

FCT Relatório Científico 2010 Print: 31-03-2011 17:01:00 [CENTRO ALGORITMI]

**General Information**

**Name of Research Unit:** (EEI-Norte-319)  
CENTRO ALGORITMI

**Coordinator:** João Luis Marques Pereira Monteiro

**Main Scientific Domain:** Engenharia Electrotécnica e Informática

**Other Subdomains:** n/a

**Host Institutions**

**Leading Host Institution:** Universidade do Minho

**Other Institutions Involved:**

**Objectives & Achievements****Unit Description**

The Centre Algoritmi (CAI) is a R&D unit of the University of Minho (UM), developing its activities in the areas of Systems Engineering, Information Technology/Information Systems and Electronics. It is organized around six research group (that we internally call "research lines"), reflecting different research and application domains. CAI has 250 members, 130 of them hold a PhD degree. Most of the doctorate-level researchers are Faculty members of three academic departments of the School of Engineering, while the other researchers are mainly post-graduate students, post-doc and research assistants.

According to the UM bylaws, Faculty members must be affiliated to one or more of the UM's R&D units, where their research activities are framed. At UM, R&D units are in equal hierarchy level when compared to the academic departments, both are under the direction of a School, as sub-units. However, most of the human resources (Faculty members and administrative staff) depend on departments. This way, R&D units become a complementary structure dedicated to the research activity, being responsible mainly for post-graduate courses and by administrative staff managed jointly with the departments. UM adopts a matrix model organization to enhance flexibility and improve resource utilization. The 6 current CAI's research lines have a strong relation with the three affiliated academic departments (Industrial Electronics Department, Information Systems Department, Production and Systems Department). During 2011, following the modification process of the national university system with the new CAI bylaws, reorganization will occur which may imply some adjustments in the scope of some of the research lines and their designation.

CAI is organized around a Steering Committee (StC), formed by the Director and three Vice-Directors. Together with the six research line coordinators, these four SC members integrate the Coordinating Committee. The Director is elected among all senior researchers (full or associate professors, or permanent doctorate-level researchers), by all CAI's doctorate-level members. Each research line coordinator is elected among the respective research line doctorate-level members. Elections take place in each three years (the last one was in December 2010). The SC is responsible for all the executive and planning tasks, including strategic planning and reporting activities. There is also a Scientific Committee (SCC) formed by all the doctorate-level members, which is essentially responsible for approving the StC work and the premature destitution of the Director. Finally, there is an Advisory Board, formed by external experts, to advice the strategic planning process. Currently, one staff members accomplish all the administrative daily work. CAI interact with other UM administrative units related, like GAP (project support office) and the accounting office.

**General Objectives**

As a university research centre, CAI aims at assuring the long-term R&D competencies of its Faculty members. This institutional goal usually constricts the generation of high levels of measurable scientific results (projects and publications). However, long-term R&D continues to be considered an important goal for this kind of research centres.

Following the recommendations of the previous evaluation reports more attention was devoted to the interdisciplinary activities, defining strategies to explore synergies between groups. This was achieved through awareness initiatives, promoting projects and collaborations mainly at the post-graduation level. The main idea behind this strategy keeps valid, since we believe that one of the CAI's strengths is its heterogeneous nature, which allows exploring different approaches and perspectives, which is an important factor towards innovation.

During the last years some modifications occurred in the university education system, motivating a strategy to promote research. Improving research is always an objective of an R&D centre, but the actual context forces us to give this goal high priority. The first reaction was to make every researcher aware of the new demands and this measure, per se, produced interesting results in scientific production. FCT launched a program to support graduated students involvement in research activities (BII). Several dozens of scholarships were granted under this program. However, to better explore the capacities of young researches, in particular, some other adjustments are required. Efforts are under way to reorganize CAI's research lines, promoting a leadership in each one of the six areas, with well-defined research activities planning and with an excellent impact of the work performed. These research lines and their leaders must adopt one much more active role within the CAI Coordination Committee and in each of the six research line scientific committee.

Also following the recommendations from the last evaluation reports, the strategy for improvement must address a higher level of internationalization. CAI benefited from the FCT national program to support fellowships for post-doctoral positions in Portuguese R&D centres, and includes now 10 post-doctorate researchers with the main goal to improve internationalization.

FP7, the European 7th Framework Programme is also seen as a very important opportunity. This program addresses all type of research activities, including the co-operation between different R&D centres and the stimulus to young researcher initiative. All CAI researchers are aware of this program and are in touch with its evolution. Furthermore, since most of the project proposal evaluations are carried by researchers from all over Europe, and since this activity is also a source of knowledge and contacts, CAI's members are encouraged to register themselves to act as project reviewers.

Co-operation should not be stimulated only at the international level. In some research areas there are other R&D centres in Portugal with a very research activity. The collaboration with such centres is always an important goal since that is a natural way to get stronger groups with more potential to be recognized.

Finally, one last CAI's aim is the intensification of regional activities concerning the science dissemination and technology transfer. This goal is very important nowadays since society and industries expect a lot from universities and its research infrastructures. Besides, this is also a strategic vector for UM and the School of Engineering.

## Objectives & Achievements

### Main Achievements during the year of 2010

In 2010 there was an improvement in the number of publications (books, journals and international/national magazines): the total number increased to 148. The actual ratio of this kind of publications per ETI PhD member/year is 1.4. The number of communications, covering all sorts of conferences and workshops, both national and international, was 227. This is the result of a higher pressure to publish at international recognized events, but also shows a weakness concerning the capacity to organize such events in Portugal. Globally, the publication indicators supersede the expected numbers, which reveals that CAIlg's researchers are aware of the current challenges. These positive results were obtained during one year of a lower budget, resulting from the decision of FCT to retain around 240KEUR of the previously budgeted amount for 2010, and reflect a strong commitment of CAIlg's members. Despite this improvement, quality is still a main concern among all research lines, and some clearly need to give additional attention to this aspect.

The number of funded projects is another indicator of the CAIlg's performance. This indicator keeps high. During 2010, CAIlg's members were responsible or were involved in over 60 approved projects. Most of the projects are funded by FCT and other governmental agencies, but 4 projects are funded by European Programs and 1 project is funded by the CMU/Portugal initiative.

Concerning the organization of scientific/technical events, in 2010 CAIlg's members were involved in 27 events (excluding the participation in technical committees). In several areas some of these events are considered very topical being supported by organizations that play an important role in those areas (i.e. ACM, IEEE and IFIP) - details are given in the individuals research line reports.

## Activities

### Integrative/multidisciplinary activities during the year of 2010

CAIlg is a multidisciplinary research centre by nature. Looking to its main scientific areas it is not difficult to identify a wide research stream including researchers from Electronic field, addressing the construction of computing devices, from Engineering Systems field, focusing on the construction of complex systems and from Information Systems, focusing on issues related with the valuable utilization of Information and Communication Technology in organizations. This main approach is complemented by some specific research areas, like Energy, Instrumentation, Optimization, Micro/Nano technologies, Data Bases, etc., which address much more narrow research problems and where multidisciplinary is more limited.

Several CAIlg members are involved in the Portuguese governmental initiatives with CMU and MIT, addressing several engineer disciplines. Locally, there is a significant research effort involving researchers from CAIlg and researchers from another UM research centres:

- Researchers from the Industrial Electronic research line collaborate frequently with the 2C2T: Centre of Science and Textile Technology. This collaboration has resulted in some important industrial projects.
- Other similar collaborations embrace researchers from Knowledge and Information Systems and Services research line with the CIPsi: Centre for Research in Psychology and the CCTC: Centre of Sciences and Computer Technologies).
- Researchers from the Nonlinear Systems Optimization and Statistics research line collaborate with the CITEPE: Interdisciplinary Centre in Technologies for Energy Production.

Knowledge sharing is the second form of collaboration, which has been accomplished by seminars, workshops, and similar local meetings. This kind of activities has been planned several times. However, the lack of resources, the actual overload of senior researchers (due to teaching loads and administrative duties) and a large period of internal changes (reorganization of the university system) impose serious restrictions to these activities.

### Outreach activities during the year of 2010

During 2010, several CAIlg researchers have been invited for seminars and similar scientific events, revealing their recognized relevance within their scientific fields – details are given in each research line report.

Following the tendency of last years, low level schools and social and economic agents keep showing a clear strategy to approach universities as a mean to explore knowledge advance. After all, this is the essence of the knowledge society. University as a whole responds to this requests positively opening its doors and organizing or adhering to several events. This is a global movement traversing all university's units. Concerning CAIlg, since it is integrated in the School of Engineering, most of the outreach activities are also integrated in wider School initiatives, allowing a better resource use and broader social impact. Besides these activities, individual researchers are frequently invited to take part of scientific, technical or dissemination events. Due to lack of clarification between research and teaching affairs it is not always possible to track these individual initiatives.

The School of Engineering organizes every year an open event associated to its birthday, aimed to show technical innovations and science advances resulting from research. PhD students are invited to take part on an exhibition where they have the opportunity to demonstrate their work and discuss with others their problems and achievements - most of the CAIlg's members adhered enthusiastically to this initiative. Other activities are also relevant, like visits to laboratories where young students can contact with the research environment and with the learning environment most of them will face in the near future.

One of the CAIlg's groups working in the robotics research field developed one robot football team and has been involved in the RoboCup competition, where they have achieved very interesting results. The group also organizes one local event, RoboParty, in Guimarães, which attracts a lot of people, including researchers, college students and teachers. This event had a tremendous impact, helping to disseminate the area and to bring the society into the CAIlg internal walls. More information is available at <http://www.robotica.dei.uminho.pt/robocup>.

CAIlg's members are also deeply involved in several national non-profit organizations/associations dedicated to the standardization and dissemination of technological and scientific knowledge: APDSI (Portuguese association for information society development), and two Technical Committees for standardization (CT 163 and CT 128).

## Funding

	2006	2007	2008	2009	2010
LA FCT	0,00	0,00	0,00		
Units FCT	334.631,25	228.250,00			
Projects FCT	911.841,00	698.828,00			
Other (National)	510.539,75	295.070,00			
Other (International)	1.226.766,00	1.416.614,00			

**Funding**

	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
National Industry	166.521,00	47.610,00			
International Industry	0,00	0,00			
	<b>0,00</b>	<b>0,00</b>	<b>3.150.299,00</b>	<b>2.686.372,00</b>	<b>0,00</b>

**General Indicators**

	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>Total</b>
No. of Researchers Proposed	0,00	0,00	0,00	0,00	0,00	0,00
No. of Researchers Hired (LA)	0,00	0,00	0,00	0,00	0,00	0,00
<b>Balance</b>	0,00	0,00	0,00	0,00	0,00	0,00
No. of Researchers Hired (Ciência Programme)	0,00	0,00	7,00	2,00	7,00	16,00
No. of Researchers integrated with PhD	73,00	82,00	95,00	94,00	109,00	
Training Masters (Master thesis completed)	21,00	38,00	62,00	75,00	0,00	196,00
Training PhDs (PhD thesis completed)	31,00	8,00	16,00	13,00	15,00	83,00

**Researchers Hired**

<b>Name</b>	<b>Start Date</b>	<b>End Date</b>	<b>Other Institution</b>
Abdullah Rashed	15-06-2009	14-06-2014	
Agostinho Gil Teixeira Lopes	30-05-2008	29-05-2013	
Hakikur Rahman	06-11-2008	05-11-2013	
Henrique Nuno Baptista Gonçalves	01-07-2009	30-06-2014	
João Paulo Pereira do Carmo	02-05-2008	01-05-2013	
MD. ABUL KALAM AZAD	01-10-2008	30-09-2013	
Nuno Ricardo Palmeiro Otero	03-03-2008	02-03-2013	

**Technical Personnel Hired**

<b>Name</b>	<b>Start Date</b>	<b>End Date</b>	<b>Other Institution</b>
No technical personnel found...			

**Additional Comments****Research Groups**

<b>Reference</b>	<b>Title / Principal Investigator</b>
RG-Norte-319-2168	<u>Nonlinear Systems Optimization and Statistics</u> (António Ismael de Freitas Vaz)
RG-Norte-319-2169	<u>Systems Engineering, Optimization and Operations Research</u> (José Manuel Vasconcelos Valério de Carvalho)
RG-Norte-319-2171	<u>Knowledge and Information Systems and Services</u> (Ricardo Jorge Silvério de Magalhães Machado)
RG-Norte-319-2184	<u>Ubiquitous and Pervasive Computing, Graphics, and Software Methodologies</u> (Adriano Jorge Cardoso Moreira)
RG-Norte-319-2959	<u>Industrial electronics</u> (Adriano Jose da Conceicao Tavares)
RG-Norte-319-2976	<u>Micro/Nanotechnologies and Biomedical Applications</u> (José Higinio Gomes Correia)

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### Group Description

**Title of Research Group:** (RG-Norte-319-2168)  
Nonlinear Systems Optimization and Statistics

**Principal Investigator:** António Ismael de Freitas Vaz

**Main Scientific Domain:** Engenharia Electrotécnica e Informática

**Group Host Institution:** Universidade do Minho

### Funding, source, dates

#### Funding, source, dates

WALC - Web Assisted Laboratory for Control Engineering on-line Education, PTDC/ESC/68069/2006, PI: Leão, C.P., 01/10/2008-31/03/2011.

Flexible and adaptive Quadruped Locomotion Generation using the Dynamical Systems Approach, POCI-FCT 197067, PI: Santos, C., 01/06/2010-30/06/2013.

CSD-Chip – Development of an integrated biomedical microdevice for blood cell separation and deformation, PTDC/SAU-BEB/105650/2008, PI: Lima, R., 01/09/2010-31/08/2013.

GRACE - InteGration of pRocess and quAlity Control using multi-agEnt technology, FP7-246203, PI: Leitão, P., 01/09/2010-31/08/2013.

Derivative-Free Optimization: Future Challenges and New Applications, PTDC/MAT/098214/2008, PI: Vicente, L.N., 01/01/2010-31/12/2012.

SEPP Sustainable Electricity Power Planning, PTDC/SEN/ENR/099578/2008, PI: Ferreira, P., 01/06/2010-01/06/2013.

### Objectives & Achievements

#### Objectives

The NSOS line fosters excellency in fundamental and applied research, and teaching in its main research areas, which includes

- Continuous Nonlinear Optimization;
- Derivative-Free Optimization;
- Global Optimization;
- Mixed Integer Programming;
- Multi-objective Optimization;
- Semi-Infinite Programming;
- Statistics and Applications;

The objectives are:

- 1- to conduct fundamental and applied research, aiming to publish the results in leading journals;
- 2- to disseminate the obtained results in high level conferences, potentiating the impact of the research and possible collaborations;
- 3- to cooperate with local and international industries increasing its competitiveness;
- 4- to provide high quality public domain software;
- 5- to promote collaborations with international leading research groups actuating in the same research areas;
- 6- to offer high level educational courses either to MSc and PhD students in the programs supported by the research center;

#### Main Achievements

According to the objectives previously described, the team main achievements are described.

- 1- The team has published and submitted for publication 20 papers in leading journals.
- 2- The team had 58 participations in international conferences and 15 participations in national conference, where at least one author is from the research line;
- 3- A team member has collaborated with the European Space Agency, under contract RFQ/3-12584/08/NL/ST, in building an Optimization Toolbox. This collaboration involved the Birmingham (UK), Southampton (UK) and Coimbra (Portugal) universities.
- 4- The team developed public domain software in the nonlinear optimization area: PSwarm ([www.norg.uminho.pt/aivaz/pswarm](http://www.norg.uminho.pt/aivaz/pswarm)) and DMS ([www.mat.uc.pt/dms](http://www.mat.uc.pt/dms)). High quality publications have been produced in the past and more are expected in a near future, which describe the implemented methods available in the software.
- 5- Team member have conducted some research visits to leading universities like Aachen University (Germany) and Southampton University (UK), where collaborative works are expected in a near future. Some work is also under progress with the Metz University (France). The line has also received a researcher from the Federal University of Brazil during 2010, where three symposiums have been organized. Collaborative work is under progress with this university. Under a research grant, a team member developed a collaborative work with the Federal University of Paraíba (Brazil). With this work, a research project was created and is currently under development. A team member collaborates at the Associated Laboratory for Energy, Transports and Aeronautics (LAETA-FEUP), since 2009.
- 6- The research line is committed with the Doctoral Program in Industrial and Systems Engineering where several courses are offered to students in the main areas of the research line. The line is also involved in the Master Program in Systems Engineering, Master Program in Industrial Engineering and Master Program in Human Engineering, where several courses are also offered. This high level courses aim to provide students with tools in the

## Objectives & Achievements

research areas of the line, potentiating their employability.

The impact of the research conducted by the team can be evaluated by the number of citations to previous works, where, for example, the first paper about the PSwarm solver is cited 16 times in the ISI Web of Knowledge and 53 times in scholar.google.pt (on the 30th March).

The team visibility can also be evaluated by the journal where team members have acted as referees. In 2010 team members have reviewed paper on, for example, journal as "Journal of Global Optimization", "Optimization and Engineering", and "Mathematical Problems in Engineering".

## Group Productivity

### Publications in peer review Journals

Carneiro, A.F.; Leão, C.P.; Teixeira, S.F.C.F.; Teaching differential equations in different environments: A first approach, *Computer Applications in Engineering Education*, vol. 18, n. 3, 2010, pp. 555-562

Rocha, A.M.A.C.; Martins, T.F.M.C.; Fernandes, E.M.G.P.; An Augmented Lagrangian Fish Swarm Based Method for Global Optimization, *Journal of Computational and Applied Mathematics*, doi:10.1016/j.cam.2010.04.020, 2011.

Ferraz, A.; Carvalho, V.; Soares, F.; Leão, C.P.; Characterization of Blood Samples Using Image Processing Techniques, *Sensors & Actuators: A. Physical*, Accepted 1 February 2011, Available online 21 March 2011, DOI information: 0.1016/j.sna.2011.02.022

Soares, F.; Leão, C.P.; Carvalho, V.; Vasconcelos, R.M.; Costa, S.; Automation & Control Remote Laboratory: Evaluating a Cooperative Methodology, *International Journal of Electrical and Engineering Education* (submitted)

Leão, C.P.; Soares, F.O.; Machado, J.; Seabra, E.; University & Secondary schools: A potential and promising partnership *International Journal of Technology and Design Education* (submitted)

Leão, C.P.; Soares, F.O.; Carvalho, V.; Vasconcelos, R.M.; Automation and Control Engineering Laboratory: Students Perspectives, *DOAJ, Lectures Notes in Engineering and Computer Science*, Vol. 2185, Issue 1, 2010, 2017-2021. ISBN: 978-988-18210-8-9. ISSN: 2078-0958 (Print); ISSN: 2078-0966 (Online)

Neves, M.; Azezes, P.; Leão, C.P.; Teixeira, S.; A lining for the thermal comfort of trekking boots – experimental and numerical studies, *Research Journal of Textile and Apparel*, Accepted January 2011.

Monteiro, M.T.T.; Rodrigues, H.S.F.; Combining the regularization strategy and the SQP to solve MPCC - a MATLAB implementation, *Journal of Computational and Applied Mathematics* (in press) DOI:10.1016/j.cam.2010.05.008

Rodrigues, H.S.F.; Monteiro, M.T.T.; Torres, D.F.M.; Dynamics of Dengue epidemics when using optimal control, *Mathematical and Computer Modelling*, vol. 52, 2010, pp. 1667-1673

Monteiro, M.T.T.; Meira, J.F.P.; A Penalty method and a regularization strategy to solve MPCC, *International Journal of Computer Mathematics*, vol. 88, n. 1, 2011, 145-149

Rodrigues, H.S.F.; Monteiro, M.T.T.; Torres, D.F.M.; Zinober, A.; Dengue disease, basic reproduction number and control, *International Journal of Computer Mathematics* (to appear)

Rodrigues, H.S.F.; Monteiro, M.T.T.; Vaz, A.I.F.; A MPCC-NLP Approach for an Electric Power Market Problem, *Int. J. Smart Grid and Renewable Energy*, vol. 1, 2010, pp. 54-61

Korobeinikov, A.; Kovacec, A.; McGuinness, M.J.; Pascoal, M.; Pereira, A.I.P.N.; Vilela, S.; Optimizing the profit from a complex cascade of hydroelectric stations with recirculating water, *Mathematics-in-Industry Case Studies Journal*, vol. 2, 2010, pp. 23

Custódio, A.L.; Madeira, J.A.; Vaz, A.I.F.; Vicente, L.N.; Direct multisearch for multiobjective optimization, *SIAM Journal on Optimization* (submitted)

Hoai, L. T.; Vaz, A.I.F.; Vicente, L.N.; Optimizing Radial Basis Functions by D.C. Programming and its use in Direct Search for Global Derivative-Free Optimization, *TOP* (submitted)

Silva-Fernandes, A. ; Costa, M.C.; Duarte-Silva, S.; Oliveira, P.; Botelho, C.M.; Martins, L.; Mariz, J.A.; Ferreira, T.; Ribeiro, F.; Correia-Neves, M.; Costa, C.; Maciel, P.; Motor uncoordination and neuropathology in a transgenic mouse model of Machado-Joseph disease lacking intranuclear inclusions and ataxin-3 cleavage products, *Neurobiology of Disease*, vol. 40, n. 1, 2010, pp. 163-176

Lemos, L.; Fontes, R.; Flores, S.; Oliveira, P.; Almeida A.; Effectiveness of the association between carbamazepine and peripheral analgesic block with ropivacaine for the treatment of trigeminal neuralgia, *Journal of Pain Research*, vol. 3, 2010, pp. 201-212

Costeira, M.J.; Oliveira, P.; Ares, S.; Roque, S.; Morreale de Escobar, G.; Palha, J.A.; Parameters of Thyroid Function Throughout and After Pregnancy in an Iodine-Deficient Population, *Thyroid*, vol. 20, n. 9, 2010, pp. 1-7

Silva, A.; Ribeiro, L. M.; Bressan, N.; Oliveira, P.; Ferreira, D. A.; Antunes, L. M.; Dogs mean arterial pressure and heart rate responses during high propofol plasma concentrations estimated by a pharmacokinetic model. *Research in Veterinary Science*, accepted for publication

Correia, F.; Oliveira, P.; Control charts and chronic respiratory patients, *Biometrical Letters*, Vol. 47, n. 1, 2010, pp. 69-81.

### Other international publications

Rocha, A.M.A.C.; Fernandes, E.M.G.P.; A Stochastic Augmented Lagrangian Equality Constrained-Based Algorithm for Global Optimization, *AIP Conference Proceedings*, American Institute of Physics, 2010

Azad, Md A.K.; Rocha, A.M.A.C.; Fernandes, E.M.G.P.; Nonlinear Continuous Global Optimization by Modified Differential Evolution, *AIP Conference Proceedings*, American Institute of Physics, 2010

Carvalho, V.; Leão, C.P.; Soares, F.; Cruz-Cunha, M.M.; Games Development for pedagogical and educational purposes, *Business, Technological and*

**Group Productivity**

Social Dimension of Computer Games, IGI-Global, Hershey, 2010 (accepted for publication)

Loureiro, I.; Leão, C.P.; Arezes, P.M.; Management of the Benefits on the Client's Involvement on Ergonomic Analysis, Communications in Computer and Information Science 92 (Global Security, Safety and Sustainability), Braga, Portugal, Springer, 2010

Fernandes, F.P.; Costa M.F.P.; Fernandes E.M.G.P.; Numerical experiments with nonconvex MINLP problems, ICNAAM 2010, AIP Conference Proceedings, Springer-Verlag, 2010

Costa, M.F.P.; Fernandes E.M.G.P.; Assessment of a primal-dual interior point method using a three-D filter line search strategy, ICNAAM 2010, AIP Conference Proceedings, Springer-Verlag, 2010

Espírito Santo, I.A.C.P.; Fernandes, E.M.G.P.; Simplified model for the activated sludge system: WWTP cost minimization via an augmented lagrangian pattern search method, Theodore Simos, G. Psihoyios and Ch. Tsitouras, Greece, Springer-Verlag, 2010

Costa, L.; Espírito Santo, I.A.C.P.; Oliveira, P.; An adaptative constraint handling technique for evolutionary algorithms, Theodore Simos, G. Psihoyios and Ch. Tsitouras, Greece, Springer-Verlag, 2010

Espírito Santo, I.A.C.P.; Costa, L.; Denysiuk, R.; Fernandes, E.M.G.P.; Hybrid Genetic Pattern Search Augmented Lagrangian Algorithm: Application to WWTP Optimization, Mikael Collan, Finland, Tadbir, 2010

Rodrigues, H.S.F.; Monteiro, M.T.T.; Torres, D.F.M.; Zinober, A.; Control of dengue disease: a study case in Cape Verde, CMMSE 2010, Almeria, Spain, 2010

Rodrigues, H.S.F.; Monteiro, M.T.T.; Torres, D.F.M.; Insecticide control in a Dengue epidemics model, ICNAAM 2010, Greece, AIP Conference Proceedings, Springer-Verlag, 2010

Rocha, A.M.A.C.; Fernandes, E.M.G.P.; Fernandes, J.P.; Martins, T.F.M.C.; Embedding a Competitive Ranking Method in the Artificial Fish Swarm Algorithm for Global Optimization, ENGOPT2010, Portugal, September 2010

Rocha, A.M.A.C.; Fernandes, E.M.G.P.; Electromagnetism-like Augmented Lagrangian Algorithm for Global Optimization, WSC15, November 2010

Rocha, A.M.A.C.; Fernandes, E.M.G.P.; A Stochastic Augmented Lagrangian Equality Constrained-Based Algorithm for Global Optimization, ICNAAM 2010, Rhodes, Greece, September 2010

Azad, M.A.K.; Rocha, A.M.A.C.; Fernandes, E.M.G.P.; Nonlinear Continuous Global Optimization by Modified Differential Evolution, ICNAAM 2010, Rhodes, Greece, September 2010

Teixeira, S.F.C.F.; Leão, C.P.; Neves, M.; Arezes, P.; Cunha, A.; Teixeira, J.C.F.; Thermal Comfort Evaluation using a CFD study and a transient thermal model of the human body, ECCOMAS CFD, Lisbon, Portugal, June 2010

Leão, C.P.; Teixeira, S.F.C.F.; Modeling toward numerical solution of an applied engineering problem, 15th SEFI MWG Seminar and 8th Workshop GFC, Wismar, Germany, June 2010

Costa, S.; Mendes, I.; Soares, F.O.; Leão, C.P.; From differential equations to real-world problems in Control Engineering, 15th SEFI MWG Seminar and 8th Workshop GFC, Wismar, Germany, June 2010

Ferreira, A.C.; Martins, L.A.S.B.; Teixeira, S.F.C.F.; Leão, C.P.; Teixeira, J.C.F.; Nunes, M.L.; Development and Evaluation of a Micro-Cogeneration Prototype for Residential Applications, ASME International Mechanical Engineering Congress & Exposition, Vancouver, Canada, November 2010

Loureiro, I.; Leão, C.P.; Arezes, P.M.; Clients' perception of ergonomic risk factors in new commercial areas with free circulation of people, ORP2010, Valencia, Spain, May 2010

Ferrell, G.; Alves, P.; Alves, M.J.; Farrugia, M.; Fernandez, C.; Engert, S.; Epelboin, Y.; Grepilloux, J.; Hayes, S.; Leão, C.; Madoz, E.; Piteira, M.; Restivo, T.; Soares, F.; Uhomoihi, J.; The State of the Nations: Current and future developments in Technology-Enhanced-Learning, EUNIS 2010, Warsaw, Poland, June 2010

Carvalho, N.; Leão, C.P.; Soares, F.O.; Machado, J.; An Interface for industrial network monitoring and control, IMS'10, Lisbon, Portugal, July 2010

Costa, J.; Carvalho, N.; Leão, C.P.; Soares, F.O.; Machado, J.; Industrial Network Platform for Monitoring and Control of Automated Manufacturing Systems, IMS'10, Lisbon, Portugal, July 2010

Carvalho, N.; Costa, S.; Leão, C.P.; Soares, F.O.; Machado, J.; Rodrigues, H.; A Network Configuration for Industrial Systems Control, MECAHITECH'10, Bucharest, Romania, September 2010

Costa, S.; Soares, F.; Leão, C.P.; Mixing Personal Learning and Control Engineering Education Environments, PAEE'2010, Barcelona, Spain, July 2010

Leão, C.P.; Soares, F.O.; Carvalho, V.; Vasconcelos, R.M.; Automation and Control Engineering Laboratory: Students Perspectives, WCE2010, London, UK, June 2010

Costa, L.; Espírito Santo, I.A.C.P.; Denysiuk, R.; Fernandes, E.M.G.P.; Using a Genetic Algorithm to Solve a Bi-Objective WWTP Process Optimization, International Conference on Operations Research "Mastering Complexity", Munich, Germany, September 2010

Costa, L.; Espírito Santo, I.A.C.P.; Denysiuk, R.; Fernandes, E.M.G.P.; Hybridization of a Genetic Algorithm with a Pattern Search Augmented Lagrangian Method, ENGOPT2010, Lisbon, Portugal, September 2010

Costa L.; Rocha, A.M.A.C.; Santos, C.P.; Oliveira M.; A Global Optimization Stochastic Algorithm for Head Motion Stabilization during Quadruped Robot Locomotion, ENGOPT2010, Lisbon, Portugal, September 2010

Oliveira M.; Santos, C.; Ferreira, M.; Costa, L.; Rocha A.M.A.C.; Locomotion gait optimization for a quadruped robot, ERLARS2010, Lisbon, Portugal, September 2010

Santos, C.P.; Oliveira, M.; Mendes, H.; Ferreira, M.; Costa, L.; Evolution Strategies Combined with Central Pattern Generators for Head Motion Minimization during Quadruped Robot Locomotion, CONTROLO'2010, Coimbra, Portugal, September 2010

**Group Productivity**

Ávila, P.; Costa, L.; Bastos, J.; Lopes, P.; Pires, A.; Analysis of the Domain of Applicability of an Algorithm for a Resources System Selection Problem for Distributed/Agile/Virtual Enterprises Integration, CISTI'2010, Santiago de Compostela, Spain, June 2010

Oliveira, M.; Costa, L.; Rocha, A.M.A.C.; Santos, C.; Ferreira, M.; Multiobjective Optimization of a Quadrupe Robot Locomotion using a Genetic Algorithm, WSC15, November 2010

Ferreira, A.L.; Machado, R.J.; Costa, L.; Silva, J.G.; Batista, R.F.; Paulk M.C.; Improving Software Inspections Performance, 26th IEEE ICSM, Timioara, Romania, September 2010

Costa, L.; Oliveira, P.; Biplots in Offline Multiobjective Reduction, IEEE CEC 2010, Barcelona, Spain, July 2010

**Ph.D. thesis completed**

Joana Fernandes, "O impacto das Instituições de Ensino Superior no desenvolvimento regional: o caso do Instituto Politécnico de Bragança", Oliveira, P.; Cunha, J.; 23-03-2010

Florbel Maria Cruz Domingues Correia, "Doenças Respiratórias Crónicas - modelo estatístico para o controlo individual dos doentes", Oliveira, P.; 08-07-2010

Alzira Maria Teixeira Mota, "Um método de redução para programação semi-infinita não linear baseado numa técnica de penalidade exacta", Vaz, A.I.F.; 20-07-2010

**Organization of conferences**

The research member acted as organizers in the following conference:

Costa, L.; The 15th Online World Conference on Soft Computing in Industrial Applications, Guimarães, Portugal, November 15-November 27

Costa, L.; 2ª Escola Luso-Brasileira de Computação Evolutiva (ELBCE), Guimarães, Portugal, July 15-July 18

The research members acted as organizers of special sessions on the following conferences:

Rocha, A.M.A.C.; Sessions "Heuristics 1" and "Heuristics 2", 24th European Conference on Operational Research – Lisbon, July 11-July 14

Rocha, A.M.A.C.; Session "Optimization Techniques", The 15th Online World Conference on Soft Computing in Industrial Applications, November 15-November 27

Fernandes, E.M.G.P.; Session "Advances in Continuous Optimization", 8th EUROPT Workshop, Aveiro, Portugal, July 09-July 10

Fernandes, E.M.G.P.; Session "Nonlinear Programming", 24th European Conference on Operational Research, Lisbon, Portugal, July 11-July 14

Fernandes, E.M.G.P.; Minisymposium "MS4 - CONTINUOUS OPTIMIZATION", 2nd International Conference on Engineering Optimization, Lisbon, Portugal, September 06-September 09

Pereira, A.I.P.N.; Session "Numerical Optimization", ICNAAM 2010, Greece, September 19- September 25

Leão, C.P.; Lima, R.M.; Session "Methodologies in Engineering Control and Automation Education", CONTROLO'2010, Coimbra, September 10

Espírito Santo, I.A.C.P.; Session "Nonlinear Optimization and Applications", EURO 2010, Lisbon, Portugal, July 13

Costa, L.; Session "Multi-objective Optimization", EURO 2010, Lisbon, Portugal, July 13

The research members acted as organizers of the following symposiums:

I Ciclo de Seminários em Engenharia Humana, Guimarães, from 20-10-2010 to 16-12-2010

Automation and Control Remote and Virtual Labs, Guimarães, 04-06-2010

Critical Thinking Skills in Engineering Education, Guimarães, 09-06-2010

Penalização Hiperbólica e Suavização Hiperbólica, Braga, 05-07-2010

Solving the Minimum Sum-of-Squares Clustering Problem by Hyperbolic Smoothing and Partition into Boundary and Gravitational, Braga, 06-07-2010

Penalização Hiperbólica e Suavização Hiperbólica: Modelagem de Operações de Scheduling e Blending de Refinarias, Braga, 07-07-2010

FCT Relatório Científico 2010 Print: 31-03-2011 17:06:49 [CENTRO ALGORITMI]

**Group Description**

**Title of Research Group:** (RG-Norte-319-2169)  
Systems Engineering, Optimization and Operations Research

**Principal Investigator:** José Manuel Vasconcelos Valério de Carvalho

**Main Scientific Domain:** Engenharia Electrotécnica e Informática

**Group Host Institution:** Universidade do Minho

**Funding, source, dates****Funding, source, dates**

ASTRA – Sistema Alternativo de Transporte para Áreas Rurais, 11-2007, 09-2011, FCT, 116.260€.

SearchCol: Metaheuristic search by column generation, 04-2010, 03-2013, FCT (PTDC/EIA-EIA/100645/2008), 94.719€.

KEP - Novos modelos no processo de transplante renal, 10-2010, 09-2013, FCT (PTDC/EGE-GES/110940/2009), 126.000€.

Logística Inversa de REEE, 12-2009, 12-2010, Amb3E, 41760€.

Sistemas de Apoio à Decisão para o IMTT, 09-2010, 02-2011, IMTT, 50000€.

Logística da biomassa florestal e agrícola, 09-2009, 09-2010, QREN - Vale Inovação, 18000€.

Quadrilátero Urbano, 2008, 2012, QREN, 180.000€.

Fast lower bounding techniques for large-scale discrete optimization problems, 01-2010, 12-2010, FCT/CNRS, 4000€.

Estudo das práticas de melhoria contínua adoptadas por empresas industriais em Portugal, 06-2010, 12-2010, Centro Algoritmi, 3000€.

Simulação de Movimentação de Viaturas, UM/Cachapuz, QREN (2009-2010), 22500€.

Business Intelligence, UM/Efacec, QREN (2009-2010), 70000€.

**Objectives & Achievements****Objectives**

The mission of SEOOR is to pursue research and research-led learning and teaching of the highest international level in all the teaching areas of the Optimization and Operations Research Group:

Optimization  
Logistics and Transportation  
Modeling and Simulation  
Quality, Reliability and Maintenance

## • Objectives:

Conduct both fundamental and applied research, targeting to publish in the highest quality and flagship journals;  
Establish research mobility, exchange and cooperation programs with internationally renowned research centers;  
Establish high quality research contracts with surrounding industries and services, aiming at contributing to their development;  
Target the job placement of our PhD and MSc students in surrounding industries and services after they graduate;  
Develop a research environment attractive to international graduate students, particularly from Portuguese speaking countries, and to postdoctoral researchers;  
Encourage the involvement of postgraduate students in ongoing research projects.

**Main Achievements**

## 1. Publications

The number of papers published in 2010 increased: there were 15 papers published or in press in international journals (7 ISI journals), 1 book (in Portuguese), 1 chapter in book (in Portuguese), and 35 papers published in conference proceedings.

## 2. International visibility

The International visibility and recognition of the group increased. The number of citations to publications in international journals resulting from the PhD thesis recently completed by many researchers of the group is significant, and the total figures increased significantly.

On the 27th March 2010, there were 138 citations in the ISI Web of Knowledge, 212 citations in Scopus and 27 citations in <http://scholar.google.pt/> to the papers published in the group.

The number of citations in the ISI Web of Knowledge almost tripled when compared with the figure of 2007.

## 3. Internationalization

In order to pursue objective 2 referred to above, in the past, internationally renowned professors visited SEOOR, and research cooperation programs have already been approved, and others are expected to follow.

We point out new collaborations with MIT, in the MIT-Portugal Program, and with the University of Valenciennes, France, which includes the exchange of a PhD student. The exchange of PhD students of SEOOR is envisaged in the future in a regular basis.



## Objectives & Achievements

For further details, see Section Internationalization, Subsection New Collaborative research.

Some of these new cooperation programs are in areas within the group that gained a critical mass when researchers got their PhDs recently, enabling targeting larger scope projects and to establish new international links.

### 4. Prizes and awards

Lopes, I.C. and Carvalho, J.M.V., Using Interval Graphs in an Order Processing Optimization Problem, Lecture Notes in Engineering and Computer Science, 2185 (1), pp. 1722-1728, 2010 (Proceedings of The World Congress on Engineering 2010, WCE 2010, June 30 – July 2, 2010, Imperial College, London, U.K.). (Best Student Paper Award by the International Association of Engineers (IAENG))

### 5. Post-doctoral researchers

Post-doctoral students find SEOOR attractive. There were two post-doctoral in 2010:

Jürgen Rietz, PhD U.Freiberg, Germany, Post-doctoral grant from FCT, 2008-.

Mansi Raed, PhD U. Valenciennes, France, Post-doctoral grant from FCT, 2010-.

Dorabella Santos, PhD U. Aveiro, Portugal, Post-doctoral grant from FCT, 2008-.

A position was open for a new post-doctoral researcher under the Programa Compromisso Ciência.

Some of the international research cooperation programs currently going-on are with past post-doctoral researchers, and we expect to do the same with the current researchers.

### 6. New PhD Program in Industrial and Systems Engineering

The new Programa Doutoral em Engenharia Industrial e de Sistemas (PDEIS) was approved by DGES in June 2009, and is now running for the second year. There were 13 candidates in the AY 2010/2011.

New courses in

- Decomposition Methods in Integer Programming
- Approximate methods in Integer Programming and Combinatorial Optimization
- Exact and hybrid methods for Integer Programming
- Heuristics Methods

are running for the first time this AY, offered by faculty members of SEOOR. Other members of SEOOR are now preparing new PhD courses in the frontier of the knowledge of their research areas to offer in this PhD Program.

We anticipate that the number of PhD students in the SEOOR group will increase in the near future.

## Group Productivity

### Publications in peer review Journals

Rita Macedo, Cláudio Alves, José Valério de Carvalho, Arc-Flow Model for the Two-Dimensional Guillotine Cutting Stock Problem. Computers and Operations Research. Vol. 37: nº (2010), p. 991-1001. [ISI]

Carina Pimentel, Filipe Alvelos, J.M. Valério de Carvalho, Comparing Dantzig-Wolfe decompositions and branch-and-price algorithms for the multi-item capacitated lot sizing problem. Optimization Methods and Software. Vol. 25: nº 2 (2010), p. 299-319. [ISI]

Elsa Silva, Filipe Alvelos, J.Valerio de Carvalho, An integer programming model for two- and three-stage two-dimensional cutting stock problems. European Journal of Operational Research. Vol. 205: nº 3 (2010), p. 699-708. [ISI]

Jürgen Rietz, J. Valério de Carvalho, Claudio Alves, Theoretical investigations on maximal dual feasible functions. Operations Research Letters. Vol. 38: nº (2010), p. 174-178. [ISI]

François Clautiaux, Cláudio Alves, Jose Valério de Carvalho, A survey of dual-feasible and superadditive functions. Annals of Operations Research. Vol. 179: nº 1 (2010), p. 317-342. [ISI]

Sousa, S.D. and Aspinwall, E., Development of a performance measurement framework for SMEs. Total Quality Management & Business Excellence. Vol. 21: nº 5 (2010), p. 475-501. [ISI]

Sampaio, P; Saraiva, P; Guimarães Rodrigues, A classification model for prediction of certification motivations from the contents of ISO 9001 audit reports. Total Quality Management & Business Excellence. Vol. 21: nº 12 (2010). [ISI]

Sampaio, P., Saraiva, P., Integration of Quality, Environmental, Occupational Health and Safety Management Systems, CESET Journal, Vol. 1 Nº7, pp. 16-27, (2010).

Carina Pimentel, Filipe Alvelos, J.M. Valério de Carvalho and A. Duarte, Exact and Heuristic Approaches for Lot Splitting and Scheduling in Identical Parallel Machines, International Journal of Manufacturing Technology and Management, 22,1, 2011.

Isabel Cristina Lopes, J.Valerio de Carvalho, Minimization of Open Orders Using Interval Graphs, IAENG International Journal of Applied Mathematics, 40, 4, pp. 297-306, 2010.

Alvelos, F.; Sousa, A.; Santos, D., SearchCol: Metaheuristic Search by Column Generation. Lecture Notes in Computer Science. Vol. 6373: nº (2010), p. 190-205.

Lopes, I.C. and Carvalho, J.M.V., Using Interval Graphs in an Order Processing Optimization Problem. Lecture Notes in Engineering and Computer Science. Vol. 2185: nº 1 (2010), p. 1722-1728.

**Group Productivity**

Ferreira, J. E.; Lopes, I. S., Improvement of scrap request process with Six Sigma methodology. *Lecture Notes in Engineering and Computer Science*. Vol. 2185: nº 1 (2010), p. 2458-2463.

Riesenberger, C.; Sousa, S. D, The 8D methodology: an effective way to reduce recurrence of customer complaints?. *Lecture Notes in Engineering and Computer Science*. Vol. 2185: nº 1 (2010), p. 2225-2230.

Isabel Cristina Lopes, J.Valerio de Carvalho, An integer programming model for the minimum interval graph completion problem, *Electronic Notes in Discrete Mathematics* 36: pp. 583-590, 2010.

Martins, I.; Alvelos, F.; Constantino, M., A Branch-and-Price Approach for Harvest Scheduling subject to Maximum Area Restrictions. *Computational Optimization and Applications*. Vol. DOI: 10.1007/s10589-010-9347-1: nº (2010) [ISI]

Santos, D.; Sousa, A.; Alvelos, F.; Dzida, M.; Pióro, M., Optimization of link load balancing in multiple spanning tree routing networks. *Telecommunication Systems*. Vol. DOI: 10.1007/s11235-010-9337-8: (2010) [ISI]

Chan, T.M.; Alvelos, F.; Silva, E.; Valério de Carvalho, J.M., Heuristics with Stochastic Neighborhood Structures for Two-dimensional Bin Packing and Cutting Stock Problems. to appear in *Asia-Pacific Journal of Operations Research*. (2010). [ISI]

François Clautiaux, Cláudio Alves, J.M. Valério de Carvalho, Jürgen Rietz, New stabilization procedures for the cutting stock problem, to appear in *INFORMS Journal on Computing*, 2010. [ISI]

**Other international publications**

Lopes, I.S., E. Moreira, S.D. Sousa (2010), Improvement of after-sales maintenance service using TPM principles, in Ale, Papazoglou & Zio (eds) *Reliability, Risk and Safety: Back to the Future*, pp. 158-166. London: Taylor & Francis.

Lopes, I.S., L. Pires, P. Bastos (2010). A decentralized predictive maintenance system based on data mining concepts , In Putnik, Ávila (eds.), *Business Sustainability I, Management Technology and Learning for Individuals, Organisations and Society in Turbulent Environments*, pp. 254-258. University of Minho & ISEP.

Alves,C, R.Macedo, J.Carvalho, Solving the pattern minimization problem with branch-and-price and constraint programming. CPAIOR 2010, Intl Conf on Integration of AI and OR Techniques in Constraint Programming. Bolonha: 06-2010

Amaral, A, Araújo, M, Pereira, G, A hybrid maturity model approach for assessing the organisational performance. EurOMA. Porto: 06-2010

Amaral, A, Araújo, M, Pereira, G, A Multi-Criteria Decision Model for Dynamically Managing the Projects Portfolio. SELASI. Havana: 12-2010

Amaral, A, Araújo, M, Pereira, G, A Project Portfolio Management technique, A DEA approach. IPMA. Istambul: 11-2010

Brás, P., C Alves, J.Carvalho, T.Pinto, Exploring New Constructive Algorithms for the Leather Nesting Problem in the Automotive Industry. 5th Intl Conf on Management and Control of Production and Logistics, (IFAC). Coimbra, 09-2010

Carvalho, M.; Nunes, E.; Telhada, J., A fuzzy-probabilistic maintenance optimization model for two interactive failure modes. ESREL 2010 Rhodes-Grécia: 09-2010

Carvalho,J;Ribeiro,S;Pereira,J;Oliveira,J;Telhada,J;Dias,L;Figueiredo,M, Spatio-Temporal conceptual model for a WEEE GIS application. METMA V, 5th Intl Workshop on Spatio-Temporal Modelling. Santiago de Compostela: 06-2010

Costa, A.; Sampaio, P.; Braga, A., E-business certification: new proposal for the QWEB Specification. European Organization for Quality Congress. Izmir, Turquia: 10-2010

Domingues, P; Sampaio, P, Arezes, P, Management Systems Integration: A Synergistic Approach. 13th Toulon, Verona Conf: Excellence in Services. Coimbra, 09-2010

Domingues, P; Sampaio, P; Arezes, P, Management Systems Integration: An organisational milestone. Engenharia e Qualidade de Vida. Guimarães, 10-2010

Duarte, A, J.Carvalho, Solving a Multiprocessor Problem by Column Generation and Branch-and-price. 5th Intl Conf on Management and Control of Production and Logistics, Intl Federation of Automatic Control (IFAC). Coimbra, 09- 2010

Geraldes, C, M.Carvalho, G.Pereira, Operational Research models in warehouse design and planning. Information Systems, Logistics and Supply Chains. Marrocos: 04-2010

Gomes, T, F.Alvelos, M.Carvalho, Modeling and Optimization in Biomass Supply Chains. ALIO-INFORMS Joint Intl Meeting. Argentina: 06-2010

Hussain, D; M.Figueiredo, A.Tereso, F.Ferreira, A Study of Textile & Clothing Supply Chain in Pakistan. EngOpt, 2nd Intl Conf on Engineering Optimization. Lisboa: 09-2010

Lopes, I.C., J.Carvalho, An integer programming model for the minimum interval graph completion problem. Intl Symposium on Combinatorial Optimization. Hammamet, Tunisia: 03-2010

Lopes, I.C., J.Carvalho, Sequencing Cutting Patterns with Colored Interval Graphs. 5th Intl Conf on Management and Control of Production and Logistics, (IFAC). Coimbra, 09-2010

Miranda, P, L.Dias, J.Oliveira, G.Pereira, AGVs for a Pallets Transport System, A Decision Based on Simulation. The Intl Workshop Applied Modeling and Simulation. Rio de Janeiro: 05-2010

Oliveira, J., J.Telhada, M.Carvalho, Integração de tecnologias SIG e WEB para o planeamento e gestão de sistemas de transporte a pedido. 4º Congresso Luso-Brasileiro para o Planeamento Urbano, Regional, Integrado e Sustentável (PLURIS). Faro, 10-2010

Oliveira, J, L.Dias,G.Pereira, Solving the Job Shop Problem with a random keys genetic algorithm with instance parameters. 2nd Intl Conf on Engineering Optimization (EngOpt 2010). Lisboa: 09-2010

Pimentel, C, F.Alvelos, J.Carvalho, A.Duarte, Heuristic approaches for lot splitting and scheduling in identical parallel machines. 17th Intl Annual European Operations Management Association (EurOMA). Porto, 06-2010

Pimentel, C. , F.Alvelos, J.Carvalho, A.Duarte, A Fast Heuristic for a Lot Splitting and Scheduling Problem of a Textile Industry. 5th Intl Conf on Management and Control of Production and Logistics, (IFAC). Coimbra, 09-2010

Riesenberger, C., Sousa, S., Application of the Six Sigma methodology in customer complaints management. POMS 2010 Vancouver, Canada: 05-2010

Sampaio, P; Pereira, G.; Carvalho, M,Telhada, J.; Paisana, A, On the Way for a Business Intelligence Solution for the Transportation Sector. WAMS

**Group Productivity**

2010, Intl Workshop on Applied Modeling and Simulation. Brasil: 05-2010

Sampaio, P.; Saraiva, P.; Orey, J.; Reis, M, The Future of Quality: Is Portugal Different? European Organization for Quality Congress. Izmir, Turquia: 10-2010

Santos, D.; Sousa, A.; Alvelos, F.; Pióro, M., Load Balancing Optimization of Telecommunication Networks: a Column Generation based Heuristic Approach. 14th Int. Telecommunications Network Strategy and Planning Symposium (NETWORKS), IEEE Xplore. Warsaw, Poland: 09-2010

Saraiva, P; Sampaio, P., Integração de Sistemas de Gestão da Qualidade, Ambiente, Segurança e Higiene no Trabalho. Colóquio Internacional de Segurança e Higiene Ocupacionais. Guimarães, 02-2010

Silva, H; Tereso, A; Oliveira, J, On Resource Complementarity in Activity Networks. Third Intl Conf on Information Systems, Logistics and Supply Chain, ILS 2010 Casablanca: 04-2010

Teixeira, S.; Sampaio, P., Analysis of Food Safety Management Systems Certification: The Portuguese Case. 13th Toulon, Verona Conf: Excellence in Services. Coimbra, 09-2010

Tereso, A; Silva, H; Oliveira, J, On Resource Complementarity in Activity Networks, Further Results. 2nd Intl Conf on Engineering Optimization (EngOpt 2010). Lisboa: 09-2010

Vik, P, Dias, L M S e Pereira, G, Automatic Generation of Computer Models Through the Integration of Production Systems Design Software Tools. Multidisciplinary Design Optimization and Applications. Paris: 06-2010

Vik, P, Dias, L M S, Pereira, G e Oliveira, J A V, Using SIMIO in the Design of Automated Solutions for Cement Plants. Workshop Applied Modeling and Simulation. Rio de Janeiro: 05-2010

Vik, P; Dias, L; Pereira, G; Oliveira, J; Abreu, R, Using Simulation for the Specification of an Integrated Automated Weighting Solution in a Cement Plant. Winter Simulation Conf, WSC2010 Baltimore: 12-2010

Vik, P; Dias, L; Pereira, G; Oliveira, J, Improving Production and Internal Logistics Systems, An Integrated Approach Using CAD and Simulation. Third Intl Conf on Information Systems, Logistics and Supply Chain, ILS 2010 Casablanca: 04-2010

**Other national publications**

Saraiva, P., Orey, J. Sampaio, P., Reis, M., Cardoso, C., Pinheiro, J., Tomé, L., "O Futuro da Qualidade em Portugal", Associação Portuguesa para a Qualidade, Lisboa, 2010.

Carvalho, M., Gestão dos Transportes na Gestão da Cadeia de Abastecimento, 32pag., "Logística e Gestão da Cadeia de Abastecimento", Carvalho, J. C. (Ed), Edições Sílabo, (2010).

Sampaio, P.; Saraiva, P.; Guimarães Rodrigues, A, O impacto económico da certificação ISO 9001 em empresas Portuguesas. Revista Qualidade. Vol. N/A: nº 1 (2010), p. 36-44.

Sampaio, P.; Saraiva, P, Modelos de Excelência: análises qualitativas e quantitativas. Revista TMQ Qualidade. Vol. N/A: nº 1 (2010), p. 17-43.

Sampaio, P.; Saraiva, P, Integração ou adição de sistemas de gestão?. Revista Qualidade. Vol. N/A: nº 3 (2010), p. 36-40.

Sampaio, P; Fonseca, L, ASQ em Portugal: make good great. Revista Qualidade. Vol. N/A: nº 4 (2010), p. 34-38.

**Ph.D. thesis completed**

Tiago Pinho, Definição de um modelo da rede logística na indústria da construção: estudo de um caso (SFRH / BDE / 15545 / 2005), 2010.

Carina Pimentel, Métodos híbridos para dimensionamento de lotes e escalonamento integrados (SFRH / BD / 38582 / 2007), submitted 2010

**Organization of conferences**

Organization Committee

EURO XXIV Lisbon, 24th European Congress on Operations Research of EURO (The Association of European Operational Research Societies), Lisbon, July 11-14, 2010. (V.Carvalho)

Program Committee

- ICORES 2012, 1st International Conference on Operations Research and Enterprise Systems, Vilamoura, Portugal, 4-6 de fevereiro de 2012. (V.Carvalho)

- IO 2011, 15o Congresso da Associação Portuguesa de Investigação Operacional, 2011, Universidade de Coimbra, Coimbra, 18 a 20 de Abril de 2011. (V.Carvalho)

- VII ALIO EURO Workshop on Applied Combinatorial Optimisation, Porto, Portugal, May, 4, 6, 2011. (V.Carvalho)

- Optimization 2011, 24 a 27 de Julho de 2011, Universidade Nova de Lisboa, Lisboa. (V.Carvalho)

- MCPL 2010, IFAC Conference on Management and Control of Production and Logistics, September 8, 10, 2010, University of Coimbra, Portugal. (V.Carvalho)

- ASQ World Conference on Quality and Improvement, St. Louis, MO, USA, 2010 (P.Sampaio)

- Colóquio Internacional de Segurança e Higiene Ocupacionais, Guimarães, Portugal, 2010 (P.Sampaio)

Business Sustainability 2011, Póvoa de Varzim, Portugal (Sérgio Sousa)

**Industry contract research**

Prestação de serviços à empresa Coindu, S.A., no domínio do planeamento de corte, 2006-

**Internationalization**

**Group Productivity**

Collaborative publication, Research

Rita Macedo, Cláudio Alves, J. M. Valério de Carvalho, François Clautiaux, Saïd Hanafi, Solving exactly the vehicle routing problem with time windows and multiple routes using a pseudo-polynomial model, under revision for European Journal of Operational Research, 2011.

Fast lower bounding techniques for large-scale discrete optimization problems, funded by Programa de Cooperação Transnacional ao abrigo do Acordo entre a FCT e o Centre National de la Recherche Scientifique (CNRS) de França (2010-2010).

Advanced Optimization Techniques based on Hybrid Integer and Constraint Programming Methods: Application to Vehicle Routing and Cutting Stock Problems, funded by Programa de Cooperação Transnacional ao abrigo do Acordo entre a FCT e o Centre National de la Recherche Scientifique (CNRS) de França (2009-2010).

François Clautiaux, Département génie informatique, IUT A de Lille 1 , Université des Sciences et Technologies de Lille, France, and INRIA.

Richard Eglese, Lancaster University, U.K.

Saïd Hanafi, Université de Valenciennes, France, and LAMIH.

Jacques Carlier, Compiègne University of Technology, France

Antoine Jouglet, Compiègne University of Technology, France

Mohamed Haouari, Özyegin University, Istanbul, Turkey, and ROI, Tunisia.

Antonio Guasch Petit, Universitat Politècnica de Catalunya, Spain

Enrique Alba, University of Málaga, Spain

Aurelia Altemira Acuña Idrogo, Universidade Federal da Paraíba-Brasil.

Graduate Training Networks and Staff Mobility

Graduate Training Network with Massachusetts Institute of Technology (MIT), Instituto Superior Técnico (IST) and Faculdade de Engenharia da Universidade do Porto (FEUP).

Examination boards

Habilitation Thesis of Gleb Below, One-Dimensional Approaches and Relaxations for Higher- Dimensional Orthogonal Packing, Institute of Numerical Mathematics, Technische Universität Dresden, Dresden, Germany, Agosto de 2010, (referee: Valério de Carvalho).

PhD Thesis of Andrea Bettinelli, Mathematical Programming Algorithms for Transportation Problems, PhD Programme in Mathematics and Statistics for Computational Sciences of the University of Milan, Italy, October 2010, (external referee: Valério de Carvalho).

**Government/Organization contract research**

Protocolo IMTT (3 years – 50.000€/year) – Contrato de Prestação de Serviços entre o Instituto de Mobilidade e dos Transportes Terrestres (IMTT-IP) e a Universidade do Minho. Estudo de soluções de apoio à decisão e monitorização no contexto da Unidade de Regulação Ferroviária (URF) do IMTT (Coordinators: Carvalho, M. Sameiro)

FCT Relatório Científico 2010 Print: 31-03-2011 17:07:46 [CENTRO ALGORITMI]

**Group Description**

**Title of Research Group:** (RG-Norte-319-2171)  
Knowledge and Information Systems and Services

**Principal Investigator:** Ricardo Jorge Silvério de Magalhães Machado

**Main Scientific Domain:** Engenharia Electrotécnica e Informática

**Group Host Institution:** Universidade do Minho

**Funding, source, dates****Funding, source, dates**

- SWAN - Semantic Web, funded by ANACOM, 01/2010-01/2010
- csSecure II, funded by ADI, 04/2010-03/2013
- OFELIA - Ambientes abertos federados para a alavancagem de Identidade e Autorização, funded by FCT, 05/2010-04/2013
- BATinLoko – Environmental performance indicators and their relation with economic factors in textile BAT implementation, funded by LIFE+ Environment Policy and Governance 2007, 01/2009-03/2011
- DeGóis - Plataforma Nacional de Ciência e Tecnologia, funded by FCT, 03/2010-02/2011
- INTCARE - Sistema de Suporte à Decisão Inteligente para Medicina Intensiva, funded by FCT, 04/2008-04/2011
- GridClass - Sistemas de Classificação para Grid Data Mining, funded by FCT, 11/2008-12/2010
- SPAM Telescope Miner, funded by FCT, 01/2008-12/2010
- ACTOR: Apostar na Certificação das Empresas TICE Organizadas em Rede, funded by ADI, 11/2010-05/2013
- ISOFIN: Interoperabilidade em Software Financeiro, funded by ADI, 10/2010-09/2013

**Objectives & Achievements****Objectives**

The KISS (Knowledge and Information Systems and Services) research line adopts three problem-domain topics: Organizational Well-Being (OWB); Valuable and Trustable Information Services (VTIS); Sustained Software Industry (SSI). These problem-domain topics act as a crosscut research agenda for integrating and for stimulating the cooperation between the internal research sub-communities that address more specific research topics: business intelligence, business process management, information services, information systems security & audit, knowledge management, semantic web & scholarly communication, software engineering & management. During 2011, we expect that some of the sub-communities evolve towards a sustainable level that enables the formal creation of research groups internal to the KISS research line.

In detail, KISS intends to:

- Perform fundamental and applied research, aiming to disseminate the scientific results in leading journals and world-class conferences;
- Establish research cooperation with international leading research groups;
- Cooperate with industrial partners to increase their competitiveness;
- Offer high-quality courses at MSc and PhD levels to maximize the employability of the students, both nationally and internationally;
- Attract international graduate students to get involved into the ongoing research projects.

**Main Achievements**

The results achieved during 2010 are at the same level of those of the previous years in what concerns projects and publications. Quantitatively, the research line achieved the following results:

- Books and book chapters: 21
- International Journals: 11
- National Journals: 2
- Conference Proceedings (International): 59
- Conference Proceedings (National): 9
- Edited Volumes: 5
- Concluded PhD Thesis: 3
- Concluded MSc Thesis: 12
- Organization of Conferences/Seminars/Workshops: 8
- R&D Projects: 10

In terms of main achievements, it is worth to mention the reinforcement of involvement in international activities with other universities like CMU or MIT, and associations like AIS and IFIP. Within the CMU|Portugal Program, one team member is coordinating the Innovation Network on Software Engineering (NET-SEI): <http://net-sei.cmuportugal.org/>.

The KISS research line coordinates the Doctoral Program in Information Systems and Technology, where several advanced courses are offered to students in the main areas of the research line. Some involvement also occurs with the Doctoral Program in Computer Science, a joint venture of Universidade do Minho, Universidade de Aveiro and Universidade do Porto (MAP-i). This Doctoral Program is a dual degree with the Carnegie Mellon

## Objectives & Achievements

University, within the CMU|Portugal Program.

The research line also coordinates the following Master Programmes, where several courses are also offered: MSc in Information Systems, MSc in Information Services, MSc in Engineering and Management of Information Systems. KISS students have a high employability rate due mainly from the research-driven approach adopted within the post-graduate courses.

The team visibility can also be evaluated by the journals and conferences where team members have acted as referees. In 2010 team members have reviewed paper on, for example, journal as "IEEE Intelligent Systems Magazine", "Data & Knowledge Engineering Journal", "Information Sciences", and "Elsevier Journal on Information and Software Technology".

M.Y. Santos received the best paper awarded at ICSEA'2010.

Finally, during 2010, two international prizes have been given to two team members (relative to activities developed during the previous years):

- 2009 IFIP Outstanding Achievement Award (I. Ramos)
- 2009 IEEE MGA Achievement Award (R.J. Machado)

## Group Productivity

### Publications in peer review Journals

#### JOURNALS:

- Catarino, E.; Baptista, A.A. 2010. Relating folksonomies with Dublin Core, *International Journal of Metadata, Semantics and Ontologies*, n. 5, p. 4-285, 295
- Pereira, T., Santos, H., An Audit Framework to Support Information System Security Management, *International Journal of Electronic Security and Digital Forensics*, 3, 2010, 197-203
- Magalhães, S., Santos, H., Santos, L., Jahankhani, H., Cyberwar and the Russian Federation: the usual suspect, *International Journal of Electronic Security and Digital Forensics*, 3, 2, 2010, 151-163
- Rodrigues, L.S.; Amaral, L., Issues in Enterprise Architecture Value, *Journal of Enterprise Architecture*, 6, 4, 2010, 6
- Campos, H.; Amaral, L., GOTOPS - Code of Technoethics Governance, *International Journal of Human Capital and Information Technology Professionals*, 1, 3, 2010
- Soares, D.; Amaral, L., Information Systems Interoperability in Public Administration: Unveiling the Constellation of the Acting Forces through a Delphi Study, *Journal of Theoretical and Applied Electronic Commerce Research*, 5, 1, 2010
- Santos, M.F.; Gomes L., Operating Room Information Systems Adoption by Portuguese Clinical Users, *WSEAS Transactions on Computers*, 9, 2010
- T. Miranda; A.G Correia; M.F Santos; L.R Sousa; P. Cortez, NEW MODELS FOR STRENGTH AND DEFORMABILITY PARAMETERS CALCULATION IN ROCK MASSES USING DATA MINING TECHNIQUES, *ASCE's International Journal of Geomechanics*, 2010, 20-30
- Santos, M.F.; Mathew, W.; Santos, H., Grid Learning Classifiers - A Web Based Interface, *WSEAS Transactions on Computers*, 2010
- Soares, D. F. M. G. S. e Amaral, L. A. M., Information Systems Interoperability in Public Administration: Identifying the Major Acting Forces through a Delphi Study, *Journal of Theoretical and Applied Electronic Commerce Research*, 2010
- R.J. Machado; J.M. Fernandes, Influence of the Bologna Accord in Software Engineering Curriculum Development, *The Interface Newsletter*, Joint publication of the IEEE Education Society and the ASEE's Electrical and Computer Engineering Division, IEEE Press, Piscataway, New Jersey, U.S.A., April, 2010

#### BOOKS AND BOOK CHAPTERS:

- Cardoso, E.; Baptista, A. A. 2010. Estudos sobre Repositórios Institucionais: metodologias, resultados e recomendações in "Repositórios Institucionais", Universidade da Bahia, Novembro, 2010.
- Baptista, A. A. 2010. A Falar nos Entendemos - a Interoperabilidade entre Repositórios Digitais in "Repositórios Institucionais", Universidade da Bahia, Novembro, 2010.
- Santos, H., Podcasts and vodcasts: pros and cons, *TICAI 2009: TICs para a Aprendizagem da Engenharia*, Espanha, IEEE, Sociedade de Educação: Capítulos Espanhol e Português, 2010
- Marques, R. P., Santos, C., Santos, H., Automation of the Approval and Control Process of Documents, *CCIS*, Springer, 2010
- Pereira, T., Santos, H., A Security Audit Framework to Manage Information System Security, *CCIS*, Springer, 2010
- Rashed, A., Santos, H., OTM Machine Acceptance: In the Arab Culture, *CCIS*, Springer, 2010
- Rashed, A., Santos, H., Multimodal Biometrics and Multilayered IDM for Secure Authentication, *CCIS*, Springer, 2010
- Martins, J., Santos, H., Methods of Organizational Information Security, *CCIS*, Springer, 2010
- BRITO, M. A. & SÁ-SOARES, F., Computer Programming: Fail Fast to Learn Sooner, Springer, 2010
- A. Azevedo, M. Santos, A Perspective on Data Mining Integration with Business Intelligence, "Knowledge Discovery Practices and Emerging Applications of Data Mining: Trends and New Domains", IGI Global, 2010
- SANTOS, M.F.; Gomes, L., A study on impact factors of the adoption of Information Systems in the Operating Room, *Latest Trends on Computers*, WSEAS Press, 2010
- M.F. Santos; Wesley Mathew; Henrique Santos, GridclassTK – Toolkit for grid learning classifier systems, *Computers*, WSEAS Press, 2010
- H. Santos; M.F. Santos; W. Mathew, Supervised Learning Classifier System for Grid Data Mining, *Data Mining: Trends and New Domains*, Viena, Intech, 2010
- M.F Santos; F. Portela; M. Vilas-Boas; J. Machad; A. Abelha; J. Neves; Á. Silva, Nursing Information Architecture for Situated Decision Support in Intensive Care Units, *COMPUTERS and SIMULATION in MODERN SCIENCE (VOLUME III)*, WSEAS Press, 2010
- Painho, M; Santos, M. Y.; Pundt, H., *Geospatial Thinking*, LNGC, 1st Ed, Springer, 2010, 418
- Santos, M. Y.; Moreira, A., Topological Spatial Relations for Circular Spatially Extended points: An Overview, in S. Ao and L. Gelman (Eds.), *Electronic Engineering and Computing Technology*, LNEE, Springer, 2010

**Group Productivity**

- Santos, M. Y.; Moreira, A., Spatial Neighbors for Topological Spatial Relations: The case of a Circular Spatially Extended Point, in S. Ao and L. Gelman (Eds.), Electronic Engineering and Computing Technology, LNEE, Springer, 2010
- Santos, M. Y.; Moreira, A., GUESS: on the prediction of mobile users' movement in space, in M. Wachowicz (Ed.), Movement-aware Applications for Sustainable Mobility: Technologies and Approaches, IGI Global, 2010
- Gonçalves, D.; Santos, M. Y.; Cruz, J., Implementação de um Sistema de Business Intelligence para a Análise da Qualidade de Vida Pré e Pós-Operatória, in Á. Rocha (Ed.), Sistemas e Tecnologias de Informação na Saúde, Edições Universidade Fernando Pessoa, 2010
- Pimenta, P.; Peres, P., Teorias e práticas de b-Learning, 1º edição, Lisboa, Editora Sílabo, 120
- J.E. Fernandes, R.J. Machado, J.A. Carvalho. Model-Driven Development for Pervasive Information Systems. J. Symonds (Ed.), Ubiquitous and Pervasive Computing: Concepts, Methodologies, Tools, and Applications, section II. Development and Design Methodologies, chap. 2.13, pp. 408 438, IGI Global, 2010

## EDITED VOLUMES:

- Painho, M.; Santos, M. Y.; Pundt, H. - "Geospatial Thinking", Lectures Notes in Geoinformation and Cartography, Springer-Verlag, 1st Edition, Proceedings of the 13th AGILE Conference on Geographic Information Science: Geospatial Thinking, Full papers, 418 p., 2010, May, ISBN: 978-3-642-12325-2.. Guimarães, Portugal: Springer-Verlag, 2010.
- Painho, M.; Santos, M. Y.; Pundt, H., "Proceedings of the 13th AGILE Conference on Geographic Information Science: Geospatial Thinking", Short papers and Posters, CD-ROM, 2010, May, ISBN: 978-989-20-1953-6., Guimarães, Portugal, 2010
- J. Gama; P. Cortez; N. Marques; M.F. Santos, Workshop on Ubiquitous Data Mining, in conjunction with 19th European Conference on Artificial Intelligence (ECAI2010), Lisboa, 2010
- Pimenta, P., "Semana de Engenharia 2010 - <http://www3.dsi.uminho.pt/seeum2010/cd/> (ISBN: ISBN: 978-972-8692-59-9)", Guimarães, UMinho, 2010
- F.B. Abreu; J.P. Faria; R.J. Machado - Proceedings of the 7th International Conference on the Quality of Information and Communications Technology - QUATIC'2010, Porto, Portugal, IEEE CS Press

**Other international publications**

## PAPERS IN INTERNATIONAL PROCEEDINGS:

- Pereira, T., Santos, H., Uma Framework Ontológica para a Gestão da Segurança dos Sistemas de Informação, IADIS CIAWI'2010, Portugal, Dec
- Marques, R. P., Santos, C., Santos, H., Automation of the Approval and Control Process of Documents, CENTERIS'2010, Portugal, Oct
- Rashed, A., Santos, H., OTM Machine Acceptance: In the Arab Culture, ICGS3'2010, Portugal, Sep
- Rashed, A., Santos, H., Multimodal Biometrics and Multilayered IDM for Secure Authentication, ICGS3'2010, Portugal, Sep
- Pereira, T., Santos, H., A Security Audit Framework to Manage Information System Security, ICGS3'2010, Portugal, Sep
- Martins, J., Santos, H., Methods of Organizational Information Security, ICGS3'2010, Portugal, Sep
- Pereira, T., Santos, H., A Security Framework for Audit and Manage Information System Security, IEEE/WIC/ACM WI-IAT'2010, Canada, Oct
- Pereira, T., Santos, H., A Conceptual Model Approach to Manage and Audit Information Systems Security, ECIW'2010, Greece, Jul
- Pereira, T., Santos, H., An Ontology Based Approach to Semantically Structure Data in Security Information, IADIS ICIS'2010, Portugal, Mar
- Rashed, A., Santos, H., Odour User Interface for Authentication: Possibility and Acceptance: Case Study, IMECS'2010, Hong Kong, Mar
- Moura, IC, Teaching SE Principles: Combining Inductive Instruction and Discussion Tools, E-Learn'2010, USA, Oct
- Carvalho, J.A.; Sousa, R. D.; Sá, J.O., Information Systems Development Course: Integrating Business, IT and IS Competencies, IEEE TEE'2010, Ireland, Apr
- Brito, C.R.; Ciampi, M.M.; Vasconcelos, R.; Amaral, L., INFORMATION TECHNOLOGY IN ARTS AND INFORMATION VISUALIZATION, WCCA'2010, Portugal, Apr
- Rodrigues, L.S.; Amaral, L., Multidimensional Value of Enterprise Architecture, IADIS ICIS'2010, Portugal, Mar
- Rodrigues, L.S.; Amaral, L., Value Trees Usefulness in Assessment of Enterprise Architectures Value, 15th IBIMA Conference 2010, Egypt, Nov
- Tavares, A.; Amaral, L., Adoption of Authenticated Peer-to-Peer Academic Networks: A Case Study of a Failure, CENTERIS'2010, Portugal, Oct
- Varajão, J.; Amaral, L.; Palacios, R.C.; Gouveia, J., A Framework for the Analysis of the Potential Performance of Chief Information Officers, CENTERIS'2010, Portugal, Oct
- Amaral, L., An intercalary evaluation of a blended learn post-graduation experience in a multi-continental context, INTERTECH'2010, Brasil, Mar
- Amaral, L., REFORMING DISTANCE LEARNING IN PORTUGAL: SOME COMMENTS FROM UNIVERSITY OF MINHO PERSPECTIVE, INTERTECH'2010, Brasil, Mar
- Oliveira, F.; Ramos, I.; Santos, L., Definition of a Crowdsourcing Innovation service for the European SMEs, 1st Enterprise Crowdsourcing Workshop at ICWE'2010, Austria, Jul
- Castro, A. T. B.; Santos, L. D., Implementation of the Technological plan for Education in Portugal, a school perspective, IFIP ITEM'2010, Botswana, Jul
- Amorim, M. T. P.; Araújo, M. M. T.; Santos, L. D.; Portela, D.; Carvalho, M. J.; Dias R.; Vilopes, L. F.; Pirotta, F. J. C., Environmental performance indicators and their relation with economic factors in textile BAT, 22nd International IFATCC Congress, Itália, May
- J. Duarte, M. Salazar, C. Quintas, M. Santos, J. Neves, A. Abelha, J. Machado, Data Quality Evaluation of Electronic Health Records in the Hospital Admission Process, IEEE ACIS'2010, Japan, Aug
- M. Miranda, G. Pontes, P. Gonçalves, H. Peixoto, M. Santos, A. Abelha, J. Machado, Modelling intelligent behaviours in multi-agent based HL7 services, IEEE ACIS'2010, Japan, Aug
- M.F. Santos, W. Mathew, H. Santos, GridClass: Strategies for Global Vs Centralized Model Construction in Grid Data Mining, ECAI'2010, Lisbon, Aug
- M. Vilas-Boas, P. Gago, F. Portela, F. Rua, A. Silva, M.F. Santos, Distributed and real time Data Mining in the Intensive Care Unit, ECAI'2010, Lisbon, Aug

**Group Productivity**

- Portela, F., Santos, M., Vilas-Boas, M., Rua, F., Silva, Neves, J., Real-time Intelligent decision support in intensive medicine, KMIS'2010, Spain, Sep
- Portela, F., Vilas-Boas, M., Santos, M.F., Abelha, A., Machado, J., Cabral, A., Aragão, I., Electronic Health Records in the Emergency Room, IEEE ACIS'2010, Japan, Aug
- Vilas-Boas, M., Santos, M.F., Portela, F., Silva, Rua, F., Hourly prediction of organ failure and outcome in intensive care based on data mining techniques, ICEIS'2010, Portugal, May
- Portela, F., Vilas-Boas, M., Santos, M.F., Improvements in data quality for decision support in Intensive Care, eHealth'2010, Marroco, Dec
- Pereira, Ó. M.; Aguiar, R. L.; Santos, M. Y., Assessment of a Enhanced ResultSet Component for Accessing Relational Databases, ICSTE'2010, IEEE CS Press, USA, Oct
- Pereira, Ó. M.; Aguiar, R. L.; Santos, M. Y., CRUD-DOM: A Model for Bridging the Gap Between the Object-Oriented and the Relational Paradigms (Best Paper Award), ICSEA'2010, IEEE CS Press, France, Aug
- Santos, M. Y.; Machado, R. J., On the Derivation of Class Diagrams from Use Cases and Logical Software Architectures, ICSEA'2010, IEEE CS Press, France, Aug
- Moreira, A.; Santos, M. Y.; Wachowicz, M.; Orellana, D., The impact of data quality in the context of pedestrian movement analysis, AGILE'2010, Springer, Portugal, May
- Gonçalves, D.; Santos, M. Y.; Cruz, J., Analysis of the quality of life after an endoscopic thoracic sympathectomy: a business intelligence approach, DBKDA'2010, IEEE CS PressFrance, Apr
- Piedade, M. B.; Santos, M. Y., Promoting Students Success with a Business Intelligence System, ICCSE'2010, Spain, Apr
- Santos, M. Y.; Gonçalves, D.; Cruz, J., Mining Healthcare Data: The Case of an Endoscopic Thoracic Sympathectomy Dataset, WSEAS AIKED'2010, UK, Feb
- P. Sousa; A. Machado; M. Rocha; P. Cortez; M. Rio, A Collaborative Approach for Spam Detection, INTERNET'2010, Spain, Sep
- Cortez, P., Sensitivity Analysis for Time Lag Selection to Forecast Seasonal Time Series using Neural Networks and Support Vector Machines, IEEE IJCNN'2010, Spain, Jul
- Cortez, P., Data Mining with Neural Networks and Support Vector Machines Using the R/rminer Tool, ICDM'2010, Germany, Jul
- P. Cortez; A. Correia; P. Sousa; M. Rocha; M. Rio, Spam Email Filtering Using Network-Level Properties, ICDM'2010, Germany, Jul
- F. Silva; P. Cortez; V. Cadavez, Using Multiple Regression, Neural Networks and Support Vector Machines to Predict Lamb Carcasses Composition, FOODSIM'2010, Portugal, Jun
- J. Tinoco; A.G. Correia; P. Cortez, Application of Data Mining Techniques to Estimate Elastic Young Modulus Over Time of Jet Grouting Laboratory Formulations, ICITG'2010, China, Sep
- C. Lopes; P. Cortez; P. Sousa, Towards Symbiotic Spam E-mail Filtering, Workshop on Ubiquitous Data Mining at ECAI'2010, Portugal, Aug

**Other national publications**

## PAPERS IN INTERNATIONAL PROCEEDINGS (CONT.):

- A.L. Ferreira; R.J. Machado; M.C. Paulk, Quantitative Analysis of Best Practices Models in the Software Domain, IEEE APSEC'2010, IEEE CS Press, Australia, Dec
- S. Azevedo; R.J. Machado; A. Bragança; H. Ribeiro, Support for Variability in Use Case Modeling with Refinement, MOMPES'10 at IEEE/ACM ASE'2010, ACM Press, Belgium, Sep
- A.L. Ferreira; R.J. Machado; L. Costa; J.G. Silva; R.F. Batista; M.C. Paulk, Improving Software Inspections Performance, IEEE ICSM'2010, IEEE Press, Romania, Sep
- R.J. Machado; J.M. Fernandes; J.P. Barros; L. Gomes, Scenario-based Modeling in Industrial Information Systems, DIPES'2010 at IFIP WCC'2010, IFIP AICT, Springer, Australia, Sep
- S. Azevedo; R.J. Machado; A. Bragança; H. Ribeiro, The UML «extend» Relationship as Support for Software Variability, SPLC'2010, LNCS, Springer, South Korea, September, 2010
- A.L. Ferreira; R.J. Machado; M.C. Paulk, Size and Complexity Attributes for Multi-model Software Process Improvement Framework Taxonomy, EUROMICRO SEAA'2010, IEEE CS Press, France, Sep
- S. Azevedo; R.J. Machado; A. Bragança; H. Ribeiro, The UML «include» Relationship and the Functional Refinement of Use Cases, EUROMICRO SEAA'2010, IEEE CS Press, France, Sep
- P. Monteiro; R.J. Machado; R. Kazman; C. Henriques, Dependency Analysis between CMMI Process Areas, PROFES'2010, LNCS, Springer, Ireland, Jun
- Lopes, I. M. e F. de Sá-Soares, Information Systems Security Policies: A Survey in Portuguese Public Administration, IADIS ICIS'2010, Portugal, Mar
- Brito, M. A. e F. de Sá-Soares, Computer Programming: Fail Fast to Learn Sooner, TECH-EDUCATION'2010, Greece, May
- de Sá-Soares, F., Interpreting Legislative Controls of DNA Databases, European Security Conference - Discourses in Security, Assurance and Privacy, Sweden, Aug

## PAPERS IN NATIONAL JOURNALS:

- Ramos, I.; Amaral, L., Gestão do Conhecimento, Aprendizagem Organizacional e Inovação na Administração Pública, Interface - Administração Pública, 2010
- Amaral, L., As Tecnologias da Informação e Comunicação na Sociedade da Informação, INGENIUM, 2010

## PAPERS IN NATIONAL PROCEEDINGS:

- Vilas-Boas, M., Santos, M.F., Portela, F., Silva, Rua, F., Tempo real na previsão da falência de Órgãos e outcome em Medicina Intensiva, CISTI'2010, Spain, Jun
- Silva, J.; Santos, M. Y., Spatiotemporal Database Models and Languages For Moving Objects: A Review, CISTI'2010, IEEE Xplorer, Spain, Jun
- Piedade, M. B.; Santos, M. Y., Business Intelligence in Higher Education: Enhancing the teaching-learning process with a SRM system, CISTI'2010, IEEE Xplorer, Spain, Jun



**Group Productivity**

- Freitas, C. M., Pimenta, P., Análise da Segurança e Privacidade nos Serviços de Redes Sociais, CISTI'2010, Spain, Jun
- Malta, P. M.; Sousa, R. D., Looking for effective ways of achieving and sustaining Business-IT alignment, CISTI'2010, Spain, Jun
- Catarino, E.; Baptista, A.A. 2010. ONTOLOGIA STAP: UM VOCABULÁRIO DE TERMOS DE METADADOS, XI ENANCIB 2010, Brasil,
- Fachin, G. R.; Pinto, C. S.; Baptista, A.A.; Rodrigues, Rosângela S.; Varvakis, Gregório. 2010. PERIÓDICOS CIENTÍFICOS DIGITAIS E ONTOLOGIA: UMA PESQUISA, 3º ONTOBRAS 2010, Brasil
- Santos, V.; Amaral, L., Arquitecturas para e-learning 2.0, CAPSI'2010, Portugal, Oct
- J. Tinoco; A.G. Correia; P. Cortez., Aplicação de Técnicas de Data Mining na previsão do Comportamento Mecânico de Colunas de Jet Grouting., Actas do XII Congresso Nacional de Geotecnia - Geotecnia e Desenvolvimento Sustentável, Portugal, Apr

**Ph.D. thesis completed**

PhD Thesis:

- Sá, J. O., Metodologia de Sistemas de Data Warehouse, Departamento de Sistemas de Informação, Universidade do Minho, 2010
- Soares, Delfina, Interoperabilidade entre Sistemas de Informação na Administração Pública, Departamento de Sistemas de Informação, Universidade do Minho, 2010
- Fernandes, J.E., About Model-Based Approaches in Pervasive Information Systems Development, Departamento de Sistemas de Informação, Universidade do Minho, 2010

MSc Thesis:

- Albino de Sousa Rocha, Data Mining Descoberta de conhecimento em bases de dados Aplicação na área de suporte à Decisão na STCP
- José Pedro Vasconcelos Carvalho, Arquitectura de Sistemas de Informação para a Indústria de Madeira de Serreação
- Linda Alves Gomes, Estudo sobre a adopção de sistemas de informação pelos utilizadores clínicos em contexto de bloco operatório
- José Miguel Ribeiro Mendes, Representação, armazenamento e processamento de movimento humano em bases de dados espaciais
- José Joaquim Dias Fernandes, Definição de componentes para plataforma para gestão de crowdsourcing: e-marketplace para comercialização de propriedade intelectual
- Daniela Rocha da Silva, Condicionadores da Obtenção de Certificação em Segurança de Sistemas de Informação
- Filipe José Gomes da Silva, Aplicação de técnicas de Data Mining para avaliar a qualidade de carne de cordeiro
- Miguel Ângelo Oliveira Martins, Definição de componentes para plataforma de gestão de crowdsourcing incubadora de tecnologia
- José Pedro Correia Pinto, Software de gestão de inovação
- António Pedro da Silva Pereira, Extensão da Plataforma de Curricula DeGóis para uma Plataforma de Gestão de e-Portefólios Científicos
- Rui Miguel da Costa Leite, Da Arquitectura Lógica de um Sistema de Informação à Arquitectura do Modelo de Dados
- Elisângela Gomes Correia da Rosa, Estudo de Metodologias para Definição e Análise de Ontologias do Domínio de Seguros

**Organization of conferences**

- Baptista, A. A. R. P., Elpub 2011 - 15th International Conference on Electronic Publishing. 2011. Turquia, Istambul, Turquia
- Carvalho, JA, 10ª CAPSI – Conferência da Associação Portuguesa de Sistemas de Informação, Viana do Castelo
- Painho, M; Santos, M. Y.; Pundt, H., The 13th AGILE International Conference on Geographic Information Science, Guimarães, Portugal
- J. Tinoco; A.G. Correia; P. Cortez., Aplicação de Técnicas de Data Mining na previsão do Comportamento Mecânico de Colunas de Jet Grouting., Actas do XII Congresso Nacional de Geotecnia - Geotecnia e Desenvolvimento Sustentável
- R.J. Machado, 7th International Conference on the Quality of Information and Communications Technology – QUATIC'2010, IEEE Computer Society Press, Los Alamitos, California, U.S.A., Porto, Portugal
- R.J. Machado, 31st International Conference on Applications and Theory of Petri Nets and Other Models of Concurrency – Petri Nets'2010 Lecture Notes in Computer Science, Springer Verlag, Berlin Heidelberg, Germany, Braga, Portugal
- R.J. Machado, 10th IEEE International Conference on Application of Concurrency to System Design – ACS D 2010, IEEE Computer Society Press, Los Alamitos, California, U.S.A., Braga, Portugal
- de Sá-Soares, F., European Security Conference - Discourses in Security, Assurance and Privacy, Örebro, Sweden

**Internationalization**

KISS internationalization includes collaborative publications and participation in international consortia that carry out R&D projects. The results in these two aspects are reasonable (cf. project and publications lists).

Some effort has been put in order to participate in networks associated to graduate education and training. The research line is involved in the CMU|Portugal Program (software engineering stream). Other contacts have been established aiming to create (or to adhere to) international graduate programs in the areas of information systems, software engineering and management, and information services. Two ERASMUS MUNDUS students have been working with the research line.

Recognizing that internationalization relies on the strength of individual networking, some initiatives have been set up aiming at stimulating networking, e.g.: invite foreign researchers for visits to UMinho for teaching in the graduate programs and to collaborate with researchers; encourage KISS members to participate in committees either related to the organization of events or related to international bodies (KISS members act as National Representatives to IFIP TC8 and TC10); encourage researchers to use their sabbatical leaves to visit other institutions.

In terms of internationalization, KISS also includes:

- a membership of IEEE-CS EAB (Educational Activities Board), the IEEE-CS Board responsible for the development, implementation and evaluation of all educational activities in the computer fields at all levels (since 2007);

**Group Productivity**

- the chair of the Steering Committee of the international workshop series MOMPES (International Workshops on Model-Driven Methodologies for Pervasive and Embedded Software); co-sponsored by IFIP WG10.2; proceedings published by IEEE Computer Society Press;
- a representative in the Dublin Core Metadata Initiative Advisory Board.

**Government/Organization contract research**

- Monitoring of the Information System Project of the Citizen Card, funded by Agency for Administrative Modernization, 01/2008-07/2011. Members of the KISS research line are responsible for the certification of the project concerning information security and development process.
- ACTOR: Apostar na Certificação das Empresas TICE Organizadas em Rede, funded by ADI, 11/2010-05/2013. Members of the KISS research line are responsible coordinating the adoption by the Portuguese industry of international standards for software process improvement, IT service management, and innovation & industrial research methods.

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### Group Description

<b>Title of Research Group:</b>	(RG-Norte-319-2184) Ubiquitous and Pervasive Computing, Graphics, and Software Methodologies
<b>Principal Investigator:</b>	Adriano Jorge Cardoso Moreira
<b>Main Scientific Domain:</b>	Engenharia Electrotécnica e Informática
<b>Group Host Institution:</b>	Universidade do Minho

### Funding, source, dates

#### Funding, source, dates

During 2010, the group has been actively involved in the execution of a number of ongoing funded research projects, more specifically:

- BIOMOTION - Perception of biological motion – integrating psychophysics, neurophysiology and computational modelling. FCT (PTDC/SAU-BEB/68455/2006)
- TELLME - Contacto Semi-automático em Ambiente Móvel. Digitalbrain; QREN (2009/6533)
- VirtualActor - Development of a software framework for animating 3D virtual characters, employing partially autonomous virtual actors. FCT (PTDC/EIA/69236/2006)
- WESP - Web Security and Privacy: Weaving Together Technology Innovation with Human and Policy Considerations. Programa Carnegie Mellon | PORTUGAL (CMU-PT/SE/0028/2008)
- PD-NET- Towards Future Pervasive Display Networks. FET-OPEN (244011-2)
- PostCaVET- Post-graduate Systems Development in Cape Verde and East-Timor. Edulink Program (9 ACP RPR 12#20)
- MOBIPAG - Iniciativa Nacional para os Pagamentos Móveis. FEDER/QREN (13847)
- COGNITO. FP7 - Comunidade Europeia
- GUIDE. FP7 - Comunidade Europeia (248893)
- SocialSigns - Processing Social Signals in Human-Computer Interaction. FCT (PTDC/EIAEIA/098634/2008)
- Remote monitoring of patients using zigbee sensor networks. AMI – Assistência Médica Integrada / HPG – Hospital Privado de Guimarães.

### Objectives & Achievements

#### Objectives

The objectives of the group for the period 2007-2010 have been defined as follows:

- To produce world-class research results and become an international reference in the areas addressed by our research programs, more specifically urban computing, situated displays, systems software for ambient intelligence, interaction design and digital arts.
- To consolidate the role of multi-disciplinary research as a key driver for our own work, and especially for the structuring of our collaboration networks.
- To collaborate with other players in academia, industry and society to create sustainable, long-term deployments and infrastructures from which new communities of practice and open innovation may emerge, possibly within the framework of living labs.
- To extend our international links by integrating long-term international research initiatives, participating in training networks, and collaborating in the organization of events.
- To consolidate and internationalize our advanced training activities, both at MSc and PhD level, in order to sustain our own need for high-quality researchers and contribute towards the availability of professionals with competences in this area.
- To attract more students, mainly PhD students, to join the group's research activities.

Further information about the activities of this group and research programs is available at:

<http://ubicomp.algoritmi.uminho.pt>, <http://www.engagelab.org> and <http://www.humandigitalsystems.org>

For 2011, and after the adoption of the new regulations by the Algoritmi research centre, this Research Line will integrate more researchers, from one other group closely related to the area of Computer Networks, and will review its name, structure, and objectives for the next 3 three years (2011-2013).

#### Main Achievements

Considering the above objectives, main achievements are related with the consolidation of the group and its base activity. More specifically:

- The group has consolidated its research programs that set the long term research strategy of the group.
- The group continued with the series of weekly seminars which has become an important element for fostering the identity of the group, promoting joint work, and promoting interactions between all its members, with particular emphasis on PhD students.
- The group has improved its publications record, including publications in high quality Conferences and Journals.
- Members of this group have also been very active in promoting education and advanced training courses within their scientific areas of research, namely the MScs in Informatics, Computer Networks and Services, Technology and Digital Arts, the Integrated MSc in Communications Engineering, courses in Ubiquitous Systems, and the PhD Programmes in Telecommunications and Computer Science.
- The group has attracted substantial funding for the period 2011-2013 through 4 new funded projects starting January 2011.

## Group Productivity

### Publications in peer review Journals

- José, R.; Rodrigues, H.; Otero, N. Ambient Intelligence: Beyond the Inspiring Vision. *Journal of Universal Computer Science*.
- Otero, Nuno; Milrad, Marcelo; Rogers, Yvonne; Santos, António J.; Veríssimo, Manuela; Torres, Nuno. Challenges in Designing Seamless Learning Scenarios: Affective and Emotional Effects on External Representations. *International Journal of Mobile Learning and Organisation*.

### Other international publications

Conference Papers and Book Chapters:

- Baras, Karolina; Moreira, Adriano. "Symbolic space modeling based on WiFi network data analysis", 7th International Conference on Networked Sensing Systems (INSS), Kassel. New York : IEEE, 2010. ISBN 978-1-4244-7911-5. p. 273-276.
- Baras, Karolina; Moreira, Adriano . "Anomaly detection in University Campus WiFi Zones", 8th International Conference on Pervasive Computing and Communications : PerCom 2010, Mannheim, Germany. New York : IEEE Computer Society Press, 2010. ISBN 978-1-4244-6605-4. p. 202-207.
- Baras, Karolina; Moreira, Adriano; Meneses, Filipe. "Navigation Based on Symbolic World Models", Abstract Volume of the 2010 International Conference on Indoor Positioning and Indoor Navigation (IPIN), editors: Rainer Mautz, Melanie Kunz and Hilmar Ingensand, 15-17 September 2010, Zürich, Switzerland.
- Iurgel, I. Virtual Actors in Public Spaces and for Cultural Heritage. DSMT 2010 e YDHTF 2010.
- Iurgel, I.; da Silva, R.; Ribeiro, P.; Soares, A.; dos Santos, M . Towards Virtual Actors for Acting out Stories. *Eduainment 2010*.
- Light, Ann; Cahour, Beatrice; Otero, Nuno . Reflections on Reflection: How Critical Thinking relates to Collecting Accounts of Experience using Explication Techniques. *Workshop na CHI 2010*.
- Moreira, A; Santos, M.Y. The impact of data quality in the context of pedestrian movement analysis. *International Conference on Geographic Information Science (AGILE'2010)*.
- Moreira, Adriano; Meneses, Filipe; Baras, Karolina. "Self-location and navigation without maps", Demonstration, 2010 International Conference on Indoor Positioning and Indoor Navigation (IPIN), 15-17 September 2010, Zürich, Switzerland.
- Müller, W.; Iurgel, Ido; Otero, Nuno; Massler, U. Teaching English as a Second Language Utilizing Authoring Tools for Interactive Digital Storytelling. *Third International Conference on Interactive Storytelling*.
- Nuno Vasco Lopes, Maria João Nicolau, Alexandre Santos, "A Micro-Mobility Solution for Supporting QoS in Global Mobility", *Proceedings of the 18th International Conference on Software, Telecommunications and Computer Networks (SoftCOM 2010)*, Split, Croatia, Sep 23-25, 2010, ISBN 978-953-290-004-0, (IEEE Catalog # CFP1087A-CDR, also in IEEEExplore).
- Ribeiro, F. R.; José, Rui. "Timely and Keyword-based Dynamic Content Selection for Public Displays," in *Third International Workshop on Frontiers in Complex Intelligent and Software Intensive Systems - 4th International Conference on Complex, Intelligent and Software Intensive Systems*, IEEE Computer Society Press, Cracóvia, Polónia, 2010.
- Ribeiro, Pedro; Silva, Tiago; José, Rui; Aharon Iurgel, Ido . Combining Explicit and Implicit Interaction Modes with Virtual Characters in Public Spaces. *ICIDS 2010*.
- Syrdal, Dag; Dautenhahn, Kerstin; Koay, Kheng Lee; Walters, Michael ; Otero, Nuno . Exploring Human Mental Models of Robots through Explication Interviews. *19th IEEE International Symposium on Robot and Human Interactive Communication*.
- Silva, R.; Iurgel, I.; Santos, M; Branco P; Zagalo, N. Understanding Virtual Actors. *SBGames, 2010, Florianópolis, Brasil*.
- Alissandrakis, Aris; Otero, Nuno ; Saunders, Joe; Dautenhahn, Kerstin; L. Nehaniv, Chrystopher. Helping Robots Imitate — Metrics and Computational Solutions Inspired By Human-Robot Interaction Studies. *IET, 2010. 978-1-84919-075-6*.
- Baras, Karolina; Moreira, Adriano; Meneses, Filipe. Self-location and navigation without maps. *2010 International Conference on Indoor Positioning and Indoor Navigation (IPIN)*.
- Costa, Sandra; Leão, Celina P.; Soares, Filomena; Rodrigues, Helena; Machado, José. *WALC - Web Assisted Laboratory for Control Engineering On-line Education. Controlo'2010*. The Portuguese Conference on Automatic Control, Coimbra, 8-10 September, 2010.
- Pereira, D.; Moreira, A.; Simões, R. Challenges on real-time monitoring of patients through the Internet. *2010 5th Iberian Conference on Information Systems and Technologies (CISTI)*.
- Ribeiro, Fernando; José, Rui. "Autonomous and context-aware scheduling for public displays using place-based tag clouds," *Engineering Ambient Intelligence and Future Trends-International Symposium on Ambient Intelligence- Advances in Soft Computing*, Springer, 2010, Volume 72/2010, 131-138.
- Santos, M.Y.; Moreira, A. Topological Spatial Relations for Circular Spatially Extended points: An Overview. *Len Gelman and Sio-Iong Aos (Eds.), Electronic Engineering and Computing Technology, Lecture Notes in Electrical Engineering. Springer-Verlag, 2010. 978-90-481-8775-2*.
- Santos, M.Y.; Moreira, A. GUESS: on the prediction of mobile users' movement in space. *Monica Wachowicz (editor), Movement-aware applications for sustainable mobility: technologies and approaches. Ici Global, 2010. ISBN13: 9781615207695*.
- Santos, M.Y.; Moreira, A.. Spatial Neighbors for Topological Spatial Relations: The case of a Circular Spatially Extended Point. *Len Gelman and Sio-Iong Aos (Eds.), Electronic Engineering and Computing Technology, Lecture Notes in Electrical Engineering. Springer-Verlag, 2010. 978-90-481-8775-1*.

### Other national publications

- Almeida, M., Rodrigues, H., José R. Bluetooth Hotspots for Smart Spaces Interaction. *Inforum 2010 - Simpósio de Informática INFORUM, Sessão de Computação Móvel e Ubíqua*.
- Almeida, Miguel; Rodrigues, Helena; José, Rui. Bluetooth Interaction Management in Smart Spaces. *Inforum 2010*.
- Coelho, André F.; Ribeiro, Hugo; Silva, Mário; José, Rui. A system for coarse-grained location-based synchronization. *Inforum 2010*.
- Lago e Silva, V.; Branco, P. (2010), The last words of Domenico: um instrumento de performance para a reconstrução sonora de discursos. *Interação 2010, 4ª Conferência Nacional em Interação Pessoa-Máquina, Universidade de Aveiro, 13-15 Outubro, 2010*.
- Lopes, Fernando; Nicolau, Maria; Costa, AL. "Encaminhamento Inter-domínio com Qualidade de Serviço", *Proceedings da 10ª Conferência sobre*

**Group Productivity**

Redes de Computadores (CRC 2010), 11 e 12 de Novembro de 2010, Universidade do Minho, Braga.

- Lopes, Nuno Vasco; Nicolau; Maria João; Santos, Alexandre. "A QoS-Enable Solution for Mobile Environments", Proceedings da 10ª Conferência sobre Redes de Computadores (CRC 2010), 11 e 12 de Novembro de 2010, Universidade do Minho, Braga.
- Monteiro, R.; Moreira, A. Mapeamento automático de redes WiFi com base em assinaturas rádio. 10ª Conferência sobre Redes de Computadores (CRC 2010).
- Ribeiro, Pedro ; Silva, Tiago ; José, Rui. Aplicação de personagens virtuais como guias de visita. Portugal. 14-15 October 2010. Interacção 2010.
- Soares, Abel; Santos, Pedro; José, Rui. Displaybook - Bringing online identity to situated displays. Inforum 2010.

**Ph.D. thesis completed**

- Plataformas de suporte a ambientes interactivos sensíveis ao contexto. Fernando Reinaldo Silva Garcia Ribeiro.
- Interoperabilidade de Sistemas de informação na Administração Pública. Delfina Garcês de Sá Soares.
- Metodologias MDD para software Ubíquo. José Eduardo Moreira Fernandes.

**Organization of conferences**

- AGILE International Conference on Geographic Information Science (AGILE'2010). 10-14 Maio, Guimarães, Portugal.
- 10ª Conferência sobre Redes de Computadores (CRC 2010). 11-12 de Novembro, Braga, Portugal.

**Industry contract research**

- DESK - Development of a sketch-based instructional laboratory for Digital Arts and Computer Graphics. HP Technology for Teaching Grant Initiative. (ID: 11446121)
- TeleportWall. Funding: Vale I&DT.TecMinho
- Datacar2010. Funding: QREN ( ref. 2009/1480), 12 months

**Internationalization**

The group has been involved in several collaboration activities with recognised international research groups which offer the group opportunities for intensify international relationships. Those include cooperation with international groups such as:

- The ETH Zurich, in the join organization of the IPIN 2011 international conference.
- The Future Interaction Technology (FIT) laboratory at University of Swansea, UK, and Department of Computer Science, University of Waikato, New Zealand in the area of Context-aware systems and Context-aware Applications, with George Buchanan and Annika Hinze.
- Sheffield-Hallam University, UK, with Ann Light and CNRS - France Telecom, France with Beatrice Cahour in the area of User Experience Methodologies.
- The Pervasive Interaction Lab, Computing Department, Open University, UK with Professor Yvonne Rogers in the area of Human-Computer Interaction in a World Embedded with Ubiquitous Computer Technologies – Research network submitted to ESF.
- The Laboratório de Tecnologias de la Información Geográfica at the Universidade Politécnica de Madrid, Spain and University of Wageningen, Netherlands in the area of Urban Computing and Exploratory Data Analysis (Spatial data analysis).
- The Institute of Media Design of the University of Arts Linz (Kunstuniversität Linz), Austria in the field of Digital and Interactive arts in order to design a joint doctoral program in this field.
- Media Lab Helsinki University of Art and Design Helsinki

FCT Relatório Científico 2010 Print: 31-03-2011 17:09:37 [CENTRO ALGORITMI]

**Group Description**

**Title of Research Group:** (RG-Norte-319-2959)  
Industrial electronics

**Principal Investigator:** Adriano Jose da Conceicao Tavares

**Main Scientific Domain:** Engenharia Electrotécnica e Informática

**Group Host Institution:** Universidade do Minho

**Funding, source, dates****Funding, source, dates**

RoboParty2010:18000€;Ciência Viva;1/1/10-15/610

Ferr.Robót. educação especial:79792€;FCT;1/6/10-31/5/12

Prot.Multifunc. de Oxycorte[...]:33000€;VIDT;1/11/093-1/10/10

Sistema pectus 3D[...]:194000€;FCT;1/2/10-30/1113

HYDRACT[...]:1671260€;FP7SME2007-1;1/6/08-30/11/10

CLIMAWIN[...]:1574354€;FP7SME2010-1;1/10/10-30/9/12

AQUAGEN[...]:2378589;FP7SME2010-1;1/12/10-30/9/13

Sw. Gestão Domótica:34100€;V.IDT 17/2008SI; 1/5/09-31/4/10

Locomoção quadrúpede flex.[...]:197067€;FCT;1/6/10-31/05/13

Assess. and Develop.[...]:84528€;MITPT/EDAM SMS/0030/20092012; 1/10/09-30/9/12;

Consola Pinto Brasil:30000€;Pinto BrasilSA;1/12/09-30/11/10

GOLFM INHO:442300€;FCT;1/11/09-31/10/12

Mordomus: 35000€; V.IDT;1/7/09-30/6/10

Qualidade de Serviço[...]:89090€;FCT;1/10/07-31/3/11

Sensor de trânsito:33000€;V.IDT;27/9/09-1 ano

Result. Cosmét. PósCirúrg.:194000€;FCT;1/9/09-30/8/12

UPQCIMREI [...]:161470€; FCT-PTDC/EAEEL/104569/2008;1/12/09-30/11/12

Urban Probe Appliances:33000€;V.IDT;27/11/09-1ano

ECORAIL:60000€;QREN;1/05/09-30/04/11

**Objectives & Achievements****Objectives**

This group congregates a relatively large number of researchers organized in 3 areas: 1 Control, Automation and Robotics; 2 Energy and Power Electronics; 3 Embedded Systems. The idea is that the researchers of these areas work in cooperative subgroups, and that these subgroups increase in size and competitiveness, becoming autonomous groups in the future.

1. Development of socially intelligent robots, i) to build dynamic control architectures to endow autonomous robots with the capacity of reading motor intention for humanrobot interaction tasks; ii) development of learning schemes for social robotics; iii) Robots that provide assistance to disabled people; iv) Robotics, Automation and Virtual Games for Special Education Needs; v) Control architectures for legged robots with many DOFs and for movement coordination/cooperation between different platforms; vi) Research on algorithms and technologies suitable for the localization of mobile platforms, ex. for factory automation and mobile robotics.

2. Development and construction of new laboratorial (also with remote access) and industrial prototypes in the following areas:

- Mechatronics systems
- Computer vision and image processing
- Instrumentation, acquisition, automations and control
- Multisensor fusion and integration using soft computing techniques

3. Research in Collective Intelligence in Organizations (Modelling and software). Advance studies in modeling, simulating, and designing concurrent, realtime, embedded systems; Recognition as a top level R&D area at an international level; Cooperation with a small group of locally based SMEs in order to establish long term partnerships.

4. R&D development on: Shunt Active Power Filters and UPQCs (Unified Power Quality Conditioners); LowCost Power Quality Monitoring Systems; Optimized Interfaces for Renewable Energy Systems with the Power Grid; Power Electronics applied to Electric and Hybrid Vehicles; Energy Harvesting/Scavenging.

**Main Achievements**

The main achievements of the Industrial Electronics Group were:

1. R&D on autonomous and cognitive robotics, autonomous mobile robots, jointlyacting autonomous systems (robotrobot, humanrobot) that communicate and work intelligently on mutual tasks (e.g. joint transportation of objects, robotic football, joint construction): i) to build control architectures for multirobot motion coordination, ii) to build neuroncognitive inspired architectures that endow the robots with socially intelligent

## Objectives & Achievements

behaviour, iii) to investigate how such systems can be synthesized using methods from the theory of nonlinear dynamical systems.

2. R&D solutions on Mechatronics Systems, Computer Vision and Image Processing including the development of a virtual and remote laboratory for improving the under and postgraduate teaching/learning process and also the industrial cooperation (R&D FCT project).
3. R&D development on: Shunt Active Power Filters and UPQCs (Unified Power Quality Conditioners); LowCost Power Quality Monitoring Systems; Optimized Interfaces for Renewable Energy Systems with the Power Grid; Power Electronics applied to Electric and Hybrid Vehicles.
4. Development of studies, modeling, simulating, and designing concurrent, realtime, embedded systems. A major problem addressed was the design of a language capable to describe development tools, such as, full systems simulators, debuggers and compilers. Other accomplishments were the development of a couple of industrial prototypes.

In quantitative terms our work can be expressed as:

- 13 papers in international journals
- 40 papers in international conferences;
- 4 PhDs
- 4 conferences/symposium organized;
- 3 industry research contract;
- participation in 3 european projects;
- 16 R&D projects with FCT and QREN;
- several collaborative research with national and international Universities/Entities;
- participation in 2 Networks of Excellence.

## Group Productivity

### Publications in peer review Journals

António Moreira, Ricardo Freitas e Manuel João Sepúlveda Mesquita de Freitas, Miniature Thermoelectric Power Plant, International Journal on Handson Science, Volume 3, Number 1, pp. 3236, March

António Moreira, Ricardo Freitas, João Sepúlveda and João Sena Esteves; Miniature Thermoelectric Power Plant; International Journal on Handson Science [ISSN (print): 16468937; (online): 16468945] Received December 28, 2009; Accepted January 7, Volume 3, Number 1, pp. 3236, March

Hugo Queirós, António Lafuente, João Sepúlveda and João Sena Esteves; MicrocontrollerDriven Hydrogen Fuel Cell Car; International Journal on Handson Science [ISSN (print): 16468937; (online): 16468945] Received December 28, 2009; Accepted February 16, Volume 3, Number 1, pp. 2831, March

Carlos Gomes e M.J.Ferreira, Application of Fuzzy Logic to Qualify the Environmental Impact in Abandoned Mining Sites, WATER, AIR, e SOIL POLLUTION, DOI: 10.1007/s1127001005876, na, August

Hirofumi Akagi e João Luiz Afonso, Instantaneous pq Power Theory for Control of Compensators in MicroGrids, PRZEGLAD ELEKTROTECHNICZNY (Electrical Review), R 86, pp. 110, June

Hugo Queirós, António Lafuente e Manuel João Sepúlveda Mesquita de Freitas, MicrocontrollerDriven Hydrogen Fuel Cell Car, International Journal on Handson Science, Volume 3, Number 1, pp. 2831, March

Paulo José G. Garrido, Open design and knowledge integration in semiotic manufacturing integration, International Journal of Computer Integrated Manufacturing 13623052, Volume 23, Issue 8, 2010, 13623052, Volume 23, Issue 8, 2010, 687 690, August

E.Erlhagen e Eliana Costa e Silva, Neurocognitive mechanisms of decision making in joint action: a humanrobot interaction study, Human Movement Science, Elsevier, doi:10.1016/j.humov.2010.08.012, in press, December

Estela Guerreiro G. S. Bicho Erlhagen, Integrating verbal and nonverbal communication in a dynamic neural field architecture for human robot interaction, Frontiers in NeuroRobotics, Vol.4, article 5, 113, May

F.Soares, Vitor Carvalho e Rosa Vasconcelos, Determination of Yarn Production Characteristics Using Image Processing, International Journal of Imaging Systems and Technology, December

F.Soares, Vitor Carvalho e Rosa Vasconcelos, Yarn Diam Characterization Using Two Orthogonal Directions, Journal Experimental Techniques, Online desde April

Jaime Francisco C. Fonseca, José L. Vilaça e António M. Pinho, 3D Surface Profile Equipment for the Characterization of the Pavement Texture TexScan, Mechatronics (Elsevier), Volume 20, Issue 6, 674685, September

Sérgio Paulo Carvalho Monteiro e Estela Guerreiro G. S. Bicho Erlhagen, Attractor dynamics approach to formation control: theory and implementation, Autonomous Robots (Springer Verlag), Vol. 29, Issue 3, pp. 33135, June

### Other international publications

. H. Watanabe, João Luiz Afonso, J. G. Pinto, M. Aredes e H. Akagi, Instantaneous pq Power Theory for Control of Compensators in MicroGrids, IEEE ISNCC International School on Nonsinusoidal Currents and Compensation, Poland, June

José C. Ferreira e João Luiz Afonso, A Conceptual V2G Aggregation Platform, EVS25 The 25th World Battery, Hybrid and Fuel Cell Electric Vehicle Symposium & Exhibition, Shenzhen, China, November

K. C. Oliveira, M. C. Cavalcanti, João Luiz Afonso, A. M. Farias e F. A. S. Neves, Transformerless Photovoltaic Systems Using Neutral Point Clamped Multilevel Inverters, ISIE 2010 IEEE International Symposium on Industrial Electronics, Bari, Italy, July

Vítor Monteiro, José C. Ferreira, Gabriel Pinto, Delfim Pedrosa e João Luiz Afonso, iV2G Charging Platform, IEEEITSC, 13th International IEEE Conference on Intelligent Transportation Systems, Madeira, Portugal, September

Elena Roxana Buhus, AlexAndréu Lazar e Adriano José C. Tavares, A SystemOnChip Approach in Designing a Dedicated RISC Microcontroller Unit Using

**Group Productivity**

- the FieldProgrammable Gate Array, Fifth International Conference on Systems 2010, Menuires, The Three Valleys, France, April
- F.Alves, M.J.Ferreira, C.Santos, Vision based automatic traffic condition interpretation, IEEE INDIN 2010, Osaka, Japan, July
- J.Sousa, V.Matos, C.Santos, A bioinspired postural control for a quadruped robot: an attractorbased dynamics, IROS 2010, Taipei, Taiwan, October
- J.Silva, V. Matos, C.Santos, Timed trajectory generation for a toylike wheeled robot, IEEE Industrial Electronics Society, Glendale, AZ, USA, November
- J.Silva, V.Matos,C.Santos, Generating Trajectories With Temporal Constraints for an Autonomous Robot, SSRR2010, Bremen, Alemanha, July
- L.Costa, A.Rocha, C.Santos, M.Oliveira, A Global Optimization Stochastic Algorithm for Head Motion Stabilization during Quadruped Robot Locomotion, EngOpt 2010, Lisbon, Portugal, September
- M.Pinheiro, E.Erlhagen, W.Erlhagen, A Dynamic Neural Field Architecture for a Proactive Assistant Robot, IEEE BioRob, Tokyo, Japan, September
- M.Campos, M.J.Ferreira, T.Martins, C.Santos, Inspection of Bottles Crates in the Beer Industry through Computer Vision, IEEE Industrial Electronics Society, Phoenix, AZ, USA, November.
- M.Oliveira, C.Santos, A Genetic Algorithm for Stabilization of a Quadruped Robot Locomotion, 24th European Conference on Operational Research, Lisbon, Portugal, July
- M.Oliveira, C.Santos, M.J.Ferreira, L.Costa, A.Rocha, Locomotion gait optimization for a quadruped robot, ERLARS 2010, Lisboa, Portugal, August
- P.Gomes, F.Souares, J. Correia, C.Lima, ECG DataAcquisition and Classification System by Using WaveletDomain Hidden Markov Models, EMBC 2010, Buenos Aires, Argentina, September
- P.Santana, C.Santos, D.Chainho, L.Correia, J. Barata, Predicting Affordances from Gist, SAB10, Paris, France, August.
- R.Campos, V.Matos, M.Oliveira, C.Santos, Hexapod Locomotion: a Nonlinear Dynamical Systems Approach, IEEE Industrial Electronics Society, Glendale, AZ, USA, November
- V.Matos, C.Santos, Omnidirectional Locomotion in a Quadruped Robot: A CPGbased Approach, IROS 2010, Taipei, Taiwan, October
- F.Souares, V.Carvalho, A.Ferraz, Development of a Human Blood Type Detection Automatic System, Eurosensors 2010, Linz, Austria, September,
- F.Souares, C.Leao, S.Costa, I.Mendes, From differential equations to realworld problems, Demo 5, SEFI 10, Wismar, German, June
- F.Souares, H.Carvalho, L.Silva, F. Guhr, Adaptive Control of an Electromagnetically Actuated PresserFoot for Industrial Sewing, ETFA10, Bilbao, Spain, September
- F.Souares, J.Machado, C.Leao, J.Costa, N.Carvalho, A Network Configuration for Industrial Systems Control, MECAHITECH2010, Bucharest, Romania, September
- F.Souares, J.Machado, P.Rodrigues, J.Ferreira, An approach for spasticity quantification based on the stretch reflex threshold, MECAHITECH2010, Bucharest, Romania, September
- F.Souares, J.Machado, J.Ferreira, M.Curado, Ethical Aspects in the Design of Medical Devices, TMSi, Porto, Portugal, October.
- F.Souares, C.Santos, M.J.Ferreira, S.Costa, F.Moreira, Promoting the interaction amongst autistic adolescents using robots, Conferência IEEE-EMBC 2010, Buenos Aires, Argentina, September,
- F.Souares, J.Machado, C.Leao, J.Costa, N.Carvalho, Industrial Network Platform for Monitoring and Control of Automated Manufacturing Systems, IFAC IMS10, Lisboa, Portugal, June
- F.Souares, C.Leao et. al., The State of the Nations: Current and future developments in TechnologyEnhancedLearning, EUNIS 2010, Warsaw, Poland, June
- F.Souares, J.Machado, V.Vieira, R.Freitas, Monitoring and Control of a Cooling System in a Commercial Store, ICEEE2010, WCE, London, U.K., July,
- F.Souares, C.Leao, S.Costa, Mixing Personal Learning and Control Engineering Education Environments, PAEE10, Barcelona, Espanha, July
- F.Souares, R.Vasconcelos, C.Leao, V.Carvalho, Automation and Control Engineering Laboratory: Students Perspectives, WCE10, London, U.K., July,
- F.Souares, J.Machado, C.Leao, N.Carvalho, An Interface for industrial network monitoring and control, IFAC IMS10, Lisboa, Portugal, July,
- F.Ribeiro, G.Lopes, Summer on Campus Learning Robotics with fun, of HSci2010, Creta, Grécia, July

**Other national publications**

- G.Lopes, P. Carvalho, Whistle Sound Recognition in a Noisy Environment, Controlo2010, Coimbra, Portugal, September
- G.Lopes, F.Ribeiro, e B.Matos, Controller and actuator of three independent dc motors In closed loop, Controlo2010, Coimbra, Portugal, September
- H.Sobreira, A. P.Moreira e J.Sena Esteves, Characterization of Position and Orientation Measurement Uncertainties in a LowCost Mobile Platform, Controlo2010, Coimbra, Portugal, September
- F.Souares, E. Matias, P. Oliveira, J. Cunha e E. J. Pires, EGracet: A Multimedia Educational Teaching Tool, Controlo2010, Coimbra, Portugal, September
- F.Souares, M.Seuplveda, R.Lima, An Integrated Project of Entrepreneurship And Innovation at University of Minho, Controlo2010, Coimbra, Portugal, September.
- F.Souares, Celina Leo, José Machado, Nuno Carvalho e Julio Costa, Remote Access to ELabs, Controlo2010, Portugal, September,



**Group Productivity**

F.Soares, Silvia Santos e Bruno Alves, Remote Laboratory for Control Studies A Casestudy Developed by Students for Students, Controlo2010, Coimbra, Portugal, September

F.Soares, Celina Leao, José Machado, Sandra Costa e Helena Rodrigues, WALC Web Assisted Laboratory for Control Engineering OnLine Education, Controlo2010, Coimbra, Portugal, September

H. Sobreira, A. Moreira e J.Sena Esteves, Low Cost SelfLocalization System With Two Beacons, Proceedings of the ROBÓTICA 2010 10th International Conference on Mobile Robots and Competitions, Leiria, Portugal, Março

F.Soares, C.Santos, M.J.Ferreira, Plataforma Robótica para jovens com necessidades educativas especiais, Revista Sonhar: Comunicar, Repensar a diferença, May

G.Lopes, Coluna empreender e inovar em Portugal, Robótica, N. 78, p. 16, April

**Ph.D. thesis completed**

Autonomic ubiquitous computing: a home environment management system,

Doutorando: Carlos Manuel Rodrigues Machado,

Orientadores: José A. Mendes, João Luís Marques Pereira Monteiro

Controlo e Representações para Tarefas de Colaboração HumanoRob,

Doutorando: Luís Filipe de Castro e Freitas Louro,

Orientadores: Estela Guerreiro G. S. Bicho Erlhagen.

Developmentally inspired computational framework for embodied speech imitation,

Doutorando: Miguel José Lopes Rodrigues Martins Vaz,

Orientadores: Estela Guerreiro G. S. Bicho Erlhagen, Wolfram Erlhagen, Frank Joublin.

Videovigilância Inteligente na Previsão e Detecção de Afogamento em Piscinas, Domésticas.

Doutorando: Nuno Pedro Rodrigues Peixoto

Orientadores: José A. Mendes e Adriano José C. Tavares

**Organization of conferences**

António Fernando Macedo Ribeiro, Summer on Campus Learning Robotics with fun, 2nd INTERNATIONAL CONFERENCE on Excellence: Education Human Development, Museu D. Diogo de Sousa, Braga, Portugal, 9-12 September.

António Fernando Macedo Ribeiro, Chair da Middle Size League, RoboCup 2010, Singapura, 19-25 June

Júlio M. Sousa B. Martins, CoChair para as Finanças, IECON2009, Porto, 3-5 November.

F.Soares, Symposium on Instrumentation, Modeling and Control, conferência CONTROLO2010, Coimbra, 8-10 September

**Industry contract research**

Consola Integrada Pinto Brasil: 30000€; Pinto BrasilSA; 1/12/09-30/11/10

60000€ (UM), QREN, 01/05/200930/04/2011, Projecto ECORAIL (Energia Regenerativa em Comboios)

Industrial Development of Power Shunt Active Filters: 30000 €; EFACEC/Centro Algoritmi, 01/10/2008, 31/03/2010

**Internationalization**

Joaquim J. S. Esteves Neves, Avaliação de Projectos do programa EUROSTARS, EUREKA Secretariat, Belgica.

F.Soares, BILATERAL AGREEMENT for 2009/2012, Lifelong Learning Programme: HIGHER EDUCATION, ERASMUS Program, com Katarina Zakova, Slovak University of Technology, Bratislava, Republica Eslovaca.

Paulo Cardoso, LLP/Erasmus 2009/2010 (teaching staff mobility), University of Zielona Gora, 1014/5/2010

Adriano José C. Tavares e João Luís Marques Pereira Monteiro, Cooperação em projectos investigação e ensino na área de Sistemas Embebidos envolvendo intercambio de estudantes ao abrigo do programa Erasmus Mundus, Asian Institute of Technology, Bangucoque, Tailândia.

Estela Guerreiro G. S. Bicho Erlhagen, Lecturer no Summer School on Neural Dynamics Approaches to Cognitive Robotics, Institut fur Neuroinformatik, Ruhr Universitt Bochum, Bochum, Alemanha, 24 September a 1 de October

M.J.Ferreira, GraphicsMediaNet, DFKI, Kaiserslautern Germany, 25/10/2010 a 27/10/2010.

Sérgio Paulo Carvalho Monteiro, Lecturer e Lab assistant no Summer School on Neural Dynamics Approaches to Cognitive Robotics, Institut fur Neuroinformatik, Ruhr Universitt Bochum, Bochum, Alemanha, 24 September 1 October 2010

Jorge Miguel N. S. Cabral, Participação na ARTIST Summer School Europe, ARTIST Network of Excellence on Embedded Systems Design, Grenoble, França, 1015 September

Sérgio Adriano Fernandes Lopes, Participação na ARTIST Summer School Europe 2010, ARTIST Network of Excellence on Embedded Systems Design, Grenoble, França, 1015 September

FCT Relatório Científico 2010 Print: 31-03-2011 17:10:36 [CENTRO ALGORITMI]

**Group Description**

**Title of Research Group:** (RG-Norte-319-2976)  
Micro/Nanotechnologies and Biomedical Applications

**Principal Investigator:** José Higinio Gomes Correia

**Main Scientific Domain:** Engenharia Electrotécnica e Informática

**Group Host Institution:** Universidade do Minho

**Funding, source, dates****Funding, source, dates**

FCT/PTDC/EEA-TEL/65286/2006, MEMS: Micro-Antenna for Wireless Biomedical Devices, 2009-2011, 130.000,00 €.

-MIT-PT/EDAM-SI/0025/2008, Development of integrated systems for smart interiors, 2009-2011, 60.000,00 €.

-FCT/PTDC/BIO/70017/2006, Lab-on-a-chip with fluid acoustic microagitation, 2007-2010, 83.000,00 €.

-FCT/PTDC/EEA-TEL/68625/2006 - "Quality of service in wireless sensor and actuator networks", 86.000,00 €, 2007-2010, José Afonso.

- MAP- MicroAnalisador de Proteínas, ADI/QREN/2008, 161.885,92 €, consórcio: Instituto Agilus, IPO-Porto, Emilio Azevedo de Campos, UM, 2009-2011, G. Minas, Jorge Cabral, L. Gonçalves, J. H. Correia.

- ADI/FCOMP-01-0202-FEDER-005358, NFCE, José Higinio Correia, UMinho budget: 400.000,00 €. Start: 1st January 2010. End: 31th December 2012.

- FCT/PTDC/SAU-BEB/100392/2008, José Higinio Correia, Wireless biomedical microsystem for neural implants. UMinho budget: 180.000,00 €. Start: 1st May 2010. End: 30th April 2013.

**Objectives & Achievements****Objectives**

Development, design, and fabrication of:

- 1) Wearable systems for monitoring human posture, heart-rate and respiratory frequency.
- 2) Neural microsystems for brain-computer interface.
- 3) Lab-on-a-chip for biological fluids.
- 4) X-rays microdetectors for medical imaging (digital radiography, CT).
- 5) Wireless sensor networks.
- 6) Chip-size antenna.
- 7) Energy scavenging thermoelectric microsystems.
- 8) RF transceivers in CMOS technology.

Therefore, the goals were to consolidate the biomedical devices developed in the past (lab-on-a-chip, neural electrodes, chip-size antenna for implantable devices) and to start the development of nanodevices, especially related with CarbonNanoTubes (CNT) for neural applications and food safety with the support of the International Nanotechnology Laboratory that will be located in Braga and it is sponsored by Portuguese and Spanish Governments, and European Commission as an European Laboratory. The final prototype of an implantable biomedical microsystem for neural prostheses, will have a tremendous impact in the development of the next generation of neuron recording/stimulation devices. A major interest in the areas of x-ray imaging sensors and piezoelectric polymer sensors and actuators.

Also, the setup of the Microtechnology Lab. and Biomedical Lab. with imaging systems was a priority (ultrasound, CT, endoscopic capsule).

**Main Achievements**

The setup of the Microtechnology Lab. with evaporator, silicon wet-bench, sputtering system, wafer-probe station, wire-bonding system, dicing and sawing system, mask aligner equipment, spin-coating system, SU-8 photoresist development system, clean cabin class 100, silicon bulk-micromachining system for fabricating 3D structures.

Development and validation of the  $\beta$ -PVDF piezoelectric polymer placed underneath the microfluidic structures of lab-on-a-chip devices for mixing and promoting fluids reaction; influence of the polymer thickness and area on the reaction rate of biological fluids; the better transparent conductive electrodes for using in the  $\beta$ -PVDF piezoelectric polymer.

Participation in projects included in the MIT-Portugal Portugal in 2 different Engineering systems fields: EDAM-Engineering Design and Manufacturing (Automotive smart flooring based in photonics) and Bio-Engineering Systems (wearable systems for biomedical applications).

Design of CMOS optical sensors optimized for measuring the fluorescence emission spectra of gastrointestinal tissues (at specific spectral bands), and readout electronics for data processing.

The setup of the Biomedical Lab. with ultrasound system – Doppler effect, EEG system for monitoring neural signals, computer tomography system, capsule endoscope system for diagnostic of the small bowel.

**Group Productivity****Publications in peer review Journals**

1. A.F. Silva, L.A. Ferreira e F.M. Araujo, "Fiber Bragg grating sensors integrated in polymeric foils", Materials Science Forum , 1548-1554, Outubro 2010. Full paper in Acrobat PDF. IF=0.399.
2. Arvin Emadi, H. Wu e S. Grabarnik, J. H. Correia, R. F. Wolfenbuttel "Fabrication and characterization of IC-Compatible Linear Variable Optical Filters

**Group Productivity**

- with application in a micro-spectrometer", *Journal Sensors and Actuators A*, 162, pp. 400-40, Outubro 2010. Full paper in Acrobat PDF. IF=1.674.
3. Arvin Emadi, H. Wu e G. de Graça, "An UV linear variable optical filter-based micro-spectrometer", *Procedia Engineering*, Vol.5, pp. 416-41, Setembro 2010. Full paper in Acrobat PDF. IF=1.674.
  4. A. F. Silva, F. M. Araujo, Paulo Mateus Mendes e José Higinio G. Correia, "PVC Smart Sensing Foil for Advanced Strain Measurements", *IEEE Sensors Journal*, pp. 1149-1, Junho 2010. Full paper in Acrobat PDF. IF=1.581.
  5. M. S. Fernandes, N.S. Dias, A.F. Silva, J.S. Nunes, S. Lanceros-Mendez, J.H. Correia, P.M. Mendes, "Hydrogel-based photonic sensor for a biopotential wearable recording system", *Biosensors and Bioelectronics*, Vol. 26, Setembro 2010. Full paper in Acrobat PDF. IF=5.429.
  6. Nuno Sergio Dias, João Paulo Carmo e Alexandre Ferreira da Silva, José Higinio Correia, "New dry electrodes based on iridium oxide (IrO) for non-invasive biopotential recordings and stimulation", *Journal Sensors and Actuators A*, 164, pp. 28-34, Outubro 2010. Full paper in Acrobat PDF. IF=1.674.
  7. Nuno Sergio Dias, S.J. Schiff, Paulo Mateus Mendes e José Higinio G. Correia, "Feature selection on movement imagery discrimination and attention detection", *Medical and biological engineering and computing*, pp. 331-34, Março 2010. Full paper in Acrobat PDF. IF=1.757.
  8. Vanessa Cardoso, Susana Catarino e José Gerardo V. Rocha, "Lab-on-a-chip with;-PVDF based acoustic microagitation", *In IEEE Transactions on Biomedical Engineering*, Vol. 57, N5, p. 1184-11, Janeiro 2010. Full paper in Acrobat PDF. IF=2.154.
  9. Vanessa Cardoso, G. Botelho e L. Rebouta, "Degradation studies of transparent conductive electrodes on electroactive poly(vinylidene fluoride) for uric acid measurements", *Science and Technology of Advanced Materials*, IOP, Vol.11, N4, Dezembro 2010. Full paper in Acrobat PDF. IF=2.599.
  10. José Augusto Afonso, Luis A. Rocha e José Higinio G. Correia, "Design and Implementation of Multi-User Wireless Body Sensor Networks", *International Journal on Advances in Networks and Services*, Vol. 3, Nr. 1, pp. 62-74, Setembro 2010. Full paper in Acrobat PDF.
  11. José Gerardo V. Rocha, Graça Maria H. Minas e Senentxu Lanceros-Mendez, "Pixel Área readout Circuit for X-Ray Imagers", *IEEE Sensors Journal*, Vol. 10, N.11, p.1740-174, Julho 2010. Full paper in Acrobat PDF. IF=1.581.
  12. Luis Miguel Valente Gonçalves, José Higinio G. Correia e P. Alpuim, "Fabrication of Thermoelectric Devices by Applying Microsystems Technology", *Journal of Electronic Materials*, Vol. 39, No. 9, Junho 2010. Full paper in Acrobat PDF. IF=1.428.
  13. Graça Maria H. Minas, R. F. Wolffenbittel e José Higinio G. Correia, "MCM-based microlaboratory for simultaneous measurement of several biochemical parameters by spectrophotometry", *Journal Biomedical Microdevices*, Vol. 12, N4, p. 727-736, Abril 2010. Full paper in Acrobat PDF. IF=3.323.
  14. João Paulo Carmo, Paulo Mateus Mendes e Carlos Alberto Caridade Monteiro e Couto, "A 2.4-GHz CMOS Short-Range Wireless-Sensor-Network Interface for Automotive Applications", *IEEE Transactions on Industrial Electronics*, 57, pp. 1764-1, Maio 2010. Full paper in Acrobat PDF. IF=4.678.
  15. João Paulo Carmo, R. F. Wolffenbittel e Luis Miguel Valente Gonçalves, "A planar thermoelectric power generator for integration in wearable microsystems", *Sensors and Actuators A: Physical*, 161(1-2), 199-204, Junho 2010. Full paper in Acrobat PDF. IF=1.674.
  16. João Paulo Carmo, J F Ribeiro e M F Silva, "Thermoelectric generator and solid-state battery for stand-alone microsystems", *Journal of Micromechanics and Microengineering: Institute of Physics (IOP) Publishing*, 20, 1-8, Agosto 2010. Full paper in Acrobat PDF. IP=1.997
  17. João Paulo Carmo, Luis Miguel Valente Gonçalves e José Higinio G. Correia, "Thermoelectric Microconverter for Energy Harvesting Systems", *IEEE Transactions on Industrial Electronics*, Vol. 57, No. 3, PP. 861-86, Março 2010. Full paper in Acrobat PDF. IF=4.678.
  18. José Gerardo Rocha, Luis Miguel Gonçalves, Sanentxu Lanceros-Mendez, "Energy Harvesting From Piezoelectric Materials Fully Integrated in Footwear", *IEEE Transactions on Industrial Electronics*, Vol. 57, No. 3, PP. 813-19, Março 2010. Full paper in Acrobat PDF. IF=4.678.
  19. A. Silva, F. Gonçalves, P. Mendes, and J.H. Correia, "PVC formulation study for the manufacturing of a skin smart structure based in optical fiber elements," *Journal Polymers for Advanced Technologies*, Wiley Publisher, 2010. Full paper in Adobe PDF. IF=1.532.
  20. J. M. Miranda, H. Oliveira, J. A. Teixeira, A. A. Vicente, J. H. Correia, G. Minas, "Numerical study of micromixing combining alternate flow and obstacles". *International Communications in Heat and Mass Transfer*, Elsevier Sciencedirect, Vol. 37, p. 581-586, 2010. Full paper in Adobe PDF. IF=
  21. A. Silva, F. Gonçalves, P. Mendes, and J.H. Correia, "PVC formulation study for the manufacturing of a skin smart structure based in optical fiber elements," *Journal Polymers for Advanced Technologies*, Wiley Publisher, 2010, pp., Full paper in Adobe PDF, 2010.

**Other international publications**

## Chapters of Books:

- J. P. Carmo, N. S. Dias, J. H. Correia, *Microsystems for wireless sensor networks with biomedical applications*. Book Chapter in *Handbook of Research on Developments in e-Health and Telemedicine*. 2010. ISBN-10: 1615206701. ISBN-13: 978-1615206704. Purchase on-demand and/or further details from the IGI-Global web-site.
- J.A. Afonso, P. Macedo, L.A. Rocha, J.H. Correia, "Hierarchical Wireless Networks of Body Sensor Networks for Healthcare Applications. Book Chapter in *Handbook of Research on Developments in e-Health and Telemedicine*. IGI-Global. 2010. ISBN-10: 1615206701. ISBN-13: 978-1615206704. Purchase on-demand and/or further details from the IGI-Global web-site.
- J. P. Carmo, J. H. Correia, *A low cost wireless sensors network with low-complexity and fast prototyping*. Book Chapter in *Handbook of Research on Mobility and Computing: Evolving Technologies and Ubiquitous Impacts*. IGI-Global. 2010. ISBN-10: 1609600428. ISBN-978-1609600426. Purchase on-demand and/or further details from the IGI-Global web-site.
- L. M. Gonçalves, J. G. Rocha, *Application of Microsystems Technology in the Fabrication of Thermoelectric Micro-Converters*, Book Chapter in *Solid State Circuits Technologies*, Edited by Jacobus W. Swart. In-Tech Education and Publishing, January 2010. ISBN: 978-953-307-045-2.

## Full papers in proceeding conferences:

- M. F. Silva, J. F. Ribeiro, N. S. Dias, João Paulo Pereira Carmo e José Higinio G. Correia, "Non-invasive dry electrodes for EEG", *MME 2010*, Enschede, The Netherlands, 26-29 September 2010.
- R. Lameiro, F. J. O. Rodrigues, Luis Miguel Valente Gonçalves, José Higinio G. Correia e Paulo Mateus Mendes, "Small antenna based on a MEMS magnetic field sensor that uses a piezoelectric polymer as translation mechanism", *MME 2010*, Enschede, The Netherlands, 26-29 September 2010.
- A.F. Silva, L.A. Ferreira, F.M. Araujo, Paulo Mateus Mendes e José Higinio G. Correia, "A process for embedding fiber Bragg gratings in flexible skin foils", [Fourth] *European Workshop on Optical Fibre Sensors (SPIE)*, Oporto, Portugal, Setembro 2010.
- Celso Figueiredo, Kai Becher, Klaus-Peter Hoffmann, Paulo M. Mendes, "Low Power Wireless Acquisition Module for Wearable Health Monitoring Systems", *EMBC 2010*, Buenos Aires, Argentina, Setembro 2010. Full paper in Adobe PDF.

### Group Productivity

D. S. Ferreira, P. J. G. Coutinho, E. M. S. Castanheira, José Higinio G. Correia e Graça Maria H. Minas, "Fluorescence and diffuse reflectance spectroscopy for early cancer detection using a new strategy towards the development of a miniaturized system", EMBC 2010, Buenos Aires, Argentina, Setembro 2010. Full paper in Adobe PDF.

J. F. Ribeiro, M. F. Silva, M. M. Silva, Luis Miguel Valente Gonçalves e José Higinio G. Correia, "Microfabrication and characterization of thin-films solid-state rechargeable lithium battery", MME 2010, Enschede, The Netherlands, 6-29 September 2010.

Maria Martins, Daniel Barbosa, Jaime Ramos e Carlos Manuel G. S. Lima, "Small Bowel Tumors Detection in CaPósule Endoscopy by Gaussian Modeling of Color Curvelet Covariance Coefficients", EMBC 2010, Buenos Aires, Argentina, August 31 - September 4 2010. Full paper in Adobe PDF.

Mariana S. Fernandes, Kevin S. Lee, Rajeev J. Ram, Higinio Correia, Paulo M. Mendes, "Flexible PDMS -based dry electrodes for electro-optic acquisition of ECG signals in wearable devices ", EMBC 2010, Buenos Aires, Argentina, Setembro 2010. Full paper in Adobe PDF.

O. S. Gama, P. M. Carvalho, P. M. Mendes, "A Time-slot Scheduling Algorithm for e-Health Wireless Sensor Networks", IEEE Healthcom2010, 12th International Conference on e-Health Networking, Application and Services, Lyon, Frana, Julho 2010. Full paper in Adobe PDF.

P. Anacleto, C. P. Figueiredo, K.-P. Hoffmann, J. H. Correia, P.M. Mendes, "Multifunction Antenna for Compact Wireless Electrophysiological Monitoring Devices", IEEE 2010 APÓS/URSI Symposium, Toronto, Canad, Julho 2010. Full paper in Adobe PDF.

Paulo M. Mendes, Fabio J. O. Rodrigues, Luis M. Gonçalves, "3D Modeling and Simulation of a MEMS Electrically Small Antenna", IEEE 2010 APÓS/URSI Symposium, Toronto, Canad, Julho 2010. Full paper in Adobe PDF.

S. Silva, L. Domingues, P. M. Mendes, "MagTag - A Wearable Wrist Device for Localization Applications", 4th International ICST Conference on Pervasive Computing Technologies for Healthcare 2010, Munique, Alemanha, Março 2010. Full paper in Adobe PDF.

Susana Catarino, José Gerardo V. Rocha, Senenmtxu Lanceros-Mendez, Vanessa Cardoso e Graça Maria H. Minas, "Heating of samples by acoustic microagitation for improving área ction of biological fluids", ISIE2010, Bari, Italy, 4-7 July, 2010. Full paper in Adobe PDF.

Vanessa Cardoso, C. M. Costa, Senenxtu Lanceros-Mendez e Graça Maria H. Minas, "Micro and Nanofabrication of beta-Poly(Vinylidene Fluoride) sensors and actuators", 3rd International Conference on Advanced Nano Materials, Agadir, Morocco, 12-15 September. Full paper in Adobe PDF.

José Gerardo V. Rocha, José Manuel T. V. Cabral, S. Lanceros-Mendez, V. Correia e Marcos Martins, "Analysis of a high frequency response in 3-3 piezocompozites using finite elements modeling", Eurosensors XXIV, Linz, Austria, 5-8 de Setembro. Full paper in Adobe PDF.

José Manuel T. V. Cabral, José Gerardo V. Rocha e Hélder Costa, "A system to manage the allocation of MSc Dissertations at University of Minho", IEEE EDUCON 2010, Madrid, Espanha, Abril de 2010. Full paper in Adobe PDF.

Luis Miguel Valente Gonçalves, J. F. Ribeiro, M. F. Silva e José Higinio G. Correia, "Integrated Solid-State Film Lithium Battery", Eurosensors 2010, Lins, Austria, September 2010.

### Other national publications

Livros:

1. J. H. Correia, J. P. Carmo - Introdução às Microtecnologias no Silício, ISBN: 978-972-757-716-3, 2010, Editora LIDEL.

### Industry contract research

Project MagTAG, contract with Nonius Software, PI: Paulo Mateus Mendes, 25 000,00 €, Feb 2010, the goal is the development of a localization device with wireless recharging.

### Internationalization

Collaborative publications, exchange of investigators and research in European Networks with Delft University of Technology, The Netherlands in Lab-on-a-chip devices and chip-size antenna. RWTH-Aachen, Germany, in technology for fabrication of bioelectrodes. CNM-Barcelona and Universidade Miguel Hernandez, Alicante, Spain in CarbonNanoTubes (CNT) for neural implants and neural diagnostic. Pennsylvania State University, State College, USA, in brain-computer interfaces and EEG systems. University of Cardiff, UK, in design and fabrication of thermoelectric microsystems.

Celso Figueiredo started his PhD work in collaboration with Fraunhofer IBMT Institute, at St. Ingbert, Germany.

Therefore, the goals for the next years is the development of nanodevices, especially related with CarbonNanoTubes (CNT) for neural applications and food safety with the support of the International Nanotechnology Laboratory that will be located in Braga and it is sponsored by Portuguese and Spanish Governments, and European Commission as an European Laboratory. Collaboration with the group of CNM-Barcelona and University of Barcelona will be appointed.

Mariana S. Fernandes started her collaboration with RLE Lab. at MIT/USA, to perform the work related to her PhD degree.

Débora Ferreira started her collaboration with the Spectroscopy Laboratory in the Laser Biomedical Research Center, at the Massachusetts Institute of Technology, to perform the work related to her PhD degree

### Government/Organization contract research

Higinio Correia collaborated in the elaboration of the program EU-Brazil R&D, that resulted in the FP7-ICT-2011-EU-Brazil call.