linguagens formais, algoritmos, linguagens de programação, semântica e verificação formal. HMIC inclui sete membros integrados. Está principalmente preocupado em criar metodologias permitindo que máquinas e sistemas de software pensem, interajam e tenham capacidades sociais semelhantes aos seres humanos de modo a serem membros de equipas heterogêneas homem/máquina. A investigação prevista é apoiada por um nível de publicação elevado e incremental e muito boa visibilidade na comunidade internacional confirmada através da consulta de bases de dados científicos (Scopus, ISI), que incluem cerca de 350 publicações do LIACC para este período. Registaram-se 6 prémios de melhor artigo. Aos projetos do LIACC também foram atribuídos mais de 15 prémios (Intellwheels, FC Portugal, MASDIMA, ACORD). O LIACC continuará envolvido na gestão de programas de doutoramento e supervisão de trabalhos de investigação conducentes a trabalhos de tese. Nos últimos anos, um total de 31 teses de doutoramento e 180 de mestrado foram por supervisionadas. O LIACC continua atrativo para estudantes, tendo 35 teses de doutoramento em curso sob supervisão. Neste contexto, acreditamos que a visibilidade e alcance de nossos projetos mais significativos atrairá um número crescente de estudantes de doutoramento, altamente motivados, em Portugal e no exterior. A investigação do LIACC é de intensidade alta a nível laboratorial. Utiliza computadores, redes, sensores, robôs, displays, bases de dados, servidores de internet e faz experiências com utilizadores/pacientes. O LIACC investe fortemente na concepção, especificação, modelação e implementação de provas de conceito muitas vezes culminando em protótipos, produtos ou criação de empresas. A unidade concentrar-se-á em explorar as suas conexões internacionais sobretudo ligações europeias e ibero-americanas para o desenvolvimento de projetos conjuntos no âmbito do Horizon 2020 e da ibero-america. As principais realizações também constituíram provas de conceitos permitindo desenhar uma estratégia para o futuro, considerando seu potencial de adaptação para domínios de aplicação importantes: gestão de roturas de planos em companhias aéreas, facilitadores para redes de empresas, frameworks de coordenação multi-robô, protótipo de cadeira de rodas inteligente, modelos para novos sistemas de informação. O LIACC dedica também atenção às estratégias adoptadas pelos organismos regionais, e considera importante o cumprimento dessas estratégias o que é facilitado pela distribuição regional dos seus membros. A nível

Fundação para a Ciência e a Tecnologia
Avenida D. Carlos I, 126
1249-074 Lisboa · Portugal
+351 213 924 300 · pct@fct.pt

internacional a unidade construiu uma rede de contatos pessoais e institucionais na Europa, América e Ásia, que permitem o intercâmbio de pessoas e de ideias com instituições de renome no exterior. A nossa principal intenção para o futuro é produzir investigação de nível internacional, atraindo e preparando investigadores para os desafios do futuro. Na sequência do nosso trabalho dos últimos 25 anos, esta intenção será realizada através da participação em projectos de investigação, organização de programas de mestrado e doutoramento, publicações científicas, desenvolvimento de protótipos e patentes, demonstrações a potenciais parceiros industriais, atração de jovens cientistas, e todas as atividades que contribuam para a visibilidade e alcance dos resultados do LIACC. Procuramos alcançar estes resultados através de uma organização flexível, pronta para se adaptar com rapidez e eficiência às mudanças que desde já se podem antecipar. Acreditamos estar no caminho certo para contribuir com investigação sólida nas áreas da Inteligência Artificial e Ciências de Computadores para ajudar a tornar a tecnologia mais inteligente, sustentável e segura.

6.2 Abstract in
English for evaluation

LIACC includes now 23 integrated PhDs and 35 PhD students. Management of LIACC is done according to the FCT Multi-year Funding Program rules, through a Coordinating Board, a Scientific Council and an external Advisory Board. LIACC general objectives for 2015-2020 are three-fold: 1) To contribute to the research on: a) Distributed and decentralized software systems and tools; b) Text mining and Information extraction; c) Human-machine intelligent cooperation; d) Declarative software programming enabling safer systems. 2) To implement proof-of-concept software and systems leading to possible prototypes and future real applications. 3) To supervise research work leading to PhD and MSc theses on the aforementioned topics. Following these lines, LIACC aims at producing both software algorithms and prototype systems backed by relevant publications, while also assisting young researchers in developing their theses. In order to fulfill the aforementioned general objectives, LIACC research will be centered in the core activities of the unit, adjusted to the new challenges of a rapidly evolving society, of the technological development, of the proliferation of networked devices, of a world where we all simultaneously are information producers and consumers. Intelligent decision-making for individual agents but also in networks and teams, in distributed environments, including artificial (agents, robots) and humans is a major aim of the unit. We also advocate the need for more theoretical efforts on developing methods, mostly declarative-type of programming based, for better matching software models and architectures. In order to better implement the strategic programme, LIACC is organized in three research groups: DAIAS- Distributed Artificial Intelligence and Agent-based Simulation, HMIC - Human-Machine Intelligent Cooperation and CS - Computer Science. DAIAS group includes 11 integrated members and pursues research on multi-agent systems and agent-based interoperability for networking and cooperation; agent-based simulation; Text mining; Cloud, parallel computing and applications. CS group include 5 integrated members. Its main general aim is software and information processing reliability with emphasis on fundamental research, ranging through computational complexity, automata and formal languages, algorithms, programming languages, semantics, and formal verification. HMIC includes 7 integrated members. The group is primarily concerned on creating methodologies that enable machines and software systems to think and interact like humans and have social capabilities similar to humans enabling them to be members of heterogeneous human/machine teams. The research envisaged is supported by a strong and incremental publication record and very good visibility in the international community confirmed by consulting the scientific databases (SCOPUS and ISI) which include about 350 publications for this period. Six papers got "best paper" awards. LIACC projects also won more than 15 awards (Intellwheels, FC Portugal, Masdima, Acord). LIACC will continue focusing on chairing PhD programmes and supervising research work leading to PhD and MSc theses. In the last years a total of 31 PhD theses and 180 MSc Thesis were supervised by LIACC members. LIACC continues very attractive having 35 ongoing PhD theses supervised by its members. In this context we believe that visibility and outreach of our most significant projects will attract an increasing number of, highly motivated, PhD students in Portugal and mostly abroad. The unit is also highly laboratory intensive. It uses computers, networks, sensors, robots, displays, databases, internet servers, user/patient testing. LIACC strongly invests in conceiving, specifying, modeling and implementing proof-of-concepts that often culminate in prototypes, products or startup companies. The unit will now focus on exploring its international connections with emphasis on European and Iberoamerican connections for developing larger joint international Horizon2020 and Iberoamerican projects. Major achievements were also proof-of-concepts that enable LIACC to draw a strategy for the future considering their potential adaptation to important application domains: Plan disruptions management for airlines, facilitators for Enterprises networking, Multi-Robot Coordination framework, Intelligent Wheelchair prototype and Cube for new Information Systems. LIACC pays also attention to regional strategies adopted by regional bodies, and gives high priority to the fulfillment of those strategies. Regional distribution of LIACC members facilitates this strategy. At the international level the unit has built a network of personal and institutional contacts in Europe, America and Asia that allows for the exchange of people and of ideas with renowned institutions abroad. Our main intent for the future is to produce research of international standards, attracting and preparing researchers for the challenges of the future. Following our work on the past 25 years, this intent will be fulfilled through the participation in research projects, the organization of MSc and PhD programmes, scientific publications, development of patents and prototypes, demonstrations to potential industrial partners, attraction of young people to scientific research, and all the activities that may contribute to

the visibility and outreach of LIACC outcomes. We try to achieve these results through a flexible organization, ready to adapt itself fast and efficiently to the change in demand that are anticipated nowadays. We believe we are on the right track to contribute with solid research on Artificial Intelligence and Computer Science that may help to make our technology more intelligent, sustainable and secure.

6.3 Strategy and vision of the unit and future management

LIACC looks to the year 2020 as a challenge for its scientific developments since, indeed, something new may be on the way: modern societies definitely enter the "data era". Starting with Communications facilities that grow at the highest speed ever, as it took 100 years for the first billion landline telephones to be in use, 10 years for the first billion mobile phones to be reached and just one year for the first billion of "smart phones" to be sold. Besides wireless Communication facilities, available data collections and archives grow at gigantic speed, data clouds storage become huge at low costs and integration of personal and geo data is available for people. People is ready to both consume and make available large amounts of data, eager to interact through world wide scale social networks which point to the intensification of investment and research efforts in social media and the web of the future, interoperability and semantics, privacy, visibility and security, social network and big data analysis, recommender systems and on-line e-business. The field of work of LIACC has always been that of combining scientific and engineering knowledge upon the common ground tool of computer science, multi-agent systems, agreement technologies, team's cooperation and coordination, text and network mining, parallelism and related subjects. What we may foresee for such a long time period (2015-20) as LIACC guidelines points to the consolidation of our basic research fields, taking into account the new demands of the exponential increase of data and interacting entities (agents) extracting and using information embedded in that data. Therefore, we will pursue challenging issues related with distributed, decentralized, possibly mobile and cloud based intelligent decision-making, asking for more flexible software and devices interoperability and heterogeneity, as well as new algorithms and methods capable of coping with big quantities of data. Although LIACC has permanently evolve and adjust its main focus along the past 20 years, we feel that now is the time for clearly embrace these more dynamic approaches and, thus, contribute to the future scenario with our own new ideas, growing from the basic ground we have been building in the past. The groups are the following and will pursue, at least, the topics listed below. 1) DAIAS-Distributed AI and Agent-based Simulation aiming to study, adapt and apply AI-based algorithms, Distributed and Decentralized approaches, thus going beyond traditional monolithic systems, and including adaptive features, for the sake of contributing to the research in: - Web of Trust: Computational Trust and Reputation models of entities (agents, services) and their application to networks (Enterprises, Social); networks active analysis and exploitation; Dynamic profiling and clustering of entities in networks, for behavior prediction. - Generic Model for Multi-agent systems leading to tools and frameworks for joint work through safe electronic encounters and partners selection by means of rich (and argumentation-based) negotiation processes and accountable electronic contracts; Normative environments, including models for the use of incentives, will be explored and formalized to make virtual space for economic activities more credible. - Evolving MAS-based general solutions for coping with plan disruptions and airport logistics management, considering negotiation over market-available resources and learning with experience. Agent-based intelligent simulation and serious games will be developed. - Application of biological and physical inspired theories in complex and evolvable systems, namely self-organization and chaos theory; Application of MAS and service-oriented principles in manufacturing and smart grids domains. - To develop techniques to deal with hardware and system software failures or intentional changes within the complex system environment: resilient, reactive schedulers that can survive errors at the node and/or the cluster-level. We need methods for Cluster-level monitoring and assessment of failures with pro-active actions to remedy those failures before they actually occur, and malleable applications that can adapt their resource usage at run-time. In conclusion DAIAS main idea for the future is to contribute for the research on specific aspects of intelligent systems, benefiting from approaches built on distributed and decentralized coordination and cooperation, applying AI-based methods for the sake of knowledge extraction (including text) and to apply those approaches to different real domains. 2) Human-Machine Intelligent Cooperation: HMIC focusses on creating methodologies that enable machines and software systems to think and interact like humans and have social capabilities similar to humans enabling them to be members of heterogeneous human/machine teams. The group is mainly focused on: - Human-machine Intelligent Interaction with focus on human-machine and human-robot cooperation; - Health information systems and its engineering, management, usability and accessibility; - Serious and educational games for human education, rehabilitation/health applications and advanced training; - Intelligent and social simulation for creating learning/testing environments for solving the previous problems. In conclusion, HMIC research examines issues in the common area of human-machine interaction and intelligent cooperation, distributed artificial intelligence and problem solving, cognitive and social sciences, and health information systems and technology. 3) Computer Science group: Within the general LIACC aim of software and information processing reliability, CS group has always had an emphasis on fundamental research, ranging through computational complexity, automata and formal languages, algorithms, programming languages, semantics, and formal verification. But at the same time it has also shown a good record of directing fundamental results towards practical applications. Research is still needed to provide the best methods and tools for designing, building, testing, verifying and adapting reliable and evolvable software systems, in a context of ever increasing interactivity among

agents (human or not). The group's approach to tackle these issues is betting on the adequacy and power of declarative programming, in its logic and functional flavours, to achieve and exploit two major abilities for narrowing the gap between intentions and achievements: to tightly match software architecture to conceptual models of the world, and to significantly simplify reasoning about programs, by both humans and computers. There is a common appreciation and use of declarative programming, i.e. logic and/or functional programming, and a generic concern with reliability and effectiveness leading to an interest in testing and verification, supported by research on types that can capture behavioural semantics underlying target program properties.

6.4 Laboratory intensity level of the unit

High

Laboratory intensity level Justification

LIACC is essentially an applied research laboratory. Although being a computer science lab, its research encompasses not only the development of algorithms, code and software but also the development of complete systems including both hardware and software and many times conducting experiments with real users or patients. Such systems include, among others, service-oriented automation systems, industrial systems, multi-robot systems, human-machine interaction devices or airlines operations control centre applications. LIACC also develops prototypes and systems for health applications that have to be tested with real patients including health information systems, rehabilitation devices and simulators, assistive technology and robotic devices. Intellwheels: Intelligent Wheelchair with a flexible multi-modal interface is a notable example of such a system. The project developed not only a hardware prototype but, as well, a realistic simulator, a flexible multimodal interface and an automatic patient interface configuration tool. All the project developments were tested with real patients suffering from cerebral palsy, resulting in 6 months of very intensive experiments. The laboratory has also developed large projects on the area of Service Oriented Architectures, Adaptive Production Management, Process and Quality Control developing intelligent, adaptive and reconfigurable control solutions for manufacturing control systems, based on multi-agent systems and service-oriented principles. The projects developed included: EU FP7 "ARUM: Adaptive Production Management" (<http://arum-project.eu/>) (2012-2015), EU FP7-NMP2-SL-2010-246203 "GRACE: Integration of Process and Quality Control Using Multi-agent Technology" (<http://www.grace-project.org>) (2010-2013), Cooperating Objects Network of Excellence (CONET) INFSO-ICT-224053 (<http://www.cooperating-objects.eu/>) (2008- 2012). For example, in the GRACE project, it was possible to develop a MAS solution running in an industrial production line producing washing machines and providing intelligence and adaptation capabilities. These projects also enabled to successfully submit 3 industrial patents. Thus, opposite to most Computer Science typical research labs, LIACC intensity level is rather high, including not only conducting experiments with real users and patients but also the development of complete fully-functional systems and prototypes.

6.5 General objectives

LIACC general objectives are three-fold: 1) To contribute to the research on: a) Distributed and decentralized software systems and tools; b) Text mining methods using machine learning algorithms; c) Human-Machine Intelligent Cooperation; d) Declarative software programming enabling safer systems. 2) To implement proof-of-concept software and systems leading to possible prototypes and future real applications. 3) To supervise research work leading to PhD and MSc theses on the aforementioned topics. Following these lines, LIACC aims at producing both software algorithms and prototype systems backed by relevant publications, while also assisting young researchers in developing their theses. We will now expand the items identified above. 1) LIACC research activities will propose solutions for: a) Distributed, Dynamic and Decentralized problems: - We address classes of problems that are inherently of a Distributed, Dynamic and Decentralized nature as those that occur when different and heterogeneous entities/partners need to inter-operate over a computer network. Both Enterprise and Social Networking raise common issues related with mutual understanding, negotiation, contracting, monitoring and trustworthiness that are crucial for mutual electronic-based relationships and joint work. - We intend to further develop, and possibly deploy, a framework that can be seen as an Electronic Institution, which provides services like negotiation mediation, ontology mapping, contract drafting, norms enforcement and evaluation of trust and reputation indicators for consortia and Virtual Organizations life-cycle automatic assistance. - We will also address Argumentation-based negotiation and trustworthiness assessment through more contextualized Computational Trust Models (CTM). - Also, the traffic management domain, both terrestrial and aerial, and crowd movements and evacuation in rescue operations, can be seen as DDD problems. These problems will be addressed through agent-based simulation paradigm using general protocols we are developing. - Still related with distributed and parallel systems, we intend to develop techniques to deal with hardware and system software failures or intentional changes within complex systems' environment. We will pursue research efforts to achieve resilient, reactive schedulers that can survive errors at both the node and cluster-levels. b) Text Mining methods for extracting information about opinions, events or trends, from user-generated contents through blogs, twitter and other on-line comments and from media (on-line news) will continue to be developed in collaboration (Academy and Companies). Our approach to Information Extraction, based on Natural Language Processing and Machine Learning techniques will be applied to the Portuguese language. c) Human-Machine intelligent Cooperation: - Development of human-machine interaction models including the use of machine learning algorithms for user profiling and interface adaptation. - We also are

developing coordination models for heterogeneous teams, including teams composed exclusively by humans with distinct capabilities, multi-robot teams and human-robot teams. - We also address the development of health information systems, its engineering, management, usability and accessibility and rehabilitation, health and assistive applications and simulators. - Still related with the previous topics we also develop Intelligent Simulation and Social Simulation methodologies for creating simulation environments useful for solving the previous problems. An important issue we will also pursue is how to bridge the gap between simulation and real machines/robots. d) Declarative Software reliability: Methods and tools for designing, building, testing, verifying and adapting software systems in a context of ever increasing interactivity among agents. - One of the themes to explore is resource analysis, aimed at guaranteeing/verifying runtime properties of sequential and concurrent programs related to their use of memory, time or energy. This involves devising appropriate type systems and corresponding proof techniques. Results with a particular impact will be for embedded and real-time systems. - On the expressiveness front we shall try to devise constructs and methods to deal with conceptual abstractions, notably the notion of context, both for the modularity it can provide and for the convenience of reference on demand, and also graphs as an expressive alternative to sequential syntax in support of various kinds of modelling including operational semantics. - For the purpose of making software more amenable to smooth evolution we intend to tackle the particular challenge of database scheme change, unavoidable in most real world information systems, by building on previous work on a high-level natural attributive framework. 2) Regarding the crucial and fundamental objective of implementing, and possibly deploy, outcomes of the research work, we identify three stages, denoting increasing availability, which LIACC's research efforts aim at reaching: Methods, algorithms, models can be described and tested against limited and strictly bounded scenarios, at the labs level, proving the generic concepts LIACC is dealing with. Publications and small demos are the privileged vehicles for a first phase toward knowledge transfer. Software systems and tools can be developed, at duration of a medium term time period, according to potential users requirements, tested and validated for realistic situations and giving clear evidences that they present new and valuable solutions for real problems. Finally, developed software methods and systems may be in a stage that makes it possible to be deployed as products. This usually happens by joint efforts with non-academic institutions and companies. Naturally, most of the outcomes of LIACC research will fall on the scope of the above mentioned second stage. We expect that MAS and agent-based simulations, cluster-level failures detection and management will give birth to methods and systems that can be described and demonstrated for credible real scenarios. We, nevertheless, expect that, for the next period, some of the research lines will be mature enough to engage in partnerships leading product deployment. 3) LIACC's members will go on chairing and participating in several different Doctoral Programs in Informatics Engineering (PRODEI), Computer Science (PDCC) and Informatics (MAPi). The first two take place at the University of Porto and the third at a broader level including three different universities of the north of Portugal. LIACC agreement with UP/Sapo Labs is also an important attractive factor for students willing to develop their theses. Another factor we hope will continue to attract more PhD students is the continued success of LIACC participation in robotic competitions.

6.6 Implementation

To implement the vision and general objectives LIACC is pursuing, we are dependent of both internal and external factors. Conditions imposed by the environment, including available projects funding by the national funding agency (FCT), enterprises willingness for risk-taking, leading them to bet (or not) on research on advanced and innovative solutions, well prepared students disposition for doing research in the country, attractiveness regarding well prepared and motivated foreign students, will also shape the possible future of research units like LIACC. Other than these general conditions imposed by the environment at different society levels, also the closer politic strategies applied to research centres can be decisive. LIACC felt there were, in the recent past, measures to enforce assembly of different groups and somewhat punishing those who resist to that policy. Looking now to the endogenous factors for possible success, we here address what we believe to be the relevant guidelines that may facilitate LIACC's mission for the next future: - To build upon LIACC past 25 years of research activity, keeping the essential of its main characterization: keeping administration burden as low as possible and focus research mostly on reliable software and DDD-type of problems. - To make a "flexible geometry" possible such that the future structure could be able to adjust to all possible future organization changes without jeopardizing LIACC main objectives and mission; - To preview, from now on, alternative scenarios depending not only on the Research Unit internal evolution, but also on the dynamics of the environment, concerning changes at regional, national and international levels, and to efficiently respond to the dynamic evolution of the scientific areas LIACC is involved in. In order to highlight LIACC's specific scientific profile, we may identify a two dimensions matrix on topics and methods: -On one hand, research topics include the development of intelligent agent-based software, machine learning and other AI-based algorithms together with developments in declarative languages, properties of sequential and concurrent programs, and tools for designing, building, testing, verifying and adapting reliable and evolutive software systems. - on the other hand, concerning the methodology, integrating "instrumentalism" kind of research, mainly problem-oriented research, in different application domains (transportation, business to business activities, enterprise and social networking, medicine, ecology, shop-floor, ...) with research efforts for, simultaneously, developing theoretical methods to improve software programs robustness and flexibility leading to more safe and trustworthy applications. Keeping this two sides approach, and multi-disciplinary flavour, without losing

LIACC own identity, will enable us to propose some kind of interdisciplinary activity for the resolution of complex problems as it is the case of connecting automatic negotiation with trust and reputation computational models, the application of data mining to text analysis or to social networks analysis as well as multi-agent systems different architectures appropriated for air or terrestrial traffic management. It is on this ground that LIACC would like to contribute with research towards the answers to real world problems producing business opportunities, enhancing quality of life and helping on boosting the economy. As a consequence of the aforementioned, for the next time period, LIACC will be organized as a kind of federation of three different groups, having their own responsible researcher who also belongs to LIACC Coordination Board. Attracting students from PhD (and also MSc) programs is crucial. We have been, and intend to continue to be, very active on participating in many open sessions for divulgation of LIACC activities. Several members of LIACC are deeply involved on PhD and MSc programs, at the level of the direction as well as at different courses level, trying to influence about the relevance of the topics LIACC addresses. UP/SAPO Labs, LIACC's director is chairing in which research is concerned, will be supported by the lab since it may, for the future, gain even more relevance and become another important LIACC cornerstone. Three main groups now accommodate in LIACC have substantial connections to, three different schools: Faculty of Engineering and Faculty of Science at the University of Porto and School of Engineering at the University of Minho. Also the laboratory includes members and privileged connections to several other schools such as IUL-ISCTE (Lisbon), ESTSP/IPP, ISCAP/IPP and ISEP/IPP (Porto), IPB (Bragança), IPVC (Viana do Castelo), IPCA (Barcelos), Catholic University (Braga), European University (Lisbon). It is a challenge to benefit from these three different roots and from the synergies with all these other institutions to grow together and not to fall apart.

6.7 Contributions for the regional strategy

LIACC has always aligned its strategy regarding research and development with the major perceived national and regional needs, both in short and long term. In the past, LIACC's projects in areas such as health, e-commerce, robotics, disaster prevention and recovery, traffic control, industrial production control, and others, have found inspiration at regional and national level, giving the laboratory the recognition for its usefulness as a technological partner when major projects are discussed. In the future, and notwithstanding the unpredictability of the current economic surroundings, but when it is taken for sure that European countries are entering a new re-industrialization era, mainly knowledge driven, LIACC will not fail the opportunity to reinforce its role as a regional partner in this process. Major regional problems, such as the integration of transportation systems, the new e-business platforms, disruption management on areas from air transportation to forest fires, the maritime industries, and other, are well known to LIACC's researchers. In fact, we often use real data (Porto Town Hall for traffic, TAP airlines for unexpected problems, SME opinion on relevant factors for enterprises trustworthiness, etc) for validating LIACC developed prototypes. An important LIACC achievement was also the Information and Knowledge Retrieval outcomes from "mining" millions of News made available by the Portuguese News Agency (LUSA). LIACC is also well placed to play an important role in the information forefront, with its experience in tackling large volumes of information and extracting knowledge in useful time. We look at Horizon 2020 and its regional counterpart as major inspiration to our long term strategy. Precisely the fact that LIACC includes researchers from different schools and towns (Porto, Guimarães, Braga, Gaia, Bragança, Barcelos, Viana), gives it the possibility to be more present in the region. Finally, LIACC will seat at some advisory boards where it is possible to articulate research with regional and national needs at the appropriate level. LIACC members have been active in the accreditation of several study cycles in other different universities of the region, trying to influence on good practices and good quality regarding teaching and research procedures.

6.8 Opportunities for advanced training

Attracting students from PhD (and also MSc) programs is crucial. We have been, and intend to continue to be, very active on participating in many open sessions for divulgation of LIACC activities. Several members of LIACC are deeply involved on PhD and MSc programs, at the level of the direction as well as at different courses level, trying to influence about the relevance of the topics LIACC addresses. LIACC members have been asked, every year, to present research topics and opportunities at three PhD programs (Informatics Engineering at Fac. of Engineering, Informatics at inter-regional level, Computer Science at Fac. of Sciences). Also, at Master of Sciences level, an all semester course, attended by informatics engineering master students, is mainly devoted to research done at LIACC. LIACC has been attracting very good students throughout the last years. However, mainly due to lack of funding and opportunities in Portugal, in and out of the scientific system, students are now preferring to go abroad and take their PhDs in other European countries and US. We foresee the reduction of Portuguese and European funding enabling Portuguese/Foreign students to complete PhD degrees at Portugal. However we will not see this as a threat but rather as an opportunity to change our strategy and attract very good student with own funding from outside of Portugal. In the past LIACC has already attracted very good Brazilian students and also students from other countries such as Spain or Iran. In the last few years, five Brazilian PhD students completed their PhD degree at LIACC and are now Professors at top Brazilian universities. Several sabbatical leaves took also place at LIACC from Brazilian renowned researchers in the last few years. Also, a very good network of contacts was created in the context of AISTI (Iberian Association for Information Systems and Technologies) and the organization of the CISTI (Iberian Conference on Information Systems and Technologies) series of conferences and in other Iberian and iberoamerican conferences LIACC is co-organizing such as IBERAMIA2014 (Iberoamerican Conference in Artificial Intelligence), CIAIQ2014 (Iberoamerican Conference on Qualitative Research) or

ROBOT2015 (Iberian Conference in Robotics). We will explore these synergies in order to attract very good Brazilian and South American PhD students for our lab in the next years.

6.9 Internationalization

LIACC is operating internationally from the very beginning, having developed strong connections with many international groups through joint projects, researcher and student exchange, book co-authorship, and the organization of scientific events. LIACC members have steered and chaired several relevant conferences, and were invited as keynote speakers in a number of occasions. In fact, internationalization is one of the strong points of LIACC. LIACC has been steadily cooperating with many prominent research groups both in academia and industry, in Europe (e.g. Schneider Elektronik, Microsoft, U. Southern Denmark, Queen Mary College – London, Humboldt University, Univ. S. Compostela, Univ. Vigo, Univ. Politécnica de Madrid, Ghent University, Royal Inst. Tech.(KTH) Stockholm), Asia (Honda Research Institute - Japan, Kyoto University, Amirkabir Univ. of Technology – Tehran, Univ. Isfahan), and Ibero-America (U. São Paulo, U. Rio Grande Sul, UNEB, UFSC, UFTPR, UFRJ, SENAI-CIMATEC), having completed a number of projects while others are still going on, as reported in previous sections. In our Scientific Advisory Board sit internationally renowned scientists, corroborating the importance given by the group to international cooperation and visibility. In the future LIACC will certainly maintain and reinforce all its international connections, as we believe in its important contribution towards keeping our research output at the levels we have achieved. This implies that one of the priorities of LIACC is to increase its involvement in the establishment of research programmes and funding mechanisms at the European and international level, and to try to participate in strategic consortia. There are expected current and future possibilities to further increase the degree of international partnership with Brazilian Universities both at the PhD theses supervision and joint projects. Brazilian students asking for these supervision by LIACC members have been very successful in getting grants to be involved both in our doctoral programs and projects. Finally, we are aware of the extra efforts and of the difficulties that a research group from a peripheral country like Portugal may encounter to survive in such a competitive arena. However we will explore our international connections with emphasis for European connections in the context of Horizon 2020 program and Iberoamerican connections with emphasis on our previously created network at Spain and South America.

6.10 Knowledge transfer

Knowledge transfer, and the application of research results to solve everyday's problems, are the ultimate goals of a research laboratory like LIACC, that deals with engineering and information in the most creative way, while trying to understand the ways intelligence manifests itself in a perceptible way in real life. In the past, some of LIACC's most renowned projects have involved partners from outside the university, large and small, interested in contributing to and using the results of our research, in a process that we think it is absolutely critical to our success. In LIACC, we believe that our research must envisage its practical application at some stage, through the mix of application oriented projects together with some more long term projects exploiting emergent directions that we may consider of strategic value. Parallel to our participation, through "Agreement Technology" E. U. funded network, that resulted in a excellent handbook that includes LIACC substantial research production on the subject, we were able to transfer that proof of concept to companies (TAP, SISCOG, Embraer, Schneider). This means that, for the next time period, one of the LIACC's main concerns should be the consolidation of those connections and getting the feedback in order to identify other possible related issues. In our research area, new ideas, new opportunities for research, new chances to transform research results into commercial products with success across borders, arise all the time, as result of the very competitive nature of the technology advances and of the data available through open platforms that reflect the way society behaves, decides and reacts. The fact that LIACC was able to attract the attention of companies interested in exploring new ideas, as it was the case with SAPO that together with the University of Porto, through LIACC member efforts, and in collaboration with other research units, build up the UP/SAPO Labs, shows that it is possible to have close and fruitful University/Companies collaboration keeping the focus on scientific research and development. The same way we feel that internationalization is not anymore a feature on itself, since world is more global than ever, knowledge transfer also happens globally, with new, and unexpected until recently, possibilities of sharing and using knowledge among users, through new types of licensing and new ways of reaching the end user. The example of a new, although simple, software tool made available by one of the LIACC members in Android Market, that got more than 100.000 downloads proves that shift of paradigm concerning the internationalization concept.

6.11 Ethical issues

LIACC research unit is mainly hosted at the University of Porto. Therefore it abides to the principles established by the Ethics Committee -CEUP ("Comissão de Ética") of the University of Porto, chaired by Professor Walter Osswald (appointed by the Rector of the University) . (https://sigarra.up.pt/up/en/WEB_BASE.GERA_PAGINA?P_pagina=1004301). CEUP assesses and monitors UP members " research projects, especially those involving sensitive issues, in particular those that involve (in any way) people, animals or biological material from people and animals, other than those that are specific to social and human sciences, technologies and the arts." Up to now, no LIACC activity has raised any problem regarding those issues. However, it is our intension to be alert and pay attention to all possible problems that can arise from LIACC knowledge transfer to external partners as it is the case of text mining and medical-oriented research work.

Continue

AJUDA

Início › **Avaliação de Unidades 2013** › Submissão de Candidatura

AVALIAÇÃO DE UNIDADES 2013

7. EXPECTED INDICATORS OF THE STRATEGIC PROGRAMME 2015/2020

7.1

DESCRIPTION	2015	2016	2017	2018	2019	2020	TOTAL (Σ)
Publications in peer-review international journals	36	36	40	40	44	44	240
Patents and performing patents	1	1	1	1	1	1	6
Books and chapters of international distribution	10	10	11	11	12	12	66
PhD theses under the supervision of integrated members	7	7	7	7	7	7	42
Conference proceedings	70	70	70	70	70	70	420
New materials, devices, products and processes, software, computer codes and algorithms	13	13	14	14	15	15	84
Books, including single-authored works (including scholarly editions of oral or written texts and translations with introduction and commentary)	2	2	2	2	2	2	12
Edited special issues of journals, with substantial research input on the part of the researcher	4	4	4	4	4	4	24
Chapters in books, including contributions to conference proceedings, essays in collections	9	9	10	10	11	11	60

Programas Doutoramento

Avaliação de Unidades 2013

Registo de Unidade
Confirmação na Equipa
Confirmação na Fusão

Submissão de Candidatura

1. Identification
2. Institutions

PART A

3. Achievements
4. Funding
5. Indicators

PART B

6. Scientific Component

7. Expected Indicators

8. Research Team
9. Research Groups
10. Thematic Lines
11. Budget 2015/2020
12. Budget Rationale
13. Reviewers proposed
14. Validation
15. Locking

Declarções de compromisso

Confirmar CV/ORCID

Documentação

Infraestruturas - Roteiro

Guia de Utilização

Delegadas pela Instituição:

LIACC/UP

Delegação de Acesso

Projectos Estratégicos

Financiamento Plurianual

DESCRIPTION	2015	2016	2017	2018	2019	2020	TOTAL (Σ)
Creative writing (to the extent that it embodies research)	0	0	0	0	0	0	0
Dictionary entries (forming part of investigation)	0	0	0	0	0	0	0
Encyclopedia entries (to the extent that they embody research)	0	0	0	0	0	0	0
Audio/visual and electronic/digital materials	0	0	0	0	0	0	0
Other categories, including web-based resources; video and audio recordings (to the extent that they embody research)	2	2	2	2	2	2	12
Performances and exhibitions to the extent that they embody research	0	0	0	0	0	0	0
Industrial research contracts	3	3	3	3	3	3	18
Research contracts with national or international bodies	7	7	8	8	8	8	46

[Continue](#)



AVALIAÇÃO DE UNIDADES 2013

8. PROPOSED RESEARCH TEAM

Programas Doutoramento

Avaliação de Unidades 2013

Registo de Unidade
 Confirmação na Equipa
 Confirmação na Fusão

Submissão de Candidatura

1. Identification
2. Institutions

PART A

3. Achievements
4. Funding
5. Indicators

PART B

6. Scientific Component
7. Expected Indicators

8. Research Team

9. Research Groups
10. Thematic Lines
11. Budget 2015/2020
12. Budget Rationale
13. Reviewers proposed
14. Validation
15. Locking

Declarações de compromisso
 Confirmar CV/ORCID
 Documentação

Infraestruturas - Roteiro

Guia de Utilização

Delegadas pela Instituição:

Delegação de Acesso

Projectos Estratégicos

Financiamento Plurianual

8.1 Criteria adopted by the R&D unit for the definition of integrated member, if different from FCT's reference table

Our adopted criteria required a minimum of 3 production indicators per year (total of 15 or more). In order to promote young researchers, although keeping the basic FCT reference table criteria, we alleviated the above mentioned requirement for recent PhD holders. As a consequence, 7 recent PhDs have been integrated. LIACC integrated members are also expected to do research in topics that benefit from a distributed and often decentralized or concurrent or parallel approach. For the more theoretical topics, researchers on declarative languages principles are also privileged.

8.2 List of Integrated Members / 10 nuclear CVs

NAME	NUCLEAR CV	ORCID ID
Eugenio da Costa Oliveira (Coordinator)		0000-0001-9271-610X
Ana Paula Cunha da Rocha		0000-0002-8129-9758
António Beça Gonçalves Porto		0000-0002-5747-5512
António Jesus Monteiro de Castro		0000-0001-8121-1974
António Manuel Correia Pereira		0000-0002-2645-3417
António Mário Silva Marcos Florido		0000-0002-0574-7555
Brígida Mónica Teixeira de Faria		0000-0003-2102-3407
CÉLIA TALMA MARTINS DE PINHO VALENTE		0000-0002-3861-0854
Daniel Augusto Gama de Castro Silva		0000-0001-9293-0341
Francisco José de Oliveira Restivo		0000-0002-6173-082X
Henrique Daniel de Avelar Lopes Cardoso		0000-0003-1252-7515
Jorge Manuel Gomes Barbosa		0000-0003-4135-2347
Jorge Manuel Neves Coelho		0000-0002-3395-6426
João Manuel Lobato Dias Silva Oliveira		0000-0002-7262-2330
Luis Henrique Ramilo Mota		0000-0002-7367-8475
Luis Paulo Gonçalves Reis		0000-0002-4709-1718
Maria Joana Malaquias Pires Urbano		0000-0002-1156-9329
Paulo Jorge Pinto Leitão		0000-0002-2151-7944
Pedro Miguel do Vale Moreira		0000-0001-8371-0347
Rosaldo José Fernandes Rossetti		0000-0002-1566-7006
Sandra Maria Mendes Alves		0000-0001-8840-5587

Fundação para a Ciência e a
Avenida D. Carlos I, 126
1249-074 Lisboa · Portugal
+351 213 924 300 · pct@fct.pt

NAME	NUCLEAR CV	ORCID ID
armando barbot campos matos		0000-0003-2144-4439
Álvaro Manuel reis da Rocha		0000-0002-0750-8187

Continue

AJUDA

[Início](#) › [Avaliação de Unidades 2013](#) › Submissão de Candidatura**AVALIAÇÃO DE UNIDADES 2013**
9. PROPOSED RESEARCH GROUPS**Programas Doutoramento****Avaliação de Unidades 2013**

Registo de Unidade
Confirmação na Equipa
Confirmação na Fusão

Submissão de Candidatura

1. Identification
2. Institutions

PART A

3. Achievements
4. Funding
5. Indicators

PART B

6. Scientific Component
7. Expected Indicators
8. Research Team

9. Research Groups

10. Thematic Lines
11. Budget 2015/2020
12. Budget Rationale
13. Reviewers proposed
14. Validation
15. Locking

Declarações de compromisso

Confirmar CV/ORCID

Documentação

Infraestruturas - Roteiro**Guia de Utilização****Delegadas pela Instituição:**

LIACC/UP

Delegação de Acesso**Projectos Estratégicos****Financiamento Plurianual**

REFERENCE	NAME	PRINCIPAL INVESTIGATOR	
RG-27-1570	Distributed Artificial Intelligence and Agent-based Simulation	Eugenio da Costa Oliveira	View
RG-27-1572	Computer Science	António Beça Gonçalves Porto	View
RG-27-1573	Human-Machine Intelligent Cooperation	Luis Paulo Gonçalves Reis	View

[Continue](#)**Fundação para a Ciência e a Tecnologia**

Avenida D. Carlos I, 126
1249-074 Lisboa - Portugal
+351 213 924 300 - pct@fct.pt

AJUDA

[Início](#) › [Avaliação de Unidades 2013](#) › Submissão de Candidatura**Programas Doutoramento****Avaliação de Unidades 2013**

Registo de Unidade
Confirmação na Equipa
Confirmação na Fusão

Submissão de Candidatura

1. Identification
2. Institutions

PART A

3. Achievements
4. Funding
5. Indicators

PART B

6. Scientific Component
7. Expected Indicators
8. Research Team

9. Research Groups**9.1. Identification**

- 9.2. Researchers
- 9.3. Description and Achievements
- 9.4. Output
- 9.5. Structure and Objectives
10. Thematic Lines
11. Budget 2015/2020
12. Budget Rationale
13. Reviewers proposed
14. Validation
15. Locking

Declarações de compromisso
Confirmar CV/ORCID
Documentação

Infraestruturas - Roteiro**Guia de Utilização****Delegadas pela Instituição:**

LIACC/UP

Delegação de Acesso**Projectos Estratégicos****Financiamento Plurianual****AVALIAÇÃO DE UNIDADES 2013****9.1. IDENTIFICATION OF THE RESEARCH GROUP****(RG-27-1570) DISTRIBUTED ARTIFICIAL INTELLIGENCE AND AGENT-BASED SIMULATION****9.1.1** Reference of the research group

RG-27-1570

9.1.2 Name of the Research Group in portuguese

Inteligência Artificial Distribuída e Simulação baseada em Agentes

9.1.3 Name of the Research Group in English

Distributed Artificial Intelligence and Agent-based Simulation

9.1.4 Keyword(s)

Multi-agent Systems Learning and Adaptation

Text Mining Information extraction

Agents interoperability and simulation

Cloud and parallel computing

9.1.5 Existed in 2008/2012

Yes

9.1.6 Participating Institution(s) to which the Research Group belongs

Universidade do Porto (UP)

Universidade do Porto (UP)

Continue



Programas Doutoramento

Avaliação de Unidades 2013

- Registo de Unidade
- Confirmação na Equipa
- Confirmação na Fusão
- Submissão de Candidatura**
 - 1. Identification
 - 2. Institutions
 - PART A**
 - 3. Achievements
 - 4. Funding
 - 5. Indicators
 - PART B**
 - 6. Scientific Component
 - 7. Expected Indicators
 - 8. Research Team
 - 9. Research Groups**
 - 9.1. Identification
 - 9.2. Researchers**
 - 9.3. Description and Achievements
 - 9.4. Output
 - 9.5. Structure and Objectives
 - 10. Thematic Lines
 - 11. Budget 2015/2020
 - 12. Budget Rationale
 - 13. Reviewers proposed
 - 14. Validation
 - 15. Locking
- Declarações de compromisso
- Confirmar CV/ORCID
- Documentação

Infraestruturas - Roteiro

Guia de Utilização

Delegadas pela Instituição:

LIACC/UP

Delegação de Acesso

Projectos Estratégicos

Financiamento Plurianual

AVALIAÇÃO DE UNIDADES 2013

9.2. RESEARCHERS IN THE GROUP

(RG-27-1570) DISTRIBUTED ARTIFICIAL INTELLIGENCE AND AGENT-BASED SIMULATION

9.2.1 List of Integrated Members / 3 nuclear CVs

NAME	PRINCIPAL INVESTIGATOR	NUCLEAR CV
Eugenio da Costa Oliveira		
Ana Paula Cunha da Rocha		
António Jesus Monteiro de Castro		
Francisco José de Oliveira Restivo		
CÉLIA TALMA MARTINS DE PINHO VALENTE		
Daniel Augusto Gama de Castro Silva		
Henrique Daniel de Avelar Lopes Cardoso		
Jorge Manuel Gomes Barbosa		
Paulo Jorge Pinto Leitão		
Maria Joana Malaquias Pires Urbano		
Rosaldo José Fernandes Rossetti		
Eugenio da Costa Oliveira		
Ana Paula Cunha da Rocha		
António Jesus Monteiro de Castro		
Francisco José de Oliveira Restivo		
CÉLIA TALMA MARTINS DE PINHO VALENTE		
Daniel Augusto Gama de Castro Silva		
Henrique Daniel de Avelar Lopes Cardoso		
Jorge Manuel Gomes Barbosa		
Paulo Jorge Pinto Leitão		
Maria Joana Malaquias Pires Urbano		

Fundação para a Ciência e a
Avenida D. Carlos I, 126
1249-074 Lisboa · Portugal
+351 213 924 300 · pct@fct.pt

NAME**PRINCIPAL
INVESTIGATOR****NUCLEAR
CV**

Rosaldo José Fernandes
Rossetti

9.2.2 List of current
PhD students**NAME**

Altino Manuel Silva Sampaio
Gustavo Alexandre Teixeira Laboreiro
Hamid Arabnejad
João Emílio Santos Carvalho de Almeida
Joaquim Fernando Fernandes da Silva
Jorge Filipe Pinheiro Guerra Ribeiro Teixeira
Lúcio Sanchez Passos
Nelson Ricardo Martins Rodrigues
Pedro Gonçalo Ferreira Alves Nogueira
Zafeiris Kokkinogenis
Altino Manuel Silva Sampaio
Gustavo Alexandre Teixeira Laboreiro
Hamid Arabnejad
João Emílio Santos Carvalho de Almeida
Joaquim Fernando Fernandes da Silva
Jorge Filipe Pinheiro Guerra Ribeiro Teixeira
Lúcio Sanchez Passos
Nelson Ricardo Martins Rodrigues
Pedro Gonçalo Ferreira Alves Nogueira
Zafeiris Kokkinogenis

9.2.3 List of other
researchers of the
Research Group**NAME**

André Monteiro de Oliveira Restivo
André Monteiro de Oliveira Restivo

[Continue](#)



Programas Doutoramento

Avaliação de Unidades 2013

- Registo de Unidade
- Confirmação na Equipa
- Confirmação na Fusão
- Submissão de Candidatura**
 - 1. Identification
 - 2. Institutions
 - PART A**
 - 3. Achievements
 - 4. Funding
 - 5. Indicators
 - PART B**
 - 6. Scientific Component
 - 7. Expected Indicators
 - 8. Research Team
 - 9. Research Groups**
 - 9.1. Identification
 - 9.2. Researchers
 - 9.3. Description and Achievements**
 - 9.4. Output
 - 9.5. Structure and Objectives
 - 10. Thematic Lines
 - 11. Budget 2015/2020
 - 12. Budget Rationale
 - 13. Reviewers proposed
 - 14. Validation
 - 15. Locking
- Declarações de compromisso
- Confirmar CV/ORCID
- Documentação

Infraestruturas - Roteiro

Guia de Utilização

Delegadas pela Instituição:

LIACC/UP

Delegação de Acesso

Projectos Estratégicos

Financiamento Plurianual

AVALIAÇÃO DE UNIDADES 2013

9.3. RESEARCH GROUP DESCRIPTION AND ACHIEVEMENTS FOR 2008/2012

(RG-27-1570) DISTRIBUTED ARTIFICIAL INTELLIGENCE AND AGENT-BASED SIMULATION

9.3.1 Description of the Research Group

DAI&R split into two more specific groups (DAIAS- Distributed AI and Agent-based Simulation, and HMIC). DAIAS group includes 11 PhDs (5 recent PhDs), 10 PhD students and 4 other collaborators. DAIAS pursues research mentioned in ACM CCS section: I.2.11- Distributed AI. Main objective is to improve quality of research through prototypes, publications, theses and project deliverables with potential applications in mind. DAIAS research lines: a) MAS and agent-based interoperability for networking and cooperation; b) agent-based simulation; c) Text Mining; d) Cloud, Parallel computing and applications. a) We pursue a long-term goal of making available a multi-agent based system (MAS), seen as an Electronic Institution, enabling e-contracting for Enterprise-networking by using Trust Models (CTM) under a Normative environment. Research topics include Adaptive Negotiation, Norms' representation and Trust metrics. Furthermore, we apply machine learning techniques to Normative environments and argumentation-based negotiation. We generalize CTM for social agents networking and adaptive negotiation protocols used in MASDIMA, a decentralized system that solves plan disruptions as occurred in Airline Operations Control Centers. We develop adaptive and reconfigurable solutions for control automation and manufacturing systems, based on MAS and SOA principles. Flexible and trustworthy MAS for run-time services e-procurement is our aim. b) We focus on Complex Systems analysis and engineering, since the engineering lifecycle depends on modelling and simulation. Agent-based approach helps on developing advanced simulation environments (for ecosystems, social networks, transportation systems). Work on Intelligent Transportation Systems, Smart Cities, and Future Mobility Systems are privileged application domains. We study on how different aspects of user experience (e.g. immersion, fun, tension) are affected by emotional states and how can it be enforced to produce more engaging affective gaming experiences. c) "Text mining" research is done in collaboration with other groups. We develop methods for extracting information (citations, topics-classification, opinions, events, micro biographies, trends) from user-generated contents (blogs, twitter, on-line comments) and from media (on-line news). We do research on inferring ontology-based resources (taxonomies, thesaurus) using information from Wikipedia. A network, for relating personalities in news, gives a temporal picture of the mentioned personalities that co-occur. We are mostly devoted to Information Extraction through Natural Language Processing and ML techniques applied to the Portuguese Language. Preprocessing and disambiguating raw text, mainly from social network messages like Twitter, is also a strong concern. A Web based search tool relying on ML techniques to find out relevant literature for genomic or proteomic sequences has also been developed. d) Another perspective on distributed systems, at the computer architecture level, leads us to develop strategies to autonomously manage resources providing availability and reliability of cloud computing infrastructures. We address the problem of scheduling multi-user jobs (represented by DAGraphs) in a cluster. The aim is to develop dynamic scheduling algorithms that maximize the use of resources by allowing a variable mapping of processors to a given job and achieve high QoS level. We are using a GPU to achieve high computational efficiency in Digital Reconstructed Radiography generation from Polygon meshes, for registering 3D deformable models of vertebrae on 2D radiographies. We proposed a method for 3D modeling of the human spine from two planar radiographies. Feature descriptors coupled with ML techniques to segment the pedicles on radiographies are being used. Research efforts take into consideration the possibility to produce proof-of-concepts based on models and prototypes to be transferred to the non-academic sector.

9.3.2 Main achievements

Theses:12PhD; 104MSc. Publications:33 Journ.;22 BCh;256 Proc. Referred in SCOPUS or ISI (213). DAIAS research topics directed our activities regarding publications, theses, prototypes, interdisciplinary and knowledge transfer. DAIAS research address problems that ask for distributed, often decentralized solutions mainly based on Agents and distributed systems. a) We implemented ANTE (Agreement Negotiation in Normative and Trust-enabled Environments, a software for B2B Enterprises networking. ANTE, the outcome of 4 PhD theses, including adaptive Negotiation protocols, active Normative environment and a Trust model, enables agents to represent different entities, selecting trustworthy partners to work jointly, according to electronic contracts. MASDIMA (MAS for Disruption Management)

Fundação para a Ciência e a Tecnologia
Avenida D. Carlos I, 126
1249-074 Lisboa · Portugal
+351 213 924 300 · pct@fct.pt

solves problems created by unexpected events causing plan disruptions. Solutions are computed taking into consideration different problem perspectives on utility measures. MASDIMA can be applied to Airlines Operation Control. Video at (<http://youtu.be/9ApQhEQj8rI>). We are negotiating its use by TAP and Embraer (Aircrafts manufacturer). MAS-based methods and systems have been applied for shop-floor production at Schneider Elek. GmbH (4 patents). b) This research implied intensive cooperation both concerning different disciplines (linguistics, HCI) and institutions (SAPO, INESC, LASIGE, Google Labs). Besides PhD theses on ML-based algorithms for "mining" text from news, news topic classification, Entity-named recognition, opinion polarity detection and personalities networking, 3 products have been made available through SAPO company (VOXX, Twitometro, "Máquina do tempo") (<http://maquinadotempo.sapo.pt/>). BiotextRetriever, is a system using ML algorithms, for scientific articles retrieval and classification from MEDLINE bibliographic DB. c) Complex Systems Analysis and Engineering lead DAIAS to do research on Modelling and Simulation theory and practice. The concept of agent-based modelling and simulation and the use of agent-oriented software engineering to develop the new generation of advanced simulation environments is a major aim of the group. MAS-Ter Lab Framework assesses intelligent transportation and mobility solutions. Simulators have been designed for buildings evacuation by pedestrians and for multi-vehicle missions. d) Cloud, parallel computing and applications. We developed: scheduling algorithms for batches of parallel task jobs on heterogeneous clusters and systems; a method for fast 3D reconstruction of the spine from biplanar radiographs. We have a Patent on monitoring transport and storage temperature of sensitive products, an outcome of industrial collaboration. Multidisciplinary work in cooperation: [Linguistics]U. Austin, IST, SAPO, INESC, LASIGE; Google Labs; U. Aston. [Economics]LIAAD. [Management]SQIMI. [Health care] E.P. Montreal, S. J. Hosp.; INEGI and S. J. Hosp.; Gaia Hosp., S. A. Hosp., FC/UP, FM/UL, INEB/UP, IEETA/UA. [Bioinformatics]LIAAD. [Transportation]TAP, SISCOG; LNEC, Armis, U.Leeds. [shop-floor control] Schneider Elek. GmbH. [computer games] U.Ontario I.T. Projects: Models, prototypes and applications to be used by companies like Schneider Elek., SISCOG, TAP and SAPO-PT. Relevant participations in European projects (7 Framework Program and Cost Actions). Outreach: Demos of ANTE at 4 scientific meetings. Negotiating MASDIMA with TAP and EMBRAER. Work on Text Mining lead to creation of UP-SAPO Labs at FEUP and products: VOXX, Máquina do Tempo, Twitometro. Presence on the Media: TV: BioStories, Twitometro, Serious Games; Radio: VOXX, UP/SAPO Labs, evacuation simulators; Newspapers: Twitometro, Biostories, Voxx, DAIAS work; Videos: UP/SAPO Labs. Events: SAPO Codebits; Innovation Days-AdI;"Fórum Empresas 08", Softwell Solutions, Brasil, "On the limits of Science"- Health Sciences Inst., Porto); "Contemporary Architectural Challenges"-Fac. of Archit.Porto. MORE information available <http://www.fe.up.pt/~niadr>

Continue

AJUDA

[Início](#) › [Avaliação de Unidades 2013](#) › Submissão de Candidatura**Programas Doutoramento****Avaliação de Unidades 2013**

Registo de Unidade
Confirmação na Equipa
Confirmação na Fusão

Submissão de Candidatura

1. Identification
2. Institutions

PART A

3. Achievements
4. Funding
5. Indicators

PART B

6. Scientific Component
7. Expected Indicators
8. Research Team

9. Research Groups

- 9.1. Identification
- 9.2. Researchers
- 9.3. Description and Achievements

9.4. Output

- 9.5. Structure and Objectives
10. Thematic Lines
11. Budget 2015/2020
12. Budget Rationale
13. Reviewers proposed
14. Validation
15. Locking

Declarações de compromisso
Confirmar CV/ORCID
Documentação

Infraestruturas - Roteiro**Guia de Utilização****Delegadas pela Instituição:**

LIACC/UP

Delegação de Acesso**Projectos Estratégicos****Financiamento Plurianual****AVALIAÇÃO DE UNIDADES 2013****9.4. RESEARCH GROUP OUTPUT 2008/2012****(RG-27-1570) DISTRIBUTED ARTIFICIAL INTELLIGENCE AND AGENT-BASED SIMULATION****9.4.1****Publications in peer reviewed journals and/or other publications**

Daniel Silva, Rodrigo A.M. Braga, Luís P. Reis, Eugénio Oliveira. "Design

P. Leitão and F. Restivo (2008), "Implementation of a Holonic Control Sys

Henrique Lopes Cardoso, Eugénio Oliveira (2008). "Electronic Institutions

Daniel C. de Moura, Jonathan Boisvert, Jorge G. Barbosa, Hubert Labelle

P. Leitão, J. Barbosa, D. Trentesaux (2012), "Bio-inspired Multi-Agent Sys

António J. M. Castro, Eugénio Oliveira (2011), A New Concept for Disrupt

Jorge G. Barbosa, Belmiro Moreira (2011). "Dynamic scheduling of a batc

Henrique Lopes Cardoso, Eugénio Oliveira (2011). "Social Control in a Nc

P. Leitão (2009), "Agent-based Distributed Manufacturing Control: A State

P. Leitão, J.M. Mendes, A. W. Colombo and F. Restivo (2012), "High-Leve

9.4.2**Completed PhD theses**

Vasco Vinhas Moreira, no tema "Realtime Dynamic Multimedia Storyline f

Luis Morais Sarmento, no tema "Analizador Semântico Robusto e de Cob

Henrique Lopes Cardoso, "Electronic Institutions with Normative Environn

João Marco Mendes, "Mechanisms and Tools for Orchestration and Chorr

Daniel Castro Silva, "Dynamic Agent Coordination for Applications in Surv

Daniel Cardoso de Moura, "Three-Dimensional Biplanar Reconstruction o

Nuno Miguel da Costa Santos Fonseca, "Singing Voice Resynthesis usinç

Raul Ramos Pollan, "Improving multilayer perceptron classifiers AUC perf

António Castro, "A Distributed Approach to Integrated and Dynamic Disru

Maria Joana Urbano, "A Situation-aware and Social Computational Trust I

Fundação para a Ciência e a Tecnologia

Avenida D. Carlos I, 126
1249-074 Lisboa · Portugal
+351 213 924 300 · pct@fct.pt

Continue



AVALIAÇÃO DE UNIDADES 2013

Programas Doutoramento

Avaliação de Unidades 2013

- Registo de Unidade
- Confirmação na Equipa
- Confirmação na Fusão
- Submissão de Candidatura**
 - 1. Identification
 - 2. Institutions
 - PART A**
 - 3. Achievements
 - 4. Funding
 - 5. Indicators
 - PART B**
 - 6. Scientific Component
 - 7. Expected Indicators
 - 8. Research Team
 - 9. Research Groups**
 - 9.1. Identification
 - 9.2. Researchers
 - 9.3. Description and Achievements
 - 9.4. Output
 - 9.5. Structure and Objectives**
 - 10. Thematic Lines
 - 11. Budget 2015/2020
 - 12. Budget Rationale
 - 13. Reviewers proposed
 - 14. Validation
 - 15. Locking
- Declarações de compromisso
- Confirmar CV/ORCID
- Documentação

Infraestruturas - Roteiro

Guia de Utilização

Delegadas pela Instituição:

LIACC/UP

Delegação de Acesso

Projectos Estratégicos

Financiamento Plurianual

9.5. ORGANISATIONAL STRUCTURE AND OBJECTIVES OF THE RESEARCH GROUP 2015/2020 (RG-27-1570) DISTRIBUTED ARTIFICIAL INTELLIGENCE AND AGENT-BASED SIMULATION

9.5.1 Structure of the Research Group

As described before, DAIAS was all comprised in the former DAI&R (Distributed Artificial Intelligence & Robotics) group and may be seen as its continuation. A sub-group of the former DAI&R becomes now a group by itself called HMIC. DAIAS encompasses four clusters that will pursue and develop further its research directions on: a) MAS and agent-based interoperability for networking and cooperation; b) agent-based simulation; c) Text Mining; d) Cloud, Parallel computing and applications. Besides that, there are expectations about possible new developments in different topics as it is the case of "emotion-guided" computer games and social networking analysis. In order to incentivize these new research topics, several members of LIACC are giving space in several post-graduation courses for seminars on the matter. They are also proposing new research themes, starting at the master's level, related with how to influence games story line based on simple emotions and how to analyze social networks. Coordinating master students work by PhD students under the supervision of more senior PhDs it is a possible way of continuous increase of interest on those new topics for further advanced research. Four senior PhDs (R. Rossetti, P. Leitão, J. Barbosa and E. Oliveira) are gathering around them most of the research supervision. However, there are a few new doctors who will be able to start independent research along similar research lines and this movement is already visible leading to more advanced and deep developments of topics tackled on their PhD theses. Nothing in the group structure prevents this possible expansion. DAIAS, a group with almost 50% of members who got their PhD after 2010, will certainly change leadership during the period under analysis. However, we believe that the organization will stay alike, in the sense that there is complete freedom for individual research, taking as basic guidelines: modeling, specification, simulation and implementation of distributed and intelligent software systems; web-based text mining; jobs scheduling, error monitoring and management at a distributed level. An important commitment that we believe to be relevant for DAIAS performance, has to do with our tight connection with doctoral programs (we chair the Doctoral Program on Informatics Engineering and support MAPi program in Informatics). This fact will permit DAIAS members to be close to PhD candidates and to attract them to the research we are pursuing. The same, although at a lower degree, also applies to MSc programs. DAIAS will continue to be closed related with other research groups, as it is the case of INESC and participate in the R&D efforts of UP/SAPO Labs. Presentations about on-going research are usually done in Seminars for graduate and post-graduate students at the Faculty of Engineering and other "fora". Annually, the group will continue to discuss its research directions and orientation during a dedicated "brain storming" special day. Most research is done associated to projects, knowledge transfer to the community and these work.

9.5.2 Objectives of the Research Group

As far as we can foresee, we state the following research directions and objectives: a) Agents and multi-agent systems: - to generalize and further develop a framework for agents to interoperate for joint work or information sharing. Normative environment will enforce incentive-based useful social strategies. Trust models will be improved in which context-sensitivity is concerned. Reputation models and Ontology services will be developed for heterogeneous agent's interoperability. Generic and argumentation-based negotiation protocols will be developed for e-contracts and partners' selection; A generic model, combining all these features will be proposed for better open MAS performance - to make MASDIMA framework more adaptive and dynamic through the use of machine learning algorithms. To add simulation capabilities of agent's behaviors, events and resources to this framework and deploy the software for plan-disruptive situations - to combine MAS and service-oriented principles for manufacturing and smart grids - to formalize emotion-like agent architecture and application of biological and physical inspired theories in complex and self-organized systems b) To design advanced methods of modelling and validation techniques for distributed, parallel and participatory simulation. Main focus will be in Socio-technical systems that behave socially and depend on communication channels and infrastructure for information generation, dissemination, preservation and interpretation. Examples include ecosystems, social networks, transportation and market-like systems. To pursue long-term research direction: Development of MAS-Ter Lab, an advanced artificial transportation model for assessment and development of ITS-based solutions. In MAS-Ter

Fundação para a Ciência e a Tecnologia
Avenida D. Carlos I, 126
1249-074 Lisboa · Portugal
+351 213 924 300 · pct@fct.pt

Lab, the application domain is conceptualised using agents and three subsystems: real world, virtual domain, and control strategies inductor. We need tools to leverage the validation and synthesis of artificial societies through the concept of agents, “gamification” and participatory simulation. This research can be applied to pedestrian behaviour modelling in emergency situations, evacuation and rescue scenarios, and to study the influence of information system ergonomics on vehicles driving environment. - to conclude the development of a distributed platform for the simulation, by a team of autonomous vehicles, of cooperative missions - to focus on challenges associated to News scenarios, such as: News categories variability, drift concepts on News categories, meta-learning techniques for News classification, build stories out of a set of chronologically sparse News articles - to develop general strategies to enhance news topic classification from meta-data and, possibly, apply them to health domains - to tackle other research domains that may improve knowledge discovery on News, such as social (media) network analysis and data mining applied to News impact prediction. c) To address the resilience of applications and runtime environments for large distributed systems. To develop techniques to deal with hardware and distributed software failures or intentional changes within the complex environment: resilient, reactive schedulers that can survive errors at node and cluster-levels; cluster-level monitoring and assessment of failures with pro-active actions to remedy failures before they actually occur, and applications that adapt the use of their resource at run-time. Regarding computer games we intend to do research on the application of social concepts and opponent modeling to complex multi-player games such as Poker or Diplomacy. We also will do individual's behavior modelling and elicitation through serious games and participatory simulation. Finally, our activities will try to consolidate the group by including new members, to foster the possibility of knowledge transfer and ensure a few industrial partnerships. We wish to improve publication productivity according to the good metrics.

Continue

AJUDA

[Início](#) › [Avaliação de Unidades 2013](#) › Submissão de Candidatura

AVALIAÇÃO DE UNIDADES 2013

9.1. IDENTIFICATION OF THE RESEARCH GROUP

(RG-27-1572) COMPUTER SCIENCE

9.1.1 Reference of the research group

RG-27-1572

9.1.2 Name of the Research Group in portuguese

Ciência de Computadores

9.1.3 Name of the Research Group in English

Computer Science

9.1.4 Keyword(s)

Formal Methods

Declarative Programming

Program Verification

Information Systems

9.1.5 Existed in 2008/2012

Yes

9.1.6 Participating Institution(s) to which the Research Group belongs

Universidade do Porto (UP)

Universidade do Porto (UP)

Continue

Programas Doutoramento

Avaliação de Unidades 2013

Registo de Unidade
Confirmação na Equipa
Confirmação na Fusão

Submissão de Candidatura

1. Identification
2. Institutions

PART A

3. Achievements
4. Funding
5. Indicators

PART B

6. Scientific Component
7. Expected Indicators
8. Research Team
9. Research Groups
 - 9.1. Identification
 - 9.2. Researchers
 - 9.3. Description and Achievements
 - 9.4. Output
 - 9.5. Structure and Objectives
10. Thematic Lines
11. Budget 2015/2020
12. Budget Rationale
13. Reviewers proposed
14. Validation
15. Locking

Declarações de compromisso
Confirmar CV/ORCID
Documentação

Infraestruturas - Roteiro

Guia de Utilização

Delegadas pela Instituição:

LIACC/UP

Delegação de Acesso

Projectos Estratégicos

Financiamento Plurianual

AJUDA

[Início](#) › [Avaliação de Unidades 2013](#) › Submissão de Candidatura

AVALIAÇÃO DE UNIDADES 2013

9.2. RESEARCHERS IN THE GROUP

Programas Doutoramento

Avaliação de Unidades 2013

- Registo de Unidade
- Confirmação na Equipa
- Confirmação na Fusão
- Confirmação na Fusão
- Submissão de Candidatura**
 - 1. Identification
 - 2. Institutions
 - PART A**
 - 3. Achievements
 - 4. Funding
 - 5. Indicators
 - PART B**
 - 6. Scientific Component
 - 7. Expected Indicators
 - 8. Research Team
 - 9. Research Groups**
 - 9.1. Identification
 - 9.2. Researchers**
 - 9.3. Description and Achievements
 - 9.4. Output
 - 9.5. Structure and Objectives
 - 10. Thematic Lines
 - 11. Budget 2015/2020
 - 12. Budget Rationale
 - 13. Reviewers proposed
 - 14. Validation
 - 15. Locking

Declarações de compromisso
 Confirmar CV/ORCID
 Documentação

Infraestruturas - Roteiro

Guia de Utilização

Delegadas pela Instituição:

Delegação de Acesso

Projectos Estratégicos

Financiamento Plurianual

(RG-27-1572) COMPUTER SCIENCE

9.2.1 List of Integrated Members / 3 nuclear CVs

NAME

António Beça Gonçalves
Porto

António Mário Silva Marcos
Florido

Jorge Manuel Neves
Coelho

Sandra Maria Mendes
Alves

armando barbot campos
matos

António Beça Gonçalves
Porto

António Mário Silva Marcos
Florido

Jorge Manuel Neves
Coelho

Sandra Maria Mendes
Alves

armando barbot campos
matos

PRINCIPAL INVESTIGATOR

NUCLEAR CV

9.2.2 List of current PhD students

NAME

Besiki Dundua

Cláudio Oliveira Amaral

Hugo Miguel Oliveira Romualdo Simões

Besiki Dundua

Cláudio Oliveira Amaral

Hugo Miguel Oliveira Romualdo Simões

9.2.3 List of other researchers of the Research Group

NAME

Mário José Parreira Pereira

Pedro Baltazar Vasconcelos

Fundação para a Ciência e a
Avenida D. Carlos I, 126
1249-074 Lisboa · Portugal
+351 213 924 300 · pct@fct.pt

NAME

Mário José Parreira Pereira

Pedro Baltazar Vasconcelos

Continue

**Programas Doutoramento****Avaliação de Unidades 2013**

- Registo de Unidade
- Confirmação na Equipa
- Confirmação na Fusão
- Submissão de Candidatura**
 - 1. Identification
 - 2. Institutions
 - PART A**
 - 3. Achievements
 - 4. Funding
 - 5. Indicators
 - PART B**
 - 6. Scientific Component
 - 7. Expected Indicators
 - 8. Research Team
 - 9. Research Groups**
 - 9.1. Identification
 - 9.2. Researchers
 - 9.3. Description and Achievements**
 - 9.4. Output
 - 9.5. Structure and Objectives
 - 10. Thematic Lines
 - 11. Budget 2015/2020
 - 12. Budget Rationale
 - 13. Reviewers proposed
 - 14. Validation
 - 15. Locking
- Declarações de compromisso
- Confirmar CV/ORCID
- Documentação

Infraestruturas - Roteiro**Guia de Utilização****Delegadas pela Instituição:**

LIACC/UP

Delegação de Acesso**Projectos Estratégicos****Financiamento Plurianual****AVALIAÇÃO DE UNIDADES 2013****9.3. RESEARCH GROUP DESCRIPTION AND ACHIEVEMENTS FOR 2008/2012****(RG-27-1572) COMPUTER SCIENCE****9.3.1** Description of the Research Group

Within the general LIACC aim of software and information processing reliability, this group has always had an emphasis on fundamental research, ranging through computational complexity, automata and formal languages, algorithms, programming languages, semantics, and formal verification. But at the same time it has also shown a good record of directing fundamental results towards practical applications. The group has gone through some major changes, and today it is much smaller than it was in the past. In 2008 it consisted in fact of three groups: advanced programming systems, formal models of computation, and language, complexity and cryptography. From 2009 it became a single group, while several researchers have either retired or left to join more specific research centers. Today it has only 7 PhD researchers, one of which has integrated a proposal for a new center to be created in 2015. With the current group composition the research is naturally not as broad as it was. There is a common appreciation and use of declarative programming, i.e. logic and/or functional programming, and a generic concern with reliability and effectiveness leading to an interest in testing and verification, supported by research on types that can capture behavioural semantics underlying target program properties. The group's productivity has typically materialised not just in publications but also in practical software tools.

9.3.2 Main achievements

The DIVERT traffic simulator definitely contributed to the visibility of LIACC in 2009, raising great interest from academia and industry. A new layer for 3D-simulation of driving situations was further developed in the scope of the DRIVE-IN project (CMU-PT/NGN/0052/2008), and DIVERT was also used in virtual traffic lights systems and in testing an industrial traffic control system (GERTRUDE, France). This line of work was instrumental in the setup of a spin-off company, GeoLink, currently exploiting novel traffic and vehicular solutions. A systematic effort to explore linearity in programming languages, more specifically in the lambda-calculus, led to many interesting results published in major venues, notably a closed reduction linear version of Gödel's system T with is as powerful as T. An interactive graphical interface GULtar was developed for automata visualization and manipulation, complemented by a software library Fado for automata and regular expression manipulation. Several results were obtained and reported in the study of descriptonal complexity of regular languages, such as relationships between automata and regular expressions, and analysis of algorithms for equivalence and representational conversions. A line of study of Kolmogorov complexity led to many novel results published in major journals. e.g. on relating complexity to entropy and on the communication complexity of random functions. A type system was designed for amortised analysis of resource (heap) usage for a lazy functional programming language. An implementation was made of a verifier for a low-level assembly language (ARM) based on denotational semantics and abstract interpretation. Application of our program verification know-how led to the first mathematically and mechanically modeled and proved SIL4 level (highest in the CENELEC standard) signaling system in the world (using SCADE, in collaboration with EFACEC). Successful inroads were made into extending unification to handle syntactical abstractions, namely sequences and contexts; this has a nice potential for simplifying programming tasks such as matching and manipulation of structured data, e.g. Web content. In a drive towards supporting the construction of declarative information systems, three major building blocks were consolidated: • Cube – compositional unification-based engine A structural logic programming platform that is an alternative to Prolog, with simple compositional semantics. A fully functional professional-grade implementation was made, with useful libraries and debugging facilities. • NAF – natural attributive framework A high-level solution for database management and interaction. Based on attributive modelling of concepts and on principles of natural language, it encompasses a modular scheme description language (NACS), a language for interaction with databases (NAD), and tools for database management. • Compass – concept-oriented modular and parametric architecture for service systems A compositional architecture for building Web systems, implemented in Cube and using NAF; it provides a development environment and methodologies for rapid prototyping of organizational information systems.

Fundação para a Ciência e a Tecnologia
Avenida D. Carlos I, 126
1249-074 Lisboa · Portugal
+351 213 924 300 · pct@fct.pt

Continue

**AVALIAÇÃO DE UNIDADES 2013****9.4. RESEARCH GROUP OUTPUT 2008/2012****Programas Doutoramento****Avaliação de Unidades 2013**

Registo de Unidade
 Confirmação na Equipa
 Confirmação na Fusão

Submissão de Candidatura

1. Identification
2. Institutions

PART A

3. Achievements
4. Funding
5. Indicators

PART B

6. Scientific Component
7. Expected Indicators
8. Research Team

9. Research Groups

- 9.1. Identification
- 9.2. Researchers
- 9.3. Description and Achievements

9.4. Output

- 9.5. Structure and Objectives

10. Thematic Lines
11. Budget 2015/2020
12. Budget Rationale
13. Reviewers proposed
14. Validation
15. Locking

Declarções de compromisso

Confirmar CV/ORCID

Documentação

Infraestruturas - Roteiro**Guia de Utilização****Delegadas pela Instituição:**

LIACC/UP

Delegação de Acesso**Projectos Estratégicos****Financiamento Plurianual****(RG-27-1572) COMPUTER SCIENCE****9.4.1****Publications in peer reviewed journals and/or other publications**

Sandra Alves, Mário Florido, Ian Mackie, François-Régis Sinot: Minimality

Nelma Moreira and Rogério Reis. Series-parallel automata and short regu

Marco Almeida, Nelma Moreira, and Rogério Reis. Antimirov and Mosses

Luís Antunes, Armando Matos, André Souto, and Paul Vitanyi. Depth as r

Sandra Alves, Maribel Fernández, Mário Florido and Ian Mackie. Linearity

Sandra Alves, Maribel Fernández, Mário Florido, Ian Mackie. Gödel's syst

Andreia Teixeira, Armando Matos, André Souto, and Luís Antunes. Entrop

António Porto. A Structured alternative to Prolog with simple composition

Andreia Teixeira, Armando Matos, Luís Antunes, Conditional Rényi Entrop

Luís Nogueira, Luís Miguel Pinho and Jorge Coelho. A feedback-based de

9.4.2**Completed PhD theses**

Pedro Vasconcelos. Space cost analysis using sized types. University of f

Stéphane Cauchie. From pattern recognition to the security for biometry. l

Marco Almeida. Equivalence of regular languages: an algorithmic approac

9.4.3**Patents and Prototypes or other research outputs****9.4.4****Books and book chapters of international circulation**

José C. B. Almeida, Maria J. Frade, Jorge S. Pinto, Simão M. de Sousa. F

Fundação para a Ciência e a Tecnologia

Avenida D. Carlos I, 126
1249-074 Lisboa · Portugal
+351 213 924 300 · pct@fct.pt

Continue

AJUDA

[Início](#) › [Avaliação de Unidades 2013](#) › Submissão de Candidatura**Programas Doutoramento****Avaliação de Unidades 2013**

Registo de Unidade
Confirmação na Equipa
Confirmação na Fusão

Submissão de Candidatura

1. Identification
2. Institutions

PART A

3. Achievements
4. Funding
5. Indicators

PART B

6. Scientific Component
7. Expected Indicators
8. Research Team

9. Research Groups

- 9.1. Identification
- 9.2. Researchers
- 9.3. Description and Achievements
- 9.4. Output

9.5. Structure and Objectives

10. Thematic Lines
11. Budget 2015/2020
12. Budget Rationale
13. Reviewers proposed
14. Validation
15. Locking

Declarações de compromisso
Confirmar CV/ORCID
Documentação

Infraestruturas - Roteiro**Guia de Utilização****Delegadas pela Instituição:**

LIACC/UP

Delegação de Acesso**Projectos Estratégicos****Financiamento Plurianual****AVALIAÇÃO DE UNIDADES 2013****9.5. ORGANISATIONAL STRUCTURE AND OBJECTIVES OF THE RESEARCH GROUP 2015/2020 (RG-27-1572) COMPUTER SCIENCE**

9.5.1 Structure of the Research Group The group is small and warrants no more structure than having one person as coordinator. The group coordinator has a seat in the coordinating board of the research center.

9.5.2 Objectives of the Research Group After several decades of computer science advancements, it is still a challenge to produce software systems that are truly effective, reliable and evolutive. Research is still needed to provide the best methods and tools for designing, building, testing, verifying and adapting software systems, in a context of ever increasing interactivity among agents (human or not). Our group's approach to tackle these issues is betting on the adequacy and power of declarative programming, in its logic and functional flavours, to achieve and exploit two major abilities for narrowing the gap between intentions and achievements: to tightly match software architecture to conceptual models of the world, and to significantly simplify reasoning about programs, by both humans and computers. One of the particular themes to explore is resource analysis, aimed at guaranteeing/verifying runtime properties of sequential and concurrent programs related to their use of memory, time or energy. This involves devising appropriate type systems and corresponding proof techniques. Results with a particular impact will be for embedded and real-time systems. On the expressiveness front we shall try to devise constructs and methods to deal with several conceptual abstractions, notably the notion of context, both for the modularity it can provide and for the convenience of reference on demand, and also graphs as an expressive alternative to sequential syntax in support of various kinds of modelling including operational semantics. For the purpose of making software more amenable to smooth evolution we intend to tackle the particular challenge of database scheme change, unavoidable in most real world information systems, by building on previous work on a high-level natural attributive framework.

Continue

AJUDA

[Início](#) › [Avaliação de Unidades 2013](#) › Submissão de Candidatura**Programas Doutoramento****Avaliação de Unidades 2013**

Registo de Unidade
Confirmação na Equipa
Confirmação na Fusão

Submissão de Candidatura

1. Identification
2. Institutions

PART A

3. Achievements
4. Funding
5. Indicators

PART B

6. Scientific Component
7. Expected Indicators
8. Research Team

9. Research Groups**9.1. Identification**

- 9.2. Researchers
- 9.3. Description and Achievements
- 9.4. Output
- 9.5. Structure and Objectives
10. Thematic Lines
11. Budget 2015/2020
12. Budget Rationale
13. Reviewers proposed
14. Validation
15. Locking

Declarações de compromisso
Confirmar CV/ORCID
Documentação

Infraestruturas - Roteiro**Guia de Utilização****Delegadas pela Instituição:**

LIACC/UP

Delegação de Acesso**Projectos Estratégicos****Financiamento Plurianual****AVALIAÇÃO DE UNIDADES 2013****9.1. IDENTIFICATION OF THE RESEARCH GROUP****(RG-27-1573) HUMAN-MACHINE INTELLIGENT COOPERATION****9.1.1** Reference of the research group

RG-27-1573

9.1.2 Name of the Research Group in portuguese

Cooperação Inteligente Homem-Máquina

9.1.3 Name of the Research Group in English

Human-Machine Intelligent Cooperation

9.1.4 Keyword(s)

Human-Machine Interface

Coordination and Cooperation

Intelligent Robotics

Health Information Systems

9.1.5 Existed in 2008/2012

Yes

9.1.6 Participating Institution(s) to which the Research Group belongs

Universidade do Porto (UP)

Universidade do Porto (UP)

Continue

AJUDA

[Início](#) › [Avaliação de Unidades 2013](#) › Submissão de Candidatura**Programas Doutoramento**
Avaliação de Unidades 2013

- Registo de Unidade
- Confirmação na Equipa
- Confirmação na Fusão
- Submissão de Candidatura**
 - 1. Identification
 - 2. Institutions
 - PART A**
 - 3. Achievements
 - 4. Funding
 - 5. Indicators
 - PART B**
 - 6. Scientific Component
 - 7. Expected Indicators
 - 8. Research Team
 - 9. Research Groups**
 - 9.1. Identification
 - 9.2. Researchers**
 - 9.3. Description and Achievements
 - 9.4. Output
 - 9.5. Structure and Objectives
 - 10. Thematic Lines
 - 11. Budget 2015/2020
 - 12. Budget Rationale
 - 13. Reviewers proposed
 - 14. Validation
 - 15. Locking
- Declarações de compromisso
- Confirmar CV/ORCID
- Documentação

Infraestruturas - Roteiro**Guia de Utilização****Delegadas pela Instituição:**

LIACC/UP

Delegação de Acesso**Projectos Estratégicos****Financiamento Plurianual****AVALIAÇÃO DE UNIDADES 2013****9.2. RESEARCHERS IN THE GROUP****(RG-27-1573) HUMAN-MACHINE INTELLIGENT COOPERATION****9.2.1** List of Integrated Members / 3 nuclear CVs

NAME	PRINCIPAL INVESTIGATOR	NUCLEAR CV
Luis Paulo Gonçalves Reis		
Álvaro Manuel reis da Rocha		
João Manuel Lobato Dias Silva Oliveira		
Brígida Mónica Teixeira de Faria		
António Manuel Correia Pereira		
Luis Henrique Ramilo Mota		
Pedro Miguel do Vale Moreira		
Luis Paulo Gonçalves Reis		
Álvaro Manuel reis da Rocha		
João Manuel Lobato Dias Silva Oliveira		
Brígida Mónica Teixeira de Faria		
António Manuel Correia Pereira		
Luis Henrique Ramilo Mota		
Pedro Miguel do Vale Moreira		

9.2.2 List of current PhD students

NAME
abbas abdolmaleki
Luís Filipe Guimarães Teófilo
Maria Dulce Fernandes Mota
Nima Sahfii
Paula Alexandra Carvalho de Sousa Rego
Paulo José de Albuquerque Cardoso Trigueiros
José Joaquim Magalhães Moreira

Fundação para a Ciência e a
Avenida D. Carlos I, 126
1249-074 Lisboa · Portugal
+351 213 924 300 · pct@fct.pt

NAME

Emerson Ferreira de Araújo Lima
Roberto Manuel Ferreira Marques Rodrigues
Patrícia Isabel Sousa Trindade da Silva Leite
Paulo adriano Marques Sousa Teixeira
Catarina Maria Brito de Noronha Santiago
Rui Jorge Martins da Silva Chilro
João Ferreira de Carvalho Castro Nunes
José Avelino Moreira Victor
Jorge Manuel da Rocha Freixo
Filipe Alexandre Almeida Ningre de Sá
abbas abdolmaleki
Luís Filipe Guimarães Teófilo
Maria Dulce Fernandes Mota
Nima Sahfii
Paula Alexandra Carvalho de Sousa Rego
Paulo José de Albuquerque Cardoso Trigueiros
José Joaquim Magalhães Moreira
Emerson Ferreira de Araújo Lima
Roberto Manuel Ferreira Marques Rodrigues
Patrícia Isabel Sousa Trindade da Silva Leite
Paulo adriano Marques Sousa Teixeira
Catarina Maria Brito de Noronha Santiago
Rui Jorge Martins da Silva Chilro
João Ferreira de Carvalho Castro Nunes
José Avelino Moreira Victor
Jorge Manuel da Rocha Freixo
Filipe Alexandre Almeida Ningre de Sá

9.2.3 List of other
researchers of the
Research Group**NAME**

José Nuno Pannels Nunes Lau
João Alberto Fabro
Armando Jorge Miranda de Sousa
Antonio Paulo Gomes Mendes Moreira
Marcelo Roberto Petry
António Pedro Dias da Costa
Rodrigo A Marques Braga
Pedro Manuel Henriques da Cunha Abreu
José Nuno Pannels Nunes Lau
João Alberto Fabro
Armando Jorge Miranda de Sousa
Antonio Paulo Gomes Mendes Moreira

NAME

Marcelo Roberto Petry

António Pedro Dias da Costa

Rodrigo A Marques Braga

Pedro Manuel Henriques da Cunha Abreu

Continue



Programas Doutoramento
Avaliação de Unidades 2013

- Registo de Unidade
- Confirmação na Equipa
- Confirmação na Fusão
- Submissão de Candidatura**
 - 1. Identification
 - 2. Institutions
 - PART A**
 - 3. Achievements
 - 4. Funding
 - 5. Indicators
 - PART B**
 - 6. Scientific Component
 - 7. Expected Indicators
 - 8. Research Team
 - 9. Research Groups**
 - 9.1. Identification
 - 9.2. Researchers
 - 9.3. Description and Achievements**
 - 9.4. Output
 - 9.5. Structure and Objectives
 - 10. Thematic Lines
 - 11. Budget 2015/2020
 - 12. Budget Rationale
 - 13. Reviewers proposed
 - 14. Validation
 - 15. Locking
- Declarações de compromisso
- Confirmar CV/ORCID
- Documentação

Infraestruturas - Roteiro**Guia de Utilização****Delegadas pela Instituição:**

LIACC/UP

Delegação de Acesso**Projectos Estratégicos****Financiamento Plurianual****AVALIAÇÃO DE UNIDADES 2013****9.3. RESEARCH GROUP DESCRIPTION AND ACHIEVEMENTS FOR 2008/2012****(RG-27-1573) HUMAN-MACHINE INTELLIGENT COOPERATION****9.3.1** Description of the Research Group

The Human-Machine Intelligent Cooperation Group (HMIC) is primarily concerned with the human factors of computing and machinery systems. In a machine-driven society, it is very often to build large information systems, mostly composed by software and hardware, which may solve complex problems, but are unable to communicate or cooperate with their human counterparts as a member of the global information system. HMIC focusses on creating methodologies that enable machines and software systems to think and interact like humans and have social capabilities similar to humans enabling them to be members of heterogeneous human/machine teams. The group is mainly focused on: - Human-Machine Intelligent Interaction with focus on Human-Machine and Human-Robot Cooperation; - Coordination of Heterogeneous Teams, including teams composed exclusively by humans with distinct capabilities, multi-robot teams and human-robot teams; - Human/Machine joint Problem Solving, including distributed problem solving, heuristics, optimization and learning algorithms. - Multi-Agent Systems as a way to model advanced systems in which humans and machines interact to solve complex problems; - Health information systems and its engineering, management, usability and accessibility; - Multi-Player Serious and Educational Games for human education, rehabilitation/health applications and advanced training; - Intelligent and Social Simulation for creating learning/testing environments for solving the previous problems. HMIC research group examines issues in the common area of human-machine interaction and intelligent cooperation, distributed artificial intelligence and problem solving, cognitive and social sciences, and information systems and technology. The group is also highly involved in the creation and management of national/international scientific societies. HMIC researchers have been involved during this period in the creation and establishment of two professional associations: AISTI – Iberian Association for Systems and Technologies and SPR – Portuguese Society for Robotics. AISTI (<http://www.aisti.eu/>) was founded in 2007 as a nonprofit technical-scientific association, whose main object is the promotion and dissemination of the domain of Information Systems and Technologies in the Iberian Peninsula, boosting the link between academia, research, business and society. During the years 2008-2013 AISTI established itself with the creation of CISTI – Iberian Conference on Information Systems and Technology, sponsored by IEEE and indexed at ISI web of Knowledge and SCOPUS, RISTI (Iberian Journal on IST) – SCOPUS/ISI (since 2013) and WorldCist Conf. (pub. by Springer). HMIC group was the basis for the creation of AISTI. Álvaro Rocha is the President since its creation and Luis Paulo Reis is the President of the General Assembly. SPR (<http://www.spr.ua.pt/site/>) was created in 2006 and include most of the Portuguese researchers on the area of Robotics. It includes individual and institutional members (academy and industry). The main goals are to foster education, scientific research, technological development and applications (industry and services) of robotic systems. During the last years, as president of the General Assembly and President of the Society and organizer of several of the society events, Luis Paulo Reis at the HMIC group helped on the scientific developed of the society. Based on this work, SPR conference starting next year, will be an IEEE conference (IEEE Conference on Autonomous Robots and Competitions) indexed at IEEE XPIore and includes a Special Issue at JINT - Journal of Intelligent Robotic Systems from Springer. Also a new Iberian Robotics conference (ROBOT 2013) was created in partnership with SEIDROB from Spain. The next edition will be organized at Lisbon and co-chaired by group members.

9.3.2Main achievements

HMIC group managed to publish 450 works consisting of books/book chapters, papers (journals/international conferences) and thesis (PhD/MSc) in the period (2008-2013), 390 from which were published in the period (2008-2012). These works included 350 papers including more than 200 papers indexed at ISI Web of Knowledge and/or Scopus. The papers published included more than 50 Journal papers (40 journal papers indexed at SCI and/or Scopus), 21 Books/Book Chapters (14 indexed at SCI/Scopus), 15 proceedings editions (10 indexed at SCI and/or SCOPUS), 15 journals/special issues editions (8 edited until the end of 2012 and 7 ongoing/edited in 2013), and more than 250 papers in international conferences (155 papers indexed at SCI and/or SCOPUS). 60 of these publications were joint work with the DAI group with which the HMIC group has a strong connection and synergies. Concerning PhD and MSc thesis, a total of 16 PhD theses (13

Fundação para a Ciência e a Tecnologia
Avenida D. Carlos I, 126
1249-074 Lisboa · Portugal
+351 213 924 300 · pct@fct.pt

finished until the end of 2012) and 85 MSc Thesis (82 finished until the end of 2012) were supervised/completed by members of the HMIC group. It is worth mentioning that the group continues very attractive for new PhD students with 16 ongoing PhD theses supervised by group members. For a small group with 7 integrated members, 5 of which achieved their PhD degree in the last 4 years we consider that the publication record achieved in the period is excellent. During the last five years, HMIC achieved several national and international awards such as best papers at ICEIS2010, Robotica2011, Robotica2013, 5 distinct awards for the Intellwheels (Intelligent Wheelchair with flexible multimodal interface) project and 10 awards for the FC Portugal (coordination in multi-robot systems/robotic soccer) project including European champion award, simulation 3D league, in both 2012 and 2013. The group also produced an international patent together with Honda Research Institute - Japan (J.L.Oliveira, G.Ince, K.Nakamura, K.Nakadai, H.Okuno, L.P.Reis and F.Gouyon "An Active Audition Framework for Auditory-driven Human-Robot Interaction", US provisional patent application nº 61/696960. A large number of prototypes were also created including a fully functional Intelligent Wheelchair including a flexible Multimodal interface and 5 distinct Robotic soccer teams based on a high-level coordination framework. The group also made a significant effort on scientific divulgation and dissemination. Group members also gave keynote lectures in renowned conferences such as ICAART2012, LARS/SBR2013, and ICINCO2013 just to cite a few. More than 50 TV, Radio, Magazine and Newspaper news about group projects were published in the last five years. Also the group actively participated in the TV program "Engenharia Num Minuto" (Engineering in One Minute) with five distinct Programs. The group was also highly involved on the creation, organization and management of several International Conferences and other scientific events such as CISTI2008, IROBOT2008, CISTI2009, IROBOT2009, CISTI2010, CISTI2011, AI4Games2011, IROBOT2011, CISTI2012, Robotica2012, RoboCup2012, WorldCIST2012, CISTI2013, Robotica2013, EPIA2013, ROBOT20013, WorldCIST2013, among several other scientific events. Also, special sessions and/or Workshops were organized by group members at several international conferences such as VIPIMAGE2009, ICAART2012, and ICINCO2013 among several others). More information about the HMIC group available at: <http://www.fe.up.pt/~hmic> Complete list of achievements and outputs available at: http://www.fe.up.pt/~hmic/hmic2008_12.pdf

Continue



Programas Doutoramento
Avaliação de Unidades 2013

- Registo de Unidade
- Confirmação na Equipa
- Confirmação na Fusão
- Submissão de Candidatura**
 - 1. Identification
 - 2. Institutions
 - PART A**
 - 3. Achievements
 - 4. Funding
 - 5. Indicators
 - PART B**
 - 6. Scientific Component
 - 7. Expected Indicators
 - 8. Research Team
 - 9. Research Groups**
 - 9.1. Identification
 - 9.2. Researchers
 - 9.3. Description and Achievements
 - 9.4. Output**
 - 9.5. Structure and Objectives
 - 10. Thematic Lines
 - 11. Budget 2015/2020
 - 12. Budget Rationale
 - 13. Reviewers proposed
 - 14. Validation
 - 15. Locking

Declarações de compromisso
Confirmar CV/ORCID
Documentação

Infraestruturas - Roteiro

Guia de Utilização

Delegadas pela Instituição:

LIACC/UP

Delegação de Acesso

Projectos Estratégicos

Financiamento Plurianual

AVALIAÇÃO DE UNIDADES 2013

9.4. RESEARCH GROUP OUTPUT 2008/2012

(RG-27-1573) HUMAN-MACHINE INTELLIGENT COOPERATION

9.4.1

Publications in peer reviewed journals and/or other publications

Luis Mota, Luís Paulo Reis and Nuno Lau: Multi-Robot Coordination using

Rodrigo A.M. Braga, Marcelo Petry, Luís Paulo Reis, A. Paulo .Moreira: Ir

Pedro H. Abreu, J.Moura, Daniel C. Silva, Luís Paulo Reis, Júlio Gargant

Pedro Abreu, João Moreira, Israel Costa, Daniel Castelão, João Moreira,

João Lobato Oliveira, Luiz Naveda, Fabien Gouyon, Luís Paulo Reis, Pau

João Lobato Oliveira, Matthew E. P. Davies, Fabien Gouyon, Luís Paulo F

Catarina B. Santiago, João Lobato Oliveira, Armando Sousa, Luís Paulo F

Joaquim Gonçalves and Álvaro Rocha: (2012), "A Decision Support Syste

Álvaro Rocha: (2012), "Framework for a Global Quality Evaluation of a W

Pedro Duarte, B. Azevedo, M. J. Guerreiro, C. Ribeiro, R. Bandeira, Antor

9.4.2

Completed PhD theses

Pedro Miguel do Vale Moreira: Intelligent Optimization Methodologies App

Francisco António Fernandes Reinaldo: AFRANCI: A Multi-Layer Architec

Rodrigo António Marques Braga: Plataforma de Desenvolvimento de Cad

António Manuel Correia Pereira: Intelligent Simulation of Coastal Ecosyst

Mirna Ariadna Muñoz Mata: Identificación de las Mejores Prácticas de un

Jezreel Mejia Miranda: Marco para el Gobierno de la Externalización del f

Pedro Manuel H. Cunha Abreu: Artificial Intelligence Methodologies Appli

António Pedro Costa: Metodologia Híbrida de Desenvolvimento Centrado

Luís Henrique Ramilo Mota: Multi-robot Coordination using flexible Setpla

Joaquim José Gonçalves: Plataforma para avaliação da Qualidade de Vic

Fundação para a Ciência e a Tecnologia

Avenida D. Carlos I, 126
1249-074 Lisboa · Portugal
+351 213 924 300 · pct@fct.pt

Continue

**AVALIAÇÃO DE UNIDADES 2013****Programas Doutoramento****Avaliação de Unidades 2013**

- Registo de Unidade
- Confirmação na Equipa
- Confirmação na Fusão
- Submissão de Candidatura**
 - 1. Identification
 - 2. Institutions
 - PART A**
 - 3. Achievements
 - 4. Funding
 - 5. Indicators
 - PART B**
 - 6. Scientific Component
 - 7. Expected Indicators
 - 8. Research Team
 - 9. Research Groups**
 - 9.1. Identification
 - 9.2. Researchers
 - 9.3. Description and Achievements
 - 9.4. Output
 - 9.5. Structure and Objectives**
 - 10. Thematic Lines
 - 11. Budget 2015/2020
 - 12. Budget Rationale
 - 13. Reviewers proposed
 - 14. Validation
 - 15. Locking
- Declarações de compromisso
- Confirmar CV/ORCID
- Documentação

Infraestruturas - Roteiro**Guia de Utilização****Delegadas pela Instituição:**

LIACC/UP

Delegação de Acesso**Projectos Estratégicos****Financiamento Plurianual****9.5. ORGANISATIONAL STRUCTURE AND OBJECTIVES OF THE RESEARCH GROUP 2015/2020 (RG-27-1573) HUMAN-MACHINE INTELLIGENT COOPERATION**

- 9.5.1 Structure of the Research Group** The HMIC group is a subgroup of the former DAI&R (Distributed Artificial Intelligence & Robotics) group that was part of LIACC since its beginning. The group is quite small with 7 PhD members and 16 PhD students. HMIC is also a rather young group in which 5 of its 7 members achieved a PhD degree only in the last 4 years. The group has a very simple structure with a coordinator (Luis Paulo Reis) that has strong relations and joint research work with all group members and with most of the members of the DAI group. Alvaro Rocha is the other senior scientist of the group and is also involved in the management of the group together with Luis Paulo Reis. Since the 7 PhD members of the group are teachers at different universities in Portugal, the group spreading poses some challenges to its management. However, this spreading, together with the very good national and international contacts of the group members are used for the group own benefit. Thus, group members supervised or are supervising several PhD students at other Universities and Universities abroad and the group has extensive collaborations, joint research work and joint projects with other research groups in Portugal and abroad. The group has also strong relations and developed collaborative research work with several other Research Laboratories and Universities in Portugal and abroad, including Honda-Research Institute Japan, Kyoto University, Istanbul Technical Univ., IPEM-Ghent Univ., IEETA, INESC-TEC, Algoritmi Center, Univ. Minho, Univ. Aveiro, Univ. Coimbra, Univ. Lisbon, IUL(ISCTE), UTAD, Univ. Fernando Pessoa, IPP, IPCA, IPVC, among many others. The group coordinator has a seat in the coordinating board of the LIACC research center, representing the group at the Laboratory central management.
- 9.5.2 Objectives of the Research Group** HMIC is targeting on aligning its research with the main Horizon 2020 objectives in order to be able to use its expertise on areas such as human-machine intelligent cooperation, simulation, ICT and assistive technology for health applications, wellbeing, sustainable development and inclusive and secure societies. The group will focus on developing, attracting and retaining research talents and get access to the best infrastructures in order to help the European Union to develop its priority areas for 2014-2020. The Human-Machine Intelligent Cooperation Group will focus on the following research directions and objectives during 2014-2020: - Development of Sustainable Health and Care Systems and Assistive/Rehabilitation Devices and Tools. Using the group expertise on developing health information systems and its engineering, management, usability and accessibility, HMIC will target developing the new generation of Health Care Information Systems. Also, previous work and experience on the areas of assistive robotics, human-machine interaction and development of health/rehabilitation games, simulators and prototypes will be essential on this objective. Emphasis will be given supporting handicapped and elder people following our previous research work on these areas. - Development of methodologies for Human-Machine interaction and cooperation, with emphasis on human-robot cooperation, targeting at the creation of a general framework for the coordination of human-robot teams. HMIC will continue its effort towards the creation of generic methodologies for human-robot cooperation testing them in competitive environments such as the RoboCup international competitions and in socially more useful environments such as assistive and rehabilitation technologies and in the development of smart cities. - Development of intelligent simulation methodologies and serious games development methodologies on the areas of education, robotics, rehabilitation/health, smart cities and sustainable development. This work follows HMIC development of several realistic multi-agent simulators such as EcoDynano (for ecological simulations), Intellwheels Sim (for intelligent wheelchair and hospital environment simulation) several other robotic/vehicle and traffic simulators and will make use of the group expertise on bridging the gap between simulation and robotics (mostly achieved in the context of RoboCup international events) For funding HMIC will apply for the new Horizon 2020 funding on the fore mentioned areas using its previously established research network. The group will also target joint projects with Brazil following collaborations established by its members in 2012-2013 (two visiting Brazilian professors for six months each at our lab and the start of two Portugal/Brazil joint projects during 2013). Although we believe HMIC had a very good publication record (2008-2012), the group will also target on improving (at least doubling) its per-capita publication record for the 2015/2020 period and increasing

Fundação para a Ciência e a Tecnologia
Avenida D. Carlos I, 126
1249-074 Lisboa · Portugal
+351 213 924 300 · pct@fct.pt

significantly the visibility and impact of these publications. During the last two years the group had already a huge increase on its publication record with emphasis on journal publications and conference/special issues editions. Following this improvement on the last years, HMIC will target for publication only on top conferences and top/indexed journals for the next 5 years in order to have higher visibility and impact of its research.

Continue

AJUDA

Início › **Avaliação de Unidades 2013** › Submissão de Candidatura

Programas Doutoramento

Avaliação de Unidades 2013

Registo de Unidade
 Confirmação na Equipa
 Confirmação na Fusão

Submissão de Candidatura

1. Identification
2. Institutions

PART A

3. Achievements
4. Funding
5. Indicators

PART B

6. Scientific Component
7. Expected Indicators
8. Research Team
9. Research Groups
10. Thematic Lines
11. Budget 2015/2020
12. Budget Rationale
13. Reviewers proposed
14. Validation
15. Locking

Declarações de compromisso

Confirmar CV/ORCID

Documentação

Infraestruturas - Roteiro

Guia de Utilização

Delegadas pela Instituição:

LIACC/UP

Delegação de Acesso

Projectos Estratégicos

Financiamento Plurianual

AVALIAÇÃO DE UNIDADES 2013

11. BUDGET FOR THE STRATEGIC PROGRAMME 2015/2020

11.1 The unit is a candidate for evaluation and intend to apply for funding?

Yes

11.2

Host institution's budget

Universidade do Porto (UP)

DESCRIÇÃO	2015	2016	2017	2018	2019	2020	TOTAL (Σ)
Human Resources	8.100	8.300	8.500	8.700	8.900	9.200	51.700
Missions	24.400	25.000	25.600	26.200	26.900	27.600	155.700
Consultants	400	400	400	500	500	500	2.700
Service Procurement and Acquisitions	18.800	19.200	19.700	20.200	20.700	21.200	119.800
Patent Registration	0	0	0	0	0	0	0
Adaptation of Buildings and Facilities	0	0	0	0	0	0	0
Overheads	7.800	8.000	8.200	8.400	8.600	8.800	49.800
Equipment	42.500	43.500	44.600	45.800	46.900	48.100	271.400
Total (€)	102.000	104.400	107.000	109.800	112.500	115.400	651.100

Overall budget

DESCRIÇÃO	2015	2016	2017	2018	2019	2020	TOTAL (Σ)
Human Resources	8.100	8.300	8.500	8.700	8.900	9.200	51.700
Missions	24.400	25.000	25.600	26.200	26.900	27.600	155.700
Consultants	400	400	400	500	500	500	2.700
Service Procurement and Acquisitions	18.800	19.200	19.700	20.200	20.700	21.200	119.800
Total (€)	102.000	104.400	107.000	109.800	112.500	115.400	651.100

DESCRIÇÃO	2015	2016	2017	2018	2019	2020	TOTAL (Σ)
Patent Registration	0	0	0	0	0	0	0
Adaptation of Buildings and Facilities	0	0	0	0	0	0	0
Overheads	7.800	8.000	8.200	8.400	8.600	8.800	49.800
Equipment	42.500	43.500	44.600	45.800	46.900	48.100	271.400
Total (€)							

[Continue](#)

AJUDA

[Início](#) › [Avaliação de Unidades 2013](#) › Submissão de Candidatura**Programas Doutoramento****Avaliação de Unidades 2013**

Registo de Unidade
Confirmação na Equipa
Confirmação na Fusão

Submissão de Candidatura

1. Identification

2. Institutions

PART A

3. Achievements

4. Funding

5. Indicators

PART B

6. Scientific Component

7. Expected Indicators

8. Research Team

9. Research Groups

10. Thematic Lines

11. Budget 2015/2020

12. Budget Rationale

13. Reviewers proposed

14. Validation

15. Locking

Declarações de compromisso

Confirmar CV/ORCID

Documentação

Infraestruturas - Roteiro**Guia de Utilização****Delegadas pela Instituição:**

LIACC/UP

Delegação de Acesso**Projectos Estratégicos****Financiamento Plurianual****AVALIAÇÃO DE UNIDADES 2013****12. STRATEGIC PROGRAMME AND BUDGET RATIONALE 2015/2020****12.1 Overall budget rationale**

For 2012 to 2015 time period, we hope to increase the number of integrated members by at least 4. We were 21 in 2012, 23 in 2013 and we expect to be 25 in 2015 with no significant variation foreseen in the subsequent years. Therefore, our calculation starts with a 20% increase on the average value for each expense item for the past period of 2008-12, and a mild yearly inflation of 2,5%.

12.2 Human Resources rationale

The same criteria as above applies to this item.

12.3 Equipment rationale

The same criteria as above applies to this item. Our type of lab needs to update equipment on a regular basis.

Continue

Fundação para a Ciência e a Tecnologia

Avenida D. Carlos I, 126
1249-074 Lisboa - Portugal
+351 213 924 300 - pct@fct.pt

AJUDA

[Início](#) › [Avaliação de Unidades 2013](#) › Submissão de Candidatura

AVALIAÇÃO DE UNIDADES 2013

13. REVIEWERS PROPOSED BY THE R&D UNIT(S)

13.1

NOME	INSTITUTION	EMAIL	SCIENTIFIC AREAS
Frank Dignum	University of Utrecht, The Netherlands	f.p.m.dignum@uu.nl	Computer Science and Engineering
Klaus Fischer	DFKI- Deutsche Forschungszentrum für Künstliche Intelligenz GmbH	klaus.fischer@dfki.de	Computer Science and Engineering
Marc Dorigo	Université Libre de Bruxelles/IRIDIA	mdorigo@ulb.ac.be	Computer Science and Engineering

Programas Doutoramento

Avaliação de Unidades 2013

Registo de Unidade
 Confirmação na Equipa
 Confirmação na Fusão

Submissão de Candidatura

1. Identification
2. Institutions

PART A

3. Achievements
4. Funding
5. Indicators

PART B

6. Scientific Component
7. Expected Indicators
8. Research Team
9. Research Groups
10. Thematic Lines
11. Budget 2015/2020
12. Budget Rationale

13. Reviewers proposed

14. Validation
15. Locking

Declarações de compromisso
 Confirmar CV/ORCID
 Documentação

Infraestruturas - Roteiro

Guia de Utilização

Delegadas pela Instituição:

Delegação de Acesso

Projectos Estratégicos

Financiamento Plurianual

Fundação para a Ciência e a Tecnologia

Avenida D. Carlos I, 126
 1249-074 Lisboa - Portugal
 +351 213 924 300 - pct@fct.pt

Report from the advisory board

Claude Kirchner¹, Carles Sierra²

¹ Inria, France

² Artificial Intelligence Research Institute, IIIA-CSIC, Spain

This assessment was produced based upon the LIACC “Relatorio Científico 2010.” It takes into account the previous advisory reports since March 1999. It is of course based on our common knowledge of LIACC researchers and activities.

1 Analysis of LIACC

We think that the laboratory is well positioned in the international arena, with links to important groups. This international positioning gives LIACC an excellent possibility to consolidate this collaboration in the form of research projects, either at EU level or as bilateral activities.

The laboratory has stabilised after the split that happened after 2006. Current groups are producing good results and have a balanced relationship with academia and industry. There has been a notable increase in tool and prototype creation.

2 General recommendations

It would be a good exercise for the LIACC members to do a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats). This will help the members to openly discuss about the global aim of LIACC, to profit from its strengths, to protect against the threats and to improve the weaknesses. The document to generate from this analysis will become a clear roadmap for the future of the lab (perhaps in a five year window), it will set up the personnel policies, the research lines to promote and those perhaps to demote, etc. It would be a social contract among the members of the lab that will help in bringing unity and cohesion to the common project.

In terms of the content of the documents to analyse, there should be more emphasis on direct impact measures of the work done at the lab (v.g. h measures, citations of certain papers, download of tools,...). There are numerous evidences that the laboratory is doing serious and deep scientific and technological progress that should be given to any potential audience. In the same line, a clear explanation of the trends in the numbers should be given. What is the rationale behind the numerical changes (v.g. in personnel or publications). We also suggest to present publication ratios by researcher, including PhD students. In a sense, highlight the quality of contributions more than the quantity.

In terms of personnel, it is important that the senior members of LIACC take responsibility in guaranteeing the necessary personnel renewal by appointing professors from the next generation.

In term of cooperations, we strongly recommend to integrate European projects, in particular in the FET program.

3 Conclusion

We consider that the LIACC is an excellent portuguese group with a very good international projection in its research activities and that it has a brilliant future perspective. We encourage its members to increase the cohesion of their activities and to plan for a common project of future.

4 Analysis of Computer Science Group

4.1 Summary of the team

Activities are conducted in the following areas:

- Declarative information systems,
- Complexity,
- Formal aspects of computation,
- Formal verification and type checking,
- Security and safety.

It shows very good activities in all these areas in terms of publications and tools.

4.2 Scientific evaluation

During 2010 the group has obtained interesting results in complexity and formal aspects like type-checking and theorem proving. The promising technique of Proof Carrying Code has received a push. Although most of the research is theoretical several practical developments have been obtained: a PCC platform or a model-checker.

With publications in very good conferences the team has a quite good academic activity, visibility and production. We recommend to increase the presence in main journals of the field.

4.3 Technology transfer

Several research activities of the team have potential for technological transfer. Security, optimisation as well as data bases. The group should increase the transfer activities.

4.4 Conclusion

The CS team is having very good results in areas that are getting wider. We encourage to continue in this way and give a bigger push to PhD production, technology transfer and participation to EU projects.

5 Analysis of Distributed Artificial Intelligence and Robotics DAI&R

5.1 Summary of the team

This research group concentrates its activities around the concept of interoperability and in the development of practical applications, demonstrators and proof-of-concept developments. It shows a very high activity in publishing in the relevant conferences and workshops of the area. Its international visibility is high, and in some subareas (v.g. “electronic” institutions and virtual organisations) it is the reference group in Portugal.

5.2 Scientific evaluation

The results of the group are many and cover a large list of topics in the field of agents and multiagent systems. The group shows a good balance between theory and development

The group publications have important impact, specially in the area of digital models of institutions, including B2B trust and reputation.

The relation with the other group of LIACC could be increased specially on the formal aspects of language definition.

5.3 Technology transfer

The group is very competent in software development and has produced a large number of prototypes and an impressive amount of joint work with companies. Overall, this is a strong asset of the group.

We encourage the group to create spin-offs due to the large amount of developments and practical applications developed. Students should be encouraged to try and start up companies along the lines and results obtained in the group.

5.4 Conclusion

Overall the research group is doing well and the papers and tools are of high quality. The group has followed previous recommendations in order to increase the number of publications in journals and now the number and quality of them show a good direction. Higher participation in EU projects should be obtained.

Report from the advisory board

Claude Kirchner¹, Carles Sierra²

¹ Inria, France

² Artificial Intelligence Research Institute, IIIA-CSIC, Spain

1 Analysis of LIACC

On February 10 we visited LIACC and listened to a series of presentations in the morning showing the achievements of the institute. In the afternoon a number of demonstrations were given and a closed meeting with the PhD students was hold.

Overall we had a very positive impression of the activities of the institute. In recent years LIACC has gone through a number of restructuring processes with groups leaving and joining. The current structure, based on a group on distributed artificial intelligence and a group on formal methods seems stable and with perspectives to continue like this.

The research activities are many and very varied. The activities are more focused than in our previous visit. For most of them the research is at the forefront of the corresponding field. This gives the possibility to establish new international connections and to strengthen those already existing. These connections should be used to increase the European projection of LIACC in the form of new international and bilateral research projects.

The PhD production is very good, with motivated and well educated students. The involvement in Master programs is also very good and leads to results well connected to up to date research topics.

We acknowledge that the LIACC has followed previous recommendations of this evaluation panel and has made a SWOT analysis of its activities.

2 Analysis of Distributed Artificial Intelligence and Robotics DAI&R

2.1 Summary of the team

This research group concentrates its activities around the concept of interoperability and in the development of practical applications, demonstrators and proof-of-concept developments. It shows a very high activity in publishing in the relevant conferences and workshops of the area. Its international visibility is high, and in some subareas (v.g. “electronic” institutions and virtual organisations) it is the reference group in Portugal.

2.2 Scientific evaluation

The results of the group are many and cover a large list of topics in the field of agents and multiagent systems. The group shows a good balance between theory and development

The group publications have important impact, specially in the area of digital models of institutions, including B2B trust and reputation.

The relation with the other group of LIACC could be increased specially on the formal aspects of language definition.

2.3 Technology transfer

The group is very competent in software development and has produced a large number of prototypes and an impressive amount of joint work with companies. Overall, this is a strong asset of the group.

We encourage the group to create spin-offs due to the large amount of practical applications developed. Students should be encouraged to try and start up companies along the lines and results obtained in the group.

2.4 Conclusion

Overall the research group is doing well and the papers and tools are of high quality. The group has followed previous recommendations in order to increase the number of publications in journals and now the number and quality of them show a good direction. Higher participation in EU projects should be obtained.

3 Analysis of Computer Science Group

3.1 Summary of the team

Activities are conducted in the following areas:

- Declarative information systems,
- Complexity,
- Formal aspects of computation,
- Formal verification and type checking,
- Security and safety.

It shows very good activities in all these areas in terms of publications and tools.

3.2 Scientific evaluation

During the last years, the group has obtained useful and original results in complexity and formal aspects like type-checking and theorem proving. The promising technique of Proof Carrying Code has received a push. Although most of the research is theoretical several practical developments have been obtained. The results obtained about linear calculi have been well received by the international community.

With publications in very good conferences the team has a quite good academic activity, visibility and production. We recommend continuing to increase the presence in main journals of the field.

3.3 Technology transfer

Several research activities of the team have potential for technological transfer. Security, optimisation as well as data bases. The group is encouraged to be attentive to transfer opportunities, shall these concern industrial as well as societal transfer.

3.4 Conclusion

The CS team is having very good results in areas that are getting wider. We encourage to continue in this way and give a bigger push to PhD production, technology transfer and participation to EU projects.

4 General recommendations

We acknowledge that LIACC performed a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) as recommended. We are very satisfied with the presentations and the effort made by the co-ordination board to give a clear evidence of the impact measures of the work done, as we also recommended. Overall we think LIACC made a serious effort to follow our previous recommendations.

We have the following general recommendations:

- In order to allow for better analysis, both internal and external, we encourage the two teams to make an annual activity report, and to make it available on the web every January.
- We suggest to the co-ordination board to write a short document that describes the strategic plans of LIACC for the next 4 years. This should describe both the scientific areas that are going to be covered as well as the general organization deployed to achieve these goals;
- We strongly recommend the organization of a lab seminar, that all lab members should be encouraged to actively attend;
- There should be an annual “general assembly” of lab members to present and share results, objectives and strategy.

- Clear strategies should be deployed to better understand the PhD need. See later in this document.
- An analysis of the relationship with other labs in computer science in Portugal would be valuable. We appreciate as an important asset of LIACC the fact that several permanent people of the lab have indeed their professorship positions in universities “far” from Porto. This is an interesting and useful situation that seems to allow for the focalization of several professors on common research topics in a main place like LIACC. We suggest to make this relationship formal and more visible, so as to see LIACC as a scientific hub of the region.
- In term of cooperation, we suggest to increase the international presence by a more aggressive policy with EU projects in particular with the FET program.
- LIACC should improve the internal organization to better serve the researchers and to help protecting the generated knowledge (e.g. engineers to maintain the results or valorisation managers to improve the relationship with industrial partners)
- LIACC should advance in an strategy to impact into industry.
- LIACC research is divided into separate lines, the LIACC should benefit from a more integrated view of research. In particular by defining one or several use cases that might be interesting for several groups. E.g. railway security could be useful for simulation, verification, trust and text mining (e.g. treats, opinions).

5 Situation of the doctoral students

During a private meeting with the students we had the opportunity to question them and listen to their views on the functioning of the institute. Overall the students show passion on their activities and are happy and proud of being members of LIACC. A number of potential improvements of the LIACC procedures were discussed. We recommend the co-ordination board to spend time discussing them as they are very valuable suggestions.

Referent. Students feel that there is a need for coaching beyond the PhD advisor. Explaining the procedures of LIACC, helping them through their PhD process, counselling in their decisions, and overall planning their scientific career.

Post-doc. There should be a more institutional policy concerning post-doctoral studies. A year before the end of the PhD students would like to have a mechanism to discuss the prospects of postdoctoral studies. For instance, helping students to look for funding or to make contacts with potential hosting labs. In this respect, the board should consider whether there is the possibility of offering short-time contracts (up to 6 months, for instance) to help bridging the end of the PhD and the start of a post-doc.

Industry. LIACC should develop a strategy to build up stronger links with industrial partners. In particular, it would be important to devise mechanisms to define realistic use cases that might help PhD students in their activity. Also,

explore the possibility that companies co-fund the salary of PhD students so that the student has on the one hand access to data and use cases and on the other opening the possibility of future jobs within the company.

Startups. More than 50% of the students in the room (9 out of 17) have the intention to create their own company at the end of their doctoral studies. This is a very positive asset that the co-ordination board has to analyse in detail. In particular, students would like to receive support from LIACC in the preparation of their spin-offs. For instance, by mediating with the University of Porto in order to use spaces for the companies or by supporting in the generation of first contact with possible customers that might boost the creation of the companies.

Integration. Students would like to have a more integrative view of their activities. There should be some group activities that facilitate the internal exchange of ideas among the PhD students community.

Structure. Students don't have the perception of a structure within LIACC. The co-ordination board should make an effort to explain the procedures to students and also try and refine the internal structure to answer the students suggestions as well as some of the recommendations included in this report.

Europe. Students would like LIACC to be more involved in EU activities: projects, networks, etc. This view concurs with the recommendation of this report.

We found the students were enthusiastic, entrepreneurs and with a lot of energy. This is an important asset of LIACC.

6 Conclusion

We consider that LIACC is an important research lab with a very good international projection in its research activities and that it has a brilliant future perspective. Following the above recommendations, we encourage its members to increase the cohesion of their activities and to continue their plans for a common project of future.