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Confidencial

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Name of the Research Unit:	CENTRO ALGORITMI uid:319 (L700319) (COMP-Norte-Braga-319)
Coordinator:	Henrique Manuel Dinis Santos
Main Scientific Domain:	Electrical and Computer Engineering
Other subdomains:	Software Engineering Information Technology/Information Systems Systems Engineering
The Research Unit resulted from a merge of:	n/a
Host institutions	
Leading Host Institution	Universidade do Minho
Other Institutions	n/a
Objectives and Achievements	
Unit Description	
<p>The Centre Algoritmi (CAIg) is a R&D unit of the University of Minho (UM), developing its activities in the fields of Systems Engineering, Information Technology/Information Systems and Electronics, each corresponding to a research group (RG). CAIg has 174 members, 77 of them hold a PhD degree. Most of the doctorates members belong to the staff of three departments of the School of Engineering, while the reminder group is mainly composed of post-graduate students and research assistants.</p> <p>According to the UM main regulation, academic staff members must be affiliated to one or more of the UM's R&D units, where their research activities are integrated. Concerning hierarchy R&D units depend on the rector, at the same organization level as Schools, but most of the human resources depend on departments, which are integrated in Schools. This way, R&D units become a complementary structure dedicated to research activity, joining human resources managed by departments. The UM established an organization matrix model, to enhance flexibility and improve resource utilization. The 3 existing CAIg's RGs were established by department association logic – reorganization is ongoing, as reported further on this document.</p> <p>CAIg is organized around a Directive Committee (DC), formed by a Director, a Vice-Director and three Group Coordinators (GC), one for each RG. The Director is elected among all senior researchers (full or associate professors), by all CAIg's members, and each GC is also elected among the respective group's elements. Elections take place in each two years (the last one was in March, 2006). The DC is responsible for all the executive and planning tasks, including strategic planning and reporting activities. There is also a Scientific Committee (SC) formed by all the doctorate members, which is essentially responsible for approving the DC work and the premature destitution of the Director. Actually, to optimize resources, most of the SC matters are discussed at the same level within regular department meetings. Finally, there is a Consultive Committee, formed by external experts, to advice the strategic planning process. All the administrative daily work is accomplished by two staff members. CAIg interact with other university units related to research activity, like GAP (project support office) and the accounting office.</p>	
General Objectives	
<p>As a university research centre, CAIg aims in assuring the long-term R&D, which allows researchers to keep up-to-date. Usually this type of research does not produce measurable scientific results (projects and publications), which imposes serious difficulties concerning its support, especially now that university funding is being considerable reduced. However, long-term R&D continues to be considered as an important goal.</p> <p>Following the recommendations of the previous evaluation report more attention was devoted to the interdisciplinary activities, defining strategies to explore synergies between groups. This was achieved through an internal call for projects, specific for that purpose and supported by 40% of the funds coming from FCT. The main idea behind this strategy keeps valid, since we believe that one of the CAIg's strengths is its heterogeneous nature, which allows exploring different approaches and is an important factor towards innovation.</p> <p>During the last two years some transformations occurred in the university system, motivating a strategy to promote research in UM. Improving research is always an objective of a R&D centre, but the actual context forces us to give this goal high priority. The first reaction was to make every researcher ware of the new demands and this measure, per si, produced interesting results in scientific production. However, to better explore the capacities of young researches, in particular, some other adjustments are required. Efforts are underway to reorganize CAIg's research groups, promoting a leadership in each of the areas where research activities are well defined, there are enough human resources and the work produced foresees an excellent impact. These groups and its leaders will have a much more active role in the CAIg management, but this requires a modification of the CAIgs's regulation.</p> <p>Strategy for improvement, also following last report recommendations, requires a higher level of internationalization. CAIg will benefit from a FCT national program to support fellowships for post-doctoral positions in Portuguese R&D centres. CAIg received ten of those grants and this is being seen as a unique opportunity to significantly 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 CAIg researchers must be ware of this program and keep 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, CAIg's members are encouraged to register themselves as project reviewer candidates.</p> <p>Co-operation should not be stimulated only at the international level. In some research areas there are other R&D centres</p>	

in Portugal with very good groups. The collaboration with such groups is always an important goal since that is a natural way to get stronger groups with more potential to be recognized.

Finally, one last CALg'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.

Main Achievements

In 2003-2006 period there was a significant improvement in the number of publications (books, journals and international/national magazines). The total number increased from 35 in 2003 to 81 in 2007, which gives a medium annual increase of 32% and an actual ratio of 1.11 per PhD member. Communications, covering all sorts of conferences and workshops, both national and international, also shows a high improvement, from 74 in 2003 to 242 in 2006, giving a medium annual increase of over 52%. These values supersede by large the expected numbers, which reveals that CALg's researchers are aware of the current challenges. Despite this promising progress, quality had not improved at the same ratio and some groups clearly need to give more attention to this aspect. By other side, the groups that in the past show a high-level production (Systems Engineering and part of the Electronic groups) keep their status, being recognized between the bests in their areas.

Another important achievement is the number of theses produced: 45 PhD theses and 71 MSc theses. However, the tendency for the number of PhD theses is decreasing, accompanying the rise of CALg's doctorate members, which reveals a weakness concerning the capacity to attract external PhD candidates. By other side the number of MSc theses shows a tendency to increase, which reveals a growth in the enrolment of students at this level. This figures received a large contribution from the Information Systems RG which was responsible for over 50% of the MSc theses, revealing a high attraction level.

The number of funded projects is another indicator of the CALg's performance. This indicator keeps improving, and projects represent near 85% of the CALg's global budget – about 2,5M€/year. During 2003-2006 CALg's members were responsible or were involved in over 50 approved projects (European, FCT and other governmental agencies that promote programs mainly for research in co-operation with industries).

In 2003 and according to de CALg's objectives an internal call for projects was launched, as a mean to stimulate interdisciplinary. This call was highly participated and 9 projects were selected by an internal committee. The scientific results were not very relevant, but the heterogeneity of the research teams matched the main program's objective. With a similar nature, the School of Engineering launched in 2004 a program, called IN2TEC and several CALg's members participated in research teams, helping to increase collaboration habits.

Also important is the number of prototypes and patents produced. During 2003-2006 period 25 software applications, 22 prototypes and 15 patents (registered at the international and national levels) were reported. Most of these achievements came from the Industrial Electronic Group, which is the research area that works more closely with physical devices typically more suitable to this kind of accomplishment.

Concerning the organization of scientific/technical events, during 2003-2006 there was also an impressive growth, from 5 and 2 in 2003 and 2004, respectively, to 33 in 2006. In several areas some of these events are considered very topical being supported by organizations which play an important role in those areas (i.e. ACM, IEEE and IFIP) - the details are given in the individuals RG reports. This involvement foresees an increasing world wide recognition, which is considered a fundamental strategy to achieve CALg's objectives related to internationalization.

Activities

Integrative/multidisciplinary activities in the 2003-2006 period

CALg is a multidisciplinary research centre by nature. Within its main scientific areas it is not difficult to identify a wide research stream including researchers from Electronic field, addressing the construction of physical computer based devices, Engineering Systems field, focusing on the construction of complex systems and Information Systems, focusing on the issues related with the valuable utilization of Information and Communication Technology in organizations. This main stream is complemented by some specific research areas, like Energy, Instrumentation, Optimization, etc., which address much more narrow issues and where multidisciplinary is more limited. Identifying projects in the main research stream is not an easy task since it would require a very long term research and resources behind our capacity. But there are interesting opportunities in sub-streams and, more important, from sharing knowledge acquired in each scientific area and that can influence research activities in other areas. So we can envisage two different types of collaboration: projects, where individuals' expertises are aggregated; and sharing knowledge activities, which conduces to a deeper understanding of surrounding requirements.

To address the first type of interdisciplinary collaboration, CALg launched, in 2003, an internal call for interdisciplinary projects. From that program 9 projects were selected and supported (as we could expect there was no project proposal in the wide research stream):

- Cogni-Adaptative Agents for Knowledge Discover
- Interactive Multimedia in Chinese Teaching
- MOMBaker – Modelling, Optimization and Miniaturization in the Production of Baker Yeast
- GeoCensus – taking geographical information from the Web
- XtrmSWING – a tool to analyze the user interface of Java SWING based programs
- Teleoperation of an Industrial Robot via Web
- Development of Equipment to Improve Electricity Quality
- ASH – Security Heterogeneous Environment
- Control and Co-ordination of Autonomous Robots in Partially Known Environments

Besides this initiative, CALg's members were also involved in a similar program launched by the School of Engineering (program IN2TEC), in 2004. Furthermore, there is a significant research stream involving researchers from the Industrial Electronic area and researchers from another UM research centre (2C2T Centre of Science and Textile Technology). This stream carried out some important industrial projects. Other collaborations embrace researchers from the CIPsi (Centre for Research in Psychology) and CCTC (Centre of Sciences and Computer Technologies), mainly within Information Systems group activities, and researchers from "Officina Mathematica", CEB (Centre of Biological Engineering) and CITEPE (Interdisciplinary Centre in Technologies for Energy Production), mainly within Systems Engineering group activities.

Knowledge sharing is the second form of collaboration, which can be accomplished by seminars, workshops, or similar 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 an unusual level of external requests (in the last 18 months CALg was submitted to 3 audits), impose serious restrictions to these activities.

Outreach activities in the 2003-2006 period

In recent years the number of external requests has been raising remarkably. From low level schools to social and economy agents, there is a clear desire to come near universities as a mean to approach knowledge. After all, this is the essence of the knowledge society. University as a whole, respond to this requests positively opening its doors and organizing or adhering to several events. This is a global movement traversing all university units. Concerning CALg, 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 divulgation events. Due to lack of clarification between research and teaching affairs it is not always possible to track these individual initiatives.

Since 2004 School of Engineering has been organizing an annual event associated to its birthday, specially tailored to show technical innovations and science advances resulting from research, to society and organizations. For one particularly activity PhD students are invited to take part on an exhibition where they have the opportunity to show their work and discuss with others their problems and achievements - most of the CALg's members adhered enthusiastically to this initiative. But other activities are also relevant, like visits to laboratories where young students can contact with the research world and with the learning environment most of them will face in the near future.

The School of Engineering and de Guimarães City Hall launched an initiative, "Ciência na Cidade", supported by a governmental program, which aims to take science and technology to the citizens, through several events like visits, exhibitions, contests and public roundtables. CALg's members participate in many of those events both by invitation or being involved in organization.

One of the CALg's groups working in the robotic area developed a robot football team and has been involved in the RoboCup competition, where they have achieved very interesting results. This is a worldwide event, started in Japan, in 1997 and the CALg's group was responsible for the 2004 edition organization, in the University of Minho. This had a tremendous impact, calling the attention to this area and promoting several events at the national level involving also a large number of low-level schools. More information is available at <http://www.robotica.dei.uminho.pt/robocup>. Related with this work, the group also developed an innovative wheelchair which received a national prize.

During the 2003-2006 period CALg's members have also been directly involved in the organization of world class scientific meetings (e.g. OASIS Workshop at the IFIP WG 8.2; Third International Conference on Application of Concurrency to System Design, sponsored by IFIP, ACM and IEEE; IEEE International Symposium on Industrial Electronics; IEEE International Conference on Industrial Technology; Eurosensors) - details are in each group report.

CALg's members are also deeply involved in several national non-profit organizations/associations dedicated to the normalization and dissemination of technological and scientific knowledge. Among them are: APDSI (Portuguese association for information society development); two Technical Committee for normalization under auspicious of the Ministry of Economy.

Future vision of the Unit's activities for the period 2007-2010

CALg as well as the other university research centres are facing an important challenge concerning their role in the host institution. There is a clear intention to define research as a development strategy, complemented by a new regimen being prepared for university organization. In spite of the final result of this ongoing transformation, if departments continue to be in absolute control of research staff, multi-departmental research centres like CALg will have problems to accomplish their own strategy. Of course their will always be good excellent individual works and also excellent collaborations, but by the will of individual researchers and not necessary under a common view.

After some years of growth CALg is now in a mature state. Most of the permanent researchers are now doctorate. Furthermore, several RG are in a maturing process and will naturally generate new groups, as soon as their achievements reach an adequate level. There will be some wealthy internal concurrency and some guidelines and rules must be developed very soon to allow a better management of this process, avoiding excessive fragmentation. Leadership must be clearly defined in these emerging groups and their leaders must be involved in the Scientific Committee, which will be the main management body. If the university organization modifications listed above are realized, the director of a centre will become a dean of research, which definitely will change the research centre's role. Assuming performance indexes at an adequate level, CALg can then legitimately desire to become an associate laboratory, which will give it much more autonomy (this can be seen as a long-term strategy).

Projects will continue to be the most important way of funding and FP7 is defined as a main priority for the next 3 years (there is already a considerable number of projects submitted and promising consortiums established). The actual tendency to fund projects in applied research can be a threat to fundamental research, which plays an important role in teaching (a fundamental vector of the university role in society). To assure this R&D vector is continued, CALg must be capable of promoting its own R&D activity independently of basic funding.

One of the weakest CALg's points is its low level of internationalization and one of its main consequences is the low number of post-doc visitors. A significant change can be generated by the recently launched FCT program "Compromise with Science", by which CALg got 10 post-doc fellowships - public job offer is now ongoing. The other initiative towards internationalization is the establishment of more or less formal relations with other research groups/centres. This is now a strategic vector.

Another weak point that requires some attention is the quality factor of publications, which must increase. Despite the current efforts there is still a hard work towards this goal. Researchers are aware of the necessity to improve publication performance.

To take advantage of its heterogeneous nature CALg must be capable to improve internal networking. An information system is being developed to address this issue, creating a common platform where individual research initiatives will be shared (at present each group or community has its own web site). A regular and pre-programmed set of research meetings must be prepared and, if possible, a larger annual conference should be organized, including keynote speakers appointed by each RG.

Future Networking activities in the 2007-2010

The Portuguese government, through FCT, recently embraced some initiatives aiming at the establishment of important partnerships between Portuguese and United States universities, focused on research and education. Concerning CALg two protocols have been signed: one with Carnegie Mellon University (CMU-Portugal, <http://www.cmuportugal.org>); and another one with the Massachusetts Institute of Technology (MIT-Portugal, <http://www.mitportugal.org>). They both gave rise to consortiums where most of the Portuguese universities are represented, as well as some of the national industries, laboratories and associations linked to research activities. These consortiums outline important knowledge networks that will shape research activities in Portugal, limiting the space for individual initiatives.

CMU-Portugal is implemented through ICTI (Information and Communication Technologies Institute). One of the first programs launched was MAP-i Doctoral Program in Computer Science, which joins the doctoral programs in Computer Science of three universities (University of Minho, University of Aveiro and University of Porto). CMU faculty co-advised the program elaboration, participates in teaching and recognizes the degree. This promotes mobility both at the students level and staff level. Some of the CALg's members are involved in this initiative, and it shows the potential of this network which can be much more explored.

MIT-Portugal is similar but addressing different areas, such as the Engineering Design and Advanced Manufacturing, Bio-Engineering Systems and Energy Systems. CALg's members from several groups are enrolled, as well as researchers from other UM and national research centres. There is also a post-graduate program and several initiatives promoting mobility at graduate-level, post-graduated level and post-doc level.

Another challenging initiative is the creation of the European Institute of Technology - EIT (http://ec.europa.eu/education/policies/educ/eit/index_en.html). EIT will create an important network, with natural influence at the strategic and financial European politics. Partnerships with EIT will be a priority.

CAIG has a group working on computer graphics in near collaboration with CCG – Computer Graphic Centre (<http://www.ccg.pt/Index.aspx>). CCG is integrated in a network of R&D Centres, INI-Graphics Net, with over 900 researchers all over the world. In Portugal CCG has another centre, located in Coimbra, and a large number of associated institutions, including UM. Some projects require expensive equipment (e.g., virtual reality) and CCG appears as a common place where they can be shared.

Besides those large and formal networks, CAIGs members are encouraged to take part and/or assume relevant roles in national and European associations with influence on the decision taken process, related with their research areas. As examples:

- APCA -Portuguese Association for Automatic Control (<http://www.dem.ist.utl.pt/~apca>)
- euCognition - European Network for the Advancement of Artificial Cognitive Systems (<http://eucognition.org>)
- SPR – Portuguese Society of Robotic (<http://www.spr.ua.pt>)
- APDSI – Portuguese Association for Development of Information Society (<http://www.apdsi.pt>)
- ADETI – Association for Development of Telecommunications and Information Technologies (<http://www.adetti.iscte.pt>)
- RTCM – Thematic Network of Mobile Communications (<http://rtcm.inescn.pt/index.php?id=420>)

General Indicators

	2003	2004	2005	2006
Nº of Researchers (FTE)*	54	54	61	73
Masters Completed in the Period	29	29	19	21
PhDs Completed in the Period	60	60	35	31

Research Groups

Reference	Group Title	Principal Investigator
(2003-2007) RG-X-COMP-Norte-Braga-319-2166	Industrial Electronics (original group)	João Luiz Afonso
(2007-2010) RG-COMP-Norte-Braga-319-2168	Nonlinear Systems Optimization and Statistics	Edite Manuela da Graça Pinto Fernandes
(2003-2007) RG-X-COMP-Norte-Braga-319-971	Information Systems	Joao Alvaro Brandao Soares de Carvalho
(2003-2007) RG-X-COMP-Norte-Braga-319-1127	Systems Engineering	Edite Manuela da Graça Pinto Fernandes
(2007-2010) RG-COMP-Norte-Braga-319-2169	Systems Engineering, Optimization and Operations Research	José Manuel Vasconcelos Valério de Carvalho
(2007-2010) RG-COMP-Norte-Braga-319-2171	Knowledge and Information Systems and Services	Joao Alvaro Brandao Soares de Carvalho
(2007-2010) RG-COMP-Norte-Braga-319-2184	Ubiquitous and Pervasive Computing, Graphics, and Software Methodologies	Adriano Jorge Cardoso Moreira
(2007-2010) RG-COMP-Norte-Braga-319-2959	Industrial electronics	Carlos Alberto Caridade Monteiro e Couto
(2007-2010) RG-COMP-Norte-Braga-319-2976	Micro/Nanotechnologies and Biomedical Applications	José Higinio Gomes Correia

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Group Description

Research Unit:	CENTRO ALGORITMI uid:319 (L700319) (LCOMP-Norte-Braga-319)
Group Name/Designation:	Industrial Electronics (original group)
Group Reference:	RG-X-COMP-Norte-Braga-319-2166
Principal Investigador:	João Luiz Afonso
Time Interval:	(2003-2007)
Location of Group (Host Institution):	Universidade do Minho
Keywords:	Micro/Nanotechnologies and Biomedical Applications; Robotics, Automation and Instrumentation; Energy and Power Electronics; Embedded Systems, Communications Systems and Services
Funding, source, dates:	<ul style="list-style-type: none">- EU, JAST, IST-2-003747-IP, 2004-2008, 560.000€- EU, ArteSimit, IST-2000-29689, 2001-2004, 167.000€- EU Socrates/Grundtvig, Project SAVI, 2004-2006, 39.000€- ADI-PRIME, Project SINUS, DEMTEC/020/1/03, 2005-2007, 706.488€- ADI/IDEIA/PELLISAQUAE, 2003- 2007, 442.000,00 €- ADI-POCTI, MICROPYROM, 2004-2007, 425.000€- ADI-PRIME, TECNOVOZ, 03/00165, 2006-2008, 118.768€- ADI- IDEIA, ADI2004/M 2.3/0012, 2003-2005, 20.000€- FCT/POCTI/ESE/38468/2001, 2003-2005, 65.000,00 €- FCT/POCTI/CTM/33751/2000, 2002- 2004, 70.000,00 €- FCT/POCTI/ESE/33747/2000, 2002-2004, 90.000 €- FCT/POCI2010/REEQ/379/EEI/2005, 2005-2007, 281.500,00 €- FCT, CoopDyn, POSI/SRI/38051/2001, 2002-2006, 62.000€- FCT, REEQ/17/2001, 2005-2007, 92.000€- FCT, POSI/SRI/39824/2001, 2002-2004, 60.000€- FCT, POCTI/CTM/33061/99, 2000-2004, 34.916€- FCT, POSI/P/EEI/13189, 1999-2003, 50.000€- FCT, SCAPS, POCTI/EME/61425/2004, 2005-2007, 33.600€- FCT, POCTI/ESE/48242/2002, 2004-2007, 30.000€- FCT, POCTI/ESE/41170/2001, 2002-2006, 65.000€- Internal projects, 2003-2006, 87.600€

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PI and Researchers
Researchers in the Group (Ph.D. Only)
(CV) Adriano Jose da Conceicao Tavares (CV) Antonio Fernando Macedo Ribeiro (CV) Carlos Alberto Batista da Silva (CV) Carlos Alberto Caridade Monteiro e Couto (CV) Carlos Manuel Gregorio Santos Lima (CV) Cristina Manuela Peixoto dos Santos (CV) ESTELA Guerreiro Silva BICHO (CV) Filomena Maria Rocha Menezes Oliveira Soares (CV) Graca Maria Henriques Minas (CV) Jaime Francisco Cruz Fonseca (CV) João Carlos Aparício Paulo Fernandes (CV) Joao Luis Marques Pereira Monteiro (CV) João Luiz Afonso (CV) João Miguel Clemente de Sena Esteves (CV) Joaquim José dos Santos Esteves Neves (CV) José Araujo Mendes (CV) José Augusto Afonso (CV) José Gerardo Vieira da Rocha (CV) José Higinio Gomes Correia (CV) Jose Manuel Tavares Vieira Cabral (CV) Júlio Manuel de Sousa Barreiros Martins (CV) Luis Filipe Botelho Ribeiro (CV) Manuel João Sepúlveda Mesquita de Freitas (CV) Paulo José Guimarães Garrido (CV) Paulo Mateus Mendes
Other Researchers in the Group (Ph.D. Only)
n/a
Other Researchers in the Group (non Ph.D.)
(CV) Paulo Francisco Silva Cardoso
Objectives and Achievements
General Objectives

This Group congregates researchers organized in 6 Sub-Groups: 1- Micro/Nanotechnologies and Biomedical Applications; 2-Mobile and Anthropomorphic Robotics; 3-Automation, Control and Instrumentation; 4-Energy and Power Electronics; 5-Embedded Systems; 6-Communications Systems and Services. The idea is that the Sub-Groups increase their productivity, becoming autonomous Groups in the future. This condition has already been accomplished for the Sub-Group 1.

The main goals for each of the above mentioned Sub-Groups were:

1- Development, design, and fabrication of:

- Solid-state integrated sensors, microactuators and micro/nano systems;
- Integrated circuits;
- Wearable systems for human monitoring;
- Microcomputer-based solutions for biomedical applications;
- Neural microsystems for brain-computer interface;
- Lab-on-a-chip;
- X-rays microdetectors for medical imaging;
- Wireless sensor networks;
- Chip-size antenna;
- Energy scavenging thermoelectric microsystems;
- RF transceivers in CMOS technology.

2- To build jointly-acting autonomous systems that communicate and work intelligently on mutual tasks to:

- Build control architectures for multi-robot motion coordination;
- Build neuron-cognitive inspired architectures to robots;
- Investigate how such systems can be synthesized.

3- Development of solutions on:

- Mechatronics Systems;
- Computer Vision and Image Processing;
- Instrumentation, Acquisition, Automation and Control;
- Multisensor Fusion and Integration.

4- To develop R&D on:

- Shunt and Series Active Power Filters;
- Power Quality Monitoring Systems;
- Optimized Interfaces for Renewable Energy Systems with Power Grid.

To develop Power Quality studies.

5- To study, model, simulate, and design concurrent, real-time, embedded systems, with focus on assembly of systems and tools based on the use of languages to generate retargetable tools adapted to the application/system. To design a language for development tools: simulators, debuggers and compilers.

6- To research on:

- Real-time Data Acquisition and Control Systems;
- Integration of Services on the Public Access Network;
- Medium Access Control for Wireless Radio Networks;
- Real-time Traffic Scheduling Based on Quality of Service;
- Interfaces and Distributed Applications for Blind-People Virtual Communities.

Main Achievements

The achievements are presented separately to the 6 Sub-Groups:

1- Conclusion of 3 projects that originated 3 prototypes with respective international and Portuguese patents:

- X-rays microdetectors for medical imaging,
- Lab-on-a-chip for biological analysis,
- Chip-size antenna for short-range communications.

Setup of a Microtechnology Lab. - clean cabin class 100.

Setup of a Biomedical Lab. with ultrasound, EEG, computer tomography and capsule endoscope systems.

Collaborative publications, exchange of investigators and research in European Networks.

Participation in projects included in the MIT-Portugal: EDAM-Engineering Design and Manufacturing and Bio-Engineering Systems.

2- Development and validation of:

- A dynamic control architecture for cooperative object transportation (Innovation Prize 2003 for Young Engineers);
- A prototype of an omnidirectional wheelchair for disabled people (BES 2006 Prize);
- A dynamic neural field-based robot control architecture for implementing cognitive capacities for human-robot interactions.

29 Int. papers, 3 Books Chapters.

3- Several R&D projects, with internal and external funding that produced publications, laboratorial prototypes, products and patents.

4- Development of 4 prototypes in the Power Quality area (Active Power Filters and Power Quality Monitors). Set up of a Power Electronics Lab. 43 papers. 1 PhD and 4 MsC. 3 Projects with a total funding of 800.000€.

5- A framework architectural model and a UML profile that supports the specific concepts in embedded systems, such as: Automatic Generation of Retargetable Processor Simulators; Real-time Operating Systems using Aspect Programming. Simulators for ARM, SPARC and 8051 processors were generated. A fault-tolerant middleware for BOSS operating. An IDE for video surveillance systems.

6- S-link to giga bit ethernet adapter; Frame segmentation procedure for LHCb data acquisition system; Wireless Bluetooth based distributed data acquisition and control system; Low power real-time medium access control protocol; System architecture for low bit rate traffic aggregation; Scheduling algorithms to perform traffic aggregation; Virtual orchestra software for the visually impaired. 17 papers Int. Confs; Teacher's/Trainer's Handbook and online manual for the visually impaired.

Productivity

Publications in peer review Journals (3000 ca.)

(Up to a max of 10. Always indicate at the end of the citation, impact factor of the journal (IF=) and number of citations (n° C=). Give title and full citation in original language. DO NOT translate)

The impact factor (IP) and the number of citations (n°C) were obtained in the ISI Web of Knowledge.

1. G. Minas, R. F. Wolffenbuttel, J. H. Correia, A Lab-on-a-Chip for Spectrophotometric Analysis of Biological Fluids, Journal

- Lab-on-a-Chip, The Royal Society of Chemistry, Vol. 5, (2005), p. 1303-1309 - ISI Web of Knowledge: (IP =5.625) (n^oC = 2).
2. J. G. Rocha, C. G. J. Schabmueller, N. F. Ramos, S. Lanceros-Mendez, M. F. Costa, A. G. R. Evans, R. F. Wolffenbuttel and J. H. Correia, X-ray Detector Based on a Bulk Micromachined Photodiode Combined with a Scintillating Crystal, Journal Micromech. Microeng. 13, 2003, pp. S45-S50 - ISI Web of Knowledge: (IP = 2.499) (n^oC = 9).
3. G. Minas, J. S. Martins, J. C. Ribeiro, R. F. Wolffenbuttel, J. H. Correia, Biological microsystem for measuring uric acid in biological fluids. Journal Sensors and Actuators A, Elsevier, Vol. 110 (2004), p. 33-38 - ISI Web of Knowledge: (IP = 1.434) (n^oC = 7).
4. J. G. Rocha, N. F. Ramos, S. Lanceros-Mendez, R. F. Wolffenbuttel and J. H. Correia, CMOS X-rays Detector Array Based on Scintillating Light Guides, Journal Sensors and Actuators A 110, 2004, pp. 119-123 - ISI Web of Knowledge: (IP = 1.434) (n^oC = 7).
5. W. Erlhagen, A. Mukovsky and E. Bicho, "A Dynamic Model for Action Understanding and Goal-Directed Imitation", Brain Research 1083:174-188, 2006 - ISI Web of Knowledge: (IP = 2.341) (n^oC = 7).
6. F. Vaz, J. Ferreira , E. Ribeiro , L. Rebouta , S. Lanceros-Mendez , J.A. Mendes , E. Alves, Ph. Goudeau , J.P. Riviere , F. Ribeiro , I. Moutinho , K. Pischow , J. de Rijk, "Influence of Nitrogen Content on the Structural, Mechanical and Electrical Properties of TiN Thin Films", Surface and Coatings Technology, 191 317-323, 2005 - ISI Web of Knowledge: (IP = 1.559) (n^oC = 5).
7. J. A. Martins, Wd. Zhang, A. M. Brito, U. Infante, M. Romero, F. O. Soares, "Isothermal and Nonisothermal Crystallization of Polymers: Analysis with a Shear Differential Thermal Analyzer", Review of Scientific Instruments 76, 105105, 2005 - ISI Web of Knowledge: (IP = 1.541) (n^oC = 2).
8. A.Valente, Raul Morais, C. Couto and J. H. Correia, "Modeling, Simulation and Testing of a Silicon Soil Moisture Sensor Based on the Dual-Probe Heat-Pulse Method", Journal Sensors and Actuators A, Vol. 115, pp.434-439, Elsevier Science, September 2004 - ISI Web of Knowledge: (IP = 1.462) (n^oC = 3).
9. Raul Morais, A. Valente, C. Couto and J. H. Correia, "A Wireless RF CMOS Mixed-Signal Interface for Soil Moisture Measurements", Journal Sensors and Actuators A, Vol. 115, pp.376-384, Elsevier Science, September 2004 - ISI Web of Knowledge: (IP = 1.462) (n^oC = 2).
10. J. A. Martins, W. Zhang, V. Carvalho, A. M. Brito, F. O. Soares, "Evaluation of the Sample Temperature Increase During the Quiescent and Shear-Induced Isothermal Crystallization of Polyethylene", Polymer – Elsevier, Vol 44, N. 26, 2003, p8071-8079, 2003 - ISI Web of Knowledge: (IP = 2.340) (n^oC = 3).

Other publications (3000 ca.)

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

1. G. Minas, J. C. Ribeiro, S. Lanceros-Mendez, F. Vaz, R. F. Wolffenbuttel, and J. H. Correia – Biosystem with 16 Highly Selective Optical Channels for Biological Fluids Analysis in the Visible Spectrum. In "Proceedings of Transducers'03". Boston-USA, 8-12 June 2003, p. 1251-1254.
2. J. C. Ribeiro, G. Minas, P. Turmezei, R. F. Wolffenbuttel, J. H. Correia - A SU-8 Fluidic Microsystem for Biological Fluids Analysis. In "Proceedings of Eurosensors XVIII". Roma, Itália, 13-15 September 2004, p. 126-127.
3. Cristina P Santos, Manuel J Ferreira, "Computer Vision and Fuzzy Rules Applied to a Dispensing Application in an Industrial Desktop Robot", Munir Merdan (Eds), Industrial Robots – from Design to Applications, Advanced Robotics Systems International, 2006.
4. W.Erlhagen, A.Mukovskiy, E.Bicho, G.Panin, C.Kiss, A.knoll, H. van Schie, H.Bekkering, "Action-Understanding and Imitation Learning in a Robot-Human Task", Artificial Neural Networks: Biological Inspirations, Lecture Notes on Computer Science, pp. 261-268, Springer Verlag, 2005.
5. Fonseca, J., Martins, J. and Couto, C., "Acquisition the Profile of Surfaces with Complementary Sensor Fusion Techniques", Chapter 15 in DAAAM International Scientific Book, 2005, B. Katalinic (Ed.), Published by DAAAM International, Vienna, Austria, ISBN: 3-901509-43-7, ISSN 1726-9687.
6. F. Guhr, L. Ferreira da Silva , Filomena Oliveira Soares, H. Carvalho, "Industrial Applications of Fuzzy Algorithms: Fuzzy Logic Based Control Strategies for an Electromagnetic Actuated Sewing Machine Presser Foot", IEEE ICIT' 04 – IEEE International Conference on Industrial Technology, Hammamet, Tunisia, December 8-10, 2004.
7. João L. Afonso, M. J. Sepúlveda Freitas, and Júlio S. Martins, "p-q Theory Power Components Calculations" – ISIE'2003 - IEEE International Symposium on Industrial Electronics, Rio de Janeiro, Brasil, 9-11 June 2003, ISBN: 0 7803 7912 8.
8. Ricardo Pregitzer, J. C. Costa, Júlio S. Martins, and João L. Afonso, "Simulation and Implementation Results of a 3 Phase 4 Wire Shunt Active Power Filter", ICHQP'2006 - International Conference on Harmonics and Quality of Power, Cascais, Portugal, 1-5 Oct. 2006.
9. A. Tavares, C. Lima, C. Silva, J. Metrôlho and C. Couto, "WCET Prediction using an ADL to Describe the Architecture of the Embedded Processors". Design of Embedded Control Systems, Editors: M. Adamsky, A. Karatkevich, and M. Wegrzyn, Section 2, pages 39–50, Springer Verlag, 2005, ISBN 0-387-23630- 9.
10. J. A. Afonso, J. E. Neves, "Scheduling of real-time traffic in IEEE 802.11 networks", European Conference on the Use of Modern Information and Communication Technologies - ECUMICT'2004, Ghent, Belgium, April 2004.

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

PhD Thesis completed:

1. J. A. Afonso, "Local access in wireless communications networks: traffic scheduling in real time for data-acquisition and control systems", UM, 2005.
2. P. M. Mendes, "Chip-size antennas for RF wireless Microsystems", UM, 2005.
3. J. G. Rocha, "X-rays microdetectors in silicon based in scintillators for digital radiography", UM, 2004.
4. R. Morais, "Sensorial micro-interface in technology CMOS for agriculture", UTAD-Portugal, 2004.
5. G. M. Minas, "Lab-on-a-chip for biological fluid analysis", UM, 2004.
6. L. A. Rocha, "Dynamics and nonlinearities of the electro-mechanical coupling in inertial MEMS", TUDelft-The Netherlands, 2005.
7. C. M. P. Santos, "Attractor dynamics based generation of timed robotic trajectories", UM, 2003.
8. M. J. Ferreira, "Desenvolvimento de um protótipo para a identificação, classificação e quantificação de defeitos, aplicável em ambiente industrial", UM, 2004.
9. J. C. A. Fernandes, "Análise de Imagens Texturadas com base em Matrizes de Co-ocorrência Modificadas", UM, 2004.
10. M. J. S. Freitas, "Implementação de um Filtro Activo de Potência para Optimização da Interface entre a Rede e outros Sistemas Eléctricos", UM, 2004.
11. J. M. C. S. Esteves, "Metodologia de Autolocalização Absoluta em Ambientes Quase-Estruturados", UM, 2005.
12. J. M Cabral, "A System Architecture for Low Bit Rate Traffic Aggregation in Control Applications", UM, 2005.

Master Dissertations completed:

1. D. A. Duraes, "Silicon bulk-micromachining system for fabricating 3D microstructures", UM, 2004.
2. J. C. Ribeiro, "RF Receptor in CMOS technology for wireless communications at 433 MHz", UM, 2006.
3. R. L. G. Pregitzer, "Simulações Computacionais de Filtros Activos de Potência em Condições Reais de Operação", UM,

2006.

4. M. Carvalheira, "Controlo de um veículo aéreo semi-autónomo", UM, 2006.
5. V. D. Rodrigues, "Monitorização e Adaptação automática de uma arquitectura de controlo baseada em atractores móveis de sistemas dinâmicos", UM, 2006.
6. T. Silva, "Integração de Sistemas de Comunicação: - Acessos ADSL", UM, 2006.
7. J. C. A. Ribeiro, "Receptor de Rádio-Frequência (RF) em tecnologia CMOS para comunicações sem fios a 433 MHz", UM, 2006
8. I. M. Pinto, "Representações dinâmicas para a geração de comportamento preditivo em sistemas duo-agente cooperativos", UM, 2005.
9. E. C. Silva, "Geração de trajectórias em tempo real: um estudo comparativo", UM, 2005.
10. M. F. T. Moreira, "Estudo do Potencial de Produção de Energias Alternativas em Portugal", UM, 2005.
11. N. J. M. Ferreira, "Análise da Tecnologia de Transferência de Energia e Informação Sem Fios", UM, 2005.
12. E. F. Couto, "Simulações e Análise de um Filtro Activo Paralelo Trifásico com Controlo Baseado na Teoria p-q", UM, 2004.
13. J. S. T. Batista, "Sistema de Monitorização da Qualidade da Energia Eléctrica Baseado em PC", UM, 2004.
14. R. Cunha, "Gestão de um Modelo Didáctico de uma Rede de Média e Baixa Tensão: Implementação de um Sistema Computorizado", UM, 2004.
15. C. Machado "Sistema Inteligente para Auto-Parametrização em Tempo Real de Serra Circular para Corte de Tubos Metálicos", UM, 2004.
16. J. G. Pinto, "Medição de Massa de Fio Têxtil, em Tempo Real, com Resolução de 1 mm", UM, 2004.
17. A. Silva, "Medição e Análise de Parâmetros em Máquinas de Ensaio Multiaxiais", UM, 2004.
18. V. Carvalho, "Parametrização de Fio Têxtil Baseado na Análise de Massa", UM, 2003.

Patents/propotypes (2000 ca.)

Patents:

1. WO2006006113: MicroLab for biological fluids analysis using white light illumination, World Intellectual Property Org., 2006.
2. PT-103159: MicroLab for fluids analysis, 2005.
3. PCT/IB2006/053268: X-ray imaging matrix with light guides and intelligent pixel sensors, 2006.
4. PT-35326-06: Flux based-sensor in piezoelectric, 2006.
5. PT-33637-05: X-rays imaging array with light guides and smart pixels, 2005.
6. PT-103551: Body kinetic monitoring system, 7 August 2006.
7. PT-103612: Bidirectional system for monit. and controlling data in real time, 2006.
8. PT-103299: Integrated and tunable microantenna, 2005.
9. Int. Patent 2006000022: Omnidirectional Electric Wheelchair Control System, 2006.
10. PT-103354: Sist. cadeira de rodas omnidireccional motorizada, 2005.
11. PT-103034, "Multiaxial Dynamometer".
12. PT-103157: Differential thermal analyser for shear induced crystallization studies – Shear DTA.
13. USPTO 60743832, "Music chat environment for interactive playing from remote sites", 2006.

Prototypes:

1. Bluetooth Based Wireless Distributed Data Acquisition and Control System, presented at Hannover Messe 2006 Exhibition, Germany, 2006.
2. Software framework for camera acquisition and image analysis - AIBO platform.
3. WISEControl - General purpose Wireless Sensor and Control network platform.
4. ArgoUML plug-in for supporting UML profiles.
5. Mobile Autonomous Robot "Afonso" to Robótica'2006.
6. Industrial electric vehicle for transporting raw materials for textile industry (commercialized).
7. Mobile Autonomous Robot "TugoBot" to Eurobor'2006, Catania, Italy.
8. 5 footballer robots to RoboCup'2005, Osaka, Japan.
9. Prototype of an omnidireccional wheelchair for disabled people under 30 kg presented on Normédica/Ajutec fair (Exponor - Porto) 2005 and TV programs (Praça da Alegria, Connosco, Telejornal RTP1, Jornal 2, etc).
10. Prototype of an omnidireccional wheelchair for disabled people for up to 120 Kg.
11. 5 footballer robots, with whistle recognition.
12. Mobile autonomous robot to the Autonomous Driving League.
13. Portable Three-Phase Power Quality Monitoring System.
14. Lab. prototype of a Three-Phase 3-Wire Shunt Active Filter.
15. Lab. prototype of a Three-Phase 4-Wire Shunt Active Filter.
16. Single-Phase 4-Wire Shunt Active Filter prototype.

Organization of conferences (2000 ca.)

- EUROSENSORS XVII: The 17th European Conference on Solid State Transducers, 21-24 September 2003, University of Minho, Guimarães, Portugal. The premier European forum in Sensors, Actuators and Micro/Nanotechnologies.
- Robótica'2006, (received over 800 participants, and more than 250 robots), 28 April - 1 May 2006, MultiUsos Pavilion, Guimarães.
- "Robótica na Indústria e nos Serviços" - Symposium with the ROBÓTICA magazine, 3 Mar 2006, University of Minho, Guimarães.
- "Exploring Space" - Invited Speech given by Prof. Calude Nicollier (ESA Astronaut), University of Minho, 28 April 2006.
- Co-organization of EPGV'06, Eurographics - Symposium on Parallel Graphics and Visualization, May 2006, University of Minho, Braga.
- Co-Organization of the 1st Robotics Sports Meeting, MultiUsos Pavilion, Guimarães.
- Co-Organization of 1st "Tertúlias em Inteligência Artificial (TelA) – Robótica Autónoma e Inteligência Artificial" – APPIA, 25 Oct. 2006, University of Minho, Braga.
- Co-Organization (General Co-Chairman) of ISIE'2003 - IEEE Int. Symposium on Industrial Electronics, Rio de Janeiro, Brazil, Jun, 2003.
- Co-Organization (General Co-Chairman) of ICIT'04 - IEEE Int. Conf. on Industrial Technology, Hammamet, Tunisia, 8-10 Dec 2004.
- Co-Organization (General Program Co-Chairman) of ETFA'2003 - 9th IEEE Int. Conf. on Emerging Technologies and Factory Automation, Lisbon, Portugal, 16-19 Sep, 2003.
- 2nd Symposium of Power Electronics, University of Minho, Guimarães, 28 Sep 2005.

Members of Organizing Committees of the Conferences:

- ISIE'2005, Dubrovnik, Croácia (Member of the Int. Advisory Board).
- ISIE'2006, Montreal, Canada (Finance Chair).
- IECON'2005, Raleigh, USA (Int. Publicity Co-Chair).
- ICIT'2005, Hong Kong, (Member of the Int. Advisory Board).
- ICIT'2006, Mumbai, India, (Member of the Int. Advisory Board).
- ETFA'2005, Catania, Italy, (Member of the Int. Advisory Committee).
- ETFA'2006, Prague, Czech Republic, (Member of the Int. Publicity Committee).
- Control 2006, Lisbon, Portugal, (Member of the Program Committee).
- RoboCup'2004 (Middle Size League Local Chair).
- RoboCup'2005, Osaka, Japan.
- 1st Int. Conf. on Dextrous Autonomous Robots and Humanoids, 2005, Yverdon-les-Bains, Switzerland.
- 3rd Int. Conf. "Hands on Science" - HSci 2006, Braga, Portugal.

Industry contract research (2000 ca.)

- Process Simulation in semiconductor technology: simulation of mold filling characteristics in microchips, Qimonda S.A. Portugal, started 6 July 2006.
- Research agreement with Honda Research Institute Europe (Offenbach, Germany) - Dynamic Field-based Modelling of Cognitive Capacities.
- Research agreement with Qimonda S.A. Portugal for the development of an Autonomous Robot for Samples Transportation and Distribution.
- Protocol established with Lincis to develop new embedded technologies in Computer Vision, 15.000€/year.
- Protocol with OrtoMaia to develop an Omnidirectional Wheelchair.
- Protocol with A Industrial, Lda. to develop Footballer Robots.
- Partnership with Cyberbotics to develop new functionalities for the AIBO Platform to be integrated onto the webots simulator.
- Project funded by CORSAR-Equipamentos e Produtos Industriais Lda, "Control and Monitorization of Cloro/Redox", 23.000€.
- Project funded by Ainoga - S.G.P.S., SA, "Boia da Vida", 27.000€.
- Project SINUS - Technology for Dynamic Compensation of Harmonics, Power Factor and Unbalances - DEMTEC/020/1/03, development of prototypes to be tested in Lameirinho - Indústria Têxtil, S.A., Alliance UniChem Farmacêutica, S.A, Hospital Pedro Hispano, 706.488€.
- Studies in the Area of Power Quality - Program "Minho Rumo à Excelência", Associação Industrial do Minho (AIMinho), 6.575€ .
- Project TECNOVOZ PRIME 03/00165; Companies: CPCHS - Healthcare Solutions; Anditec - Tecnologias de Reabilitação; Datelka; EDISOFT SA; Priberam Informática; Promosoft SIS; RTP - Rádio e Televisão de Portugal; Tecmic; 118.768€.
- Project AIVA, Companies: Files & Bytes Lda.; Enermeter Lda.; INOV-Inesc Inovação; Élio - Artigos de Desportos Náuticos, Lda.; Motorávia, S.A.; REN - Rede Eléctrica Nacional, S.A.
- Project PERSCRUTA - FCT PEAM/P/IF/0012/97, "Programa de Combate e Prevenção de Incêndios Florestais", CNEFF/FCT, with a patented prototype (nº 102.300 - INPI).
- Participation on Hannover Messe 06 with the work: WISEControl - General Purpose Wireless Sensor and Control Network Platform.
- Participation on the "Salon de Inventos e Inovação Tecnológica, Imaginaria 2004", Vilagarcía, Espanha (invited by TecMinho).
- Participation on the ORTO PRO CARE'2006 Int. Fair, Madrid, with Omnidirectional Wheelchair prototype.

Internationalization (2000 ca.)

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

- European Project JAST-cooperation with 7 institutions from 4 different countries, 5 Joint PhD supervisions (with the Universities of Bochum, Parma and Nijmegen).
- Research agreement with Honda Research Institute Europe, Offenbach, Germany.
- Member of the European Networks of Excellence euCognition.
- Member of Euron2.
- Joint Project - Dev. Electromec. Drives and Active Power Line Conditioners for the Efficient Use of Elect. Energy - Cooperation Project with COPPE/Federal University of Rio de Janeiro - GRICES/CAPES, 2003-2006.
- Joint PhD supervision - Alþan Program - with COPPE/Federal University of Rio de Janeiro, Brazil.
- Joint PhD supervision - FCT - with Fraunhofer FIRST, Germany.
- Examples of Collaborative Publications:
- G.Minas, R.F.Wolffenbuttel, J.H.Correia, An array of highly selective Fabry-Perot optical-channels for biological fluids analysis by optical absorption using white light source for illumination. Journal of Optics A, Inst. of Physics, Vol. 8 (2006), p.272-278. (IP=1.295)
- J.G.Rocha, C.G.J.Schabmueller, N.F.Ramos, S.Lanceros-Mendez, M.V. Moreira, A. G. R. Evans, R. F. Wolffenbuttel and J. H. Correia, "Comparison Between Bulk Micromachined and CMOS X-ray Detectors," Sensors and Actuators A 115, 2004, pp.215-220. (IP=1.434) (nºC=1).
- L.M.Goncalves, C.Couto, P.Alpuim, D.M.Rowe and J.H.Correia, Thermoelectric microstructures of Bi2Te3/Sb2Te3 for a self-calibrated micro-pyrometer, Sensors and Actuators A: Physical, 130-131 p346-351, (2006) (IP=1.434).
- P.M.Mendes, A.Polyakov, M.Bartek, J.N.Burghartz, J.H.Correia, "Integrated Chip-Size Antenna for Wireless Microsystems: Fabrication and Design Considerations", Sensors and Actuators A Physical, Vol.125, N.2, 2006, pp.217-222 (IP=1.434).
- L.Monteiro, J. C. C. Costa, M. Aredes, J. L. Afonso, "A Control Strategy for a Three-Level Unified Power Quality Conditioner", 8th COBEP, Recife, Brazil, Jul 2005.
- J.E.Neves, N.Neufeld, R.Jacobsson and B.Jost, "New Packet Fragmentation for S-Link to Giga Bit Ethernet Adapter", Conf. Systemics, Cybernetics and Informatics, SCI 2003, Orlando, USA, Jul 2003.
- F.Afonso, C.Silva, S.Montenegro and A.Tavares, "Implementation of middleware fault tolerance support for real-time embedded applications", 18th Euromicro Conf. Real-Time Systems, Dresden, Germany, Jul 2006.

Future Research

Objectives

Funding, source, dates

Confidencial

Previous publications in the area

Special Requirements

FCT - Gabinete de Informática::2007
Opt. 1024x768 IE 6.x/7.x | Firefox 2.x | Opera 9.x | Safari 2.x | Konqueror

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- » [Unit Report Form \(Exemplo\) Parte B - Research Group\(s\)](#)

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Group Description	
Research Unit:	CENTRO ALGORITMI uid:319 (L700319) (LCOMP-Norte-Braga-319)
Group Name/Designation:	Information Systems
Group Reference:	RG-X-COMP-Norte-Braga-319-971
Principal Investigador:	Joao Alvaro Brandao Soares de Carvalho
Time Interval:	(2003-2007)
Location of Group (Host Institution):	Universidade do Minho
Keywords:	Information Systems and Services; Software Engineering; Mobile and Ubiquitous Systems; Computer Graphics
Funding, source, dates:	<p>During 2003-2006 the RG had 32 funded projects.</p> <p>For each year, the number of running projects and corresponding funding was:</p> <ul style="list-style-type: none"> - 2003: 16 projects, 499.610,01€ - 2004: 14 projects, 329.239,39 € - 2005: 16 projects, 447.362,03 € - 2006: 16 projects, 376.339,62 € <p>Selection of projects:</p> <ul style="list-style-type: none"> INFOCITIZEN, Agent based negotiation for inter and intra-enterprise coordination employing a European Information Architecture for Public Administration, IST-2000-28759, Set. 2001 – Ago. 2003, 109.735,53 € Omnipaper, Smart Access to European Newspapers, IST-2001-32174, Jan. 2002 – Dez. 2004, 162.875,00 € EPSILON, Environmental policy via sustainability indexing at a European wide NUTS III level, IST-2001-32389, Dez. 2002 – Nov. 2005, 75.372,00 € USE-ME.GOV, USability-drivEn open platform for MobilE GOVernment, IST-2002-002294, Jan. 2004 – Fev. 2006, 134.160,00 € UPAIN, Ubiquitous Solutions for Pain Monitoring and Control in Post-Surgery Patients, ADI IDEIA 70/2004/3.1B/00364/007, 237.130,00 €
PI and Researchers	
Researchers in the Group (Ph.D. Only)	
(CV) Adérito Fernandes Marcos (CV) Adriano Jorge Cardoso Moreira (CV) Ana Alice Rodrigues Pereira Baptista (CV) Anabela Mesquita Teixeira Sarmento (CV) Claus Kaldeich (CV) Helena Cristina Coutinho Duarte Rodrigues (CV) Henrique Manuel Dinis Santos (CV) Isabel Cristina Assis Andrade de Moura (CV) Isabel Maria Pinto Ramos (CV) Joao Alvaro Brandao Soares de Carvalho (CV) Jose Carlos Baptista do Nascimento e Silva (CV) José Filipe de Sá Rodrigues Soares (CV) José Luís Mota Pereira (CV) Leonel Duarte dos Santos (CV) Luis Alfredo Martins Amaral (CV) Manuel Filipe Vieira Torres dos Santos (CV) Maria João Mesquita Rodrigues da Cunha Nicolau Pinto (CV) Maribel Yasmína Campos Alves Santos (CV) Paulo Alexandre Ribeiro Cortez (CV) Paulo Rogério Perfeito Tomé (CV) Pedro Correia Cravo Pimenta (CV) Pedro Miguel Gonzalez de Abreu Ribeiro (CV) Ricardo Jorge Silvério de Magalhães Machado (CV) Rui Joao Peixoto Jose (CV) Rui Manuel Dinis de Sousa	
Other Researchers in the Group (Ph.D. Only)	
n/a	
Other Researchers in the Group (non Ph.D.)	

Confidencial

n/a

Objectives and Achievements

General Objectives

The period 2003-2006 can be described as a transition period. This was due to:

- The research group (RG) included all the faculty belonging to the Department of Information Systems (DIS), School of Engineering, University of Minho (UMinho). Many of the department's members (± 10) finished their doctoral degrees after 2002. Therefore, the number of researchers with a doctorate increased considerably;
- The DIS's R&D interests and competencies cover several areas and require different research approaches. It became clear that the existence of several R&D groups would be beneficial. Such re-organization had to wait until critical dimension was attained;
- During the last 3 years a major effort was put on re-organizing the educational programs according to European directives. One of the aspects that has been taken into consideration was the articulation between R&D activities and education programs. The reflection carried out during this change process was very important to define the R&D groups' profile.

The RG pursued objectives at different levels:

A first set of objectives was related with the re-organization of the RG and its division in coherent groups.

Another set of objectives addressed common performance aspects. Although no specific goals have been established, several aspects have been defined as matters of concern where performance increase was expected:

- Publications: increase the quantity and quality of publications, specially in international refereed journals;
- Projects: increase participation in formal, funded projects as a way to increase R&D performance and to augment the possibilities of engaging in enduring international partnerships;

Other objectives addressed the establishment of a scholar culture, focusing on aspects such as academic rigor, international collaboration, writing habits, and openness to intellectual criticism. Such culture is regarded as essential to the RG' maturity.

Main Achievements

Some of the RG achievements are related to its own change. The RG is splitting in two new and more coherent research groups. This result from a process that stimulated the emergence of R&D communities (knowledge management; information science; information services; business processes; business intelligence; IS security; software process; computer graphics; ubiquitous & mobile computing) combined with the selection of a set of themes oriented towards real world problems and opportunities: organizational well being; valuable & trustable information services; sustained software industry; smart places.

The resulting matrix (R&D communities versus themes) and its associated dynamics led to the establishment of two RG: Knowledge and Information Systems and Services; Ubiquitous Systems, Graphics and Software Methodologies. Although both groups have a focus on information technology, the former often uses empirical research approaches typical from the human and social sciences while the research approaches used in the latter are those common in computer science and software engineering.

The groups now presented independently, have a common history within the information systems RG. Moreover, the R&D themes they focus on are strongly interrelated. This confers them some degree of interdependence that is viewed as a valuable characteristic.

Although their differences, both groups have viability prospects as they emerge in a situation that evidences a sustained steady increase on productivity and maturity. The results achieved during the period 2003-2006 show increases and stability in aspects such as: number and quality of publications in international refereed journals and conferences; participation in R&D projects involving international consortia; number of graduate students at MSc and PhD levels; involvement in international groups and committees; involvement in program and organization committees of international conferences.

Productivity

Publications in peer review Journals (3000 ca.)

(Up to a max of 10. Always indicate at the end of the citation, impact factor of the journal (IF=) and number of citations (n^o C=). Give title and full citation in original language. DO NOT translate)

The RG achieved an important increase in publication of all kinds, including in journals with peer review. The figures are:

- International Journals: 2 (2003), 5 (2004), 10 (2005), 9 (2006)
- National Journals: 4 (2003), 2 (2004), 3 (2005), 3 (2006)

Selection of publications:

1. Rui José, Adriano Moreira, Helena Rodrigues, and Nigel Davies, The AROUND architecture for dynamic location-based services, Mobile Networks and Applications (MONET), the Journal of Special Issues on Mobility of Systems, Users, Data and Computing. ISSN 1383-469X. Kluwer Academic Publishers, Special issue on Mobile & Wireless Data Management., Aug. 2003. Impact Factor (ISI JCR 2003): (IP=0.844) (n^o C=16)
2. Valbom, L. and A. Marcos, "WAVE: Sound and Music in an Immersive Environment", "Computers & Graphics", Special Issue "Digital Arts", Elsevier Science, 29(6), Dec. 2005. (ISSN: 0097-8493) (IP= 0.601) (n^o C = 0)
3. Cortez, P., M. Rocha, and J. Neves, "Evolving Time Series Forecasting ARMA Models", Journal of Heuristics, Kluwer Academic Publishers, 10(4), pp. 415-429, July 2004, The Netherlands, ISSN: 1381-1231. (IP = 0.740) (n^o C = 0)
4. Magalhães, S.T., K. Revett and Santos, H., "Generation of Authentication Strings from Graphic Keys", International Journal on Computer Science and Network Security, 6(3), 2006. (ISSN: 1738-7906) (n^o C = 0)
5. Ramos, I, D.M. Berry and J.A. Carvalho. "The Role of Emotion, Values, and Beliefs in the Construction of Innovative Work Realities". Lecture Notes in Computer Science vol. 2311, p. 300-314, 2002. (IP = 0.402) (n^o C - GoogleScholar= 4)
6. Ramos, I., D.M. Berry and J.A. Carvalho, "Requirements engineering for organizational transformation". Information and Software Technology, 47(7), pp. 479-495, 2005. (IP = 0.726) (n^o C = 1)
7. Ramos, I., and D.M. Berry, "Is Emotion Relevant to Requirements Engineering?", Requirements Engineering Journal, pp. 1-5, 2005, (IP = 1.103) (n^o C - GoogleScholar = 1)
8. Santos, M.Y. and L. Amaral, "Geo-Spatial Data Mining in the Analysis of a Demographic Database", Soft Computing – A Fusion of Foundations, Methodologies and Applications, Special Issue on Soft Computing Applications to Spatial Data Analysis, 9(5), pp. 374-384, May 2005. (ISSN 1432-7643) (IP = 0.538) (n^o C = 1)
9. Santos, M.Y. and L.A. Amaral, "Mining geo-referenced data with qualitative spatial reasoning strategies", Computers and Graphics, Special Issue on Visual Knowledge Discovery, Elsevier Science, 28(3), pp. 371-379, 2004. (ISSN 0097-8493). (IP = 0.641) (n^o C = 1)
10. Silva, A., P. Cortez, M.F. Santos, L. Gomes and J. Neves. "Mortality assessment in intensive care units via adverse events using artificial neural networks". In Artificial Intelligence in Medicine, Elsevier, 36 (3): 223-234, 2006, ISSN:0933-3657 (IP=1.634) (n^o C = 0).

Other publications (3000 ca.)

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

Summary of other research results published in the 2003-2006 period:

- Books and Book Chapters: 13 (2003), 14 (2004), 15 (2005), 13 (2006)
- Proceedings of international conferences: 38 (2003), 39 (2004), 42 (2005), 53 (2006)
- Proceedings of national conferences: 22 (2003), 20 (2004), 12 (2005), 10 (2006)
- Technical reports and other publications: 15 (2003), 19 (2004), 7 (2005), 17 (2006)

Selection of publications:

1. Branco, P., Encarnação M., A. Marcos, "Let Me See Your Face: an Approach to Monitor Users' Experience", In Proc. SIACC 2006 - Third Ibero-American Symposium on Computer Graphics, Santiago de Compostela, 5-7 July, Spain. Eurographics Proceedings (P. Brunet, N. Correia, G. Baranoski, Eds.), ISBN 3-905673-60-6.
2. Pinto, C.S., Ramos, F., "Enhancing Web Supported Learning by Adding a Management Layer to SCORM Compliant LMS". Proceedings of the 6th IEEE International Conference on Advanced Learning Technologies, Holanda, 2006.
3. Machado, R. J., Fernandes, J. M., Monteiro, P., Rodrigues, H., "Refinement of Software Architectures by Recursive Model Transformations". J. Munch, M. Vierimaa (Eds.), Proceedings of the 7th International Conference on Product Focused Software Process Improvement, Netherland, 2006, LNCS Series vol. 4034, Springer-Verlag.
4. Ramos, I., J.A. Carvalho, "Reinventing the future: A study of the Organizational Mind". IFIP International Conference on "The past and future of Information Systems: 1976-2006 and beyond" (as part of IFIP World Computing Conference), Santiago, Chile, 20-25 Aug. 2006.
5. Revett, K., M. Gorunescu, M. Ene, S.T. Magalhães, H. Santos, "Authenticating Computer Access Based On Keystroke Dynamics Using A Probabilistic Neural Network", in Proc. of ICGES 06 - 2nd International Conference on Global E-Security, London, 20-22 Apr. 2006.
6. Santos, M.F., H. Quintela, "Agent-Based Learning Classifier Systems for Grid Data Mining", Proceedings of GECCO 2006 - Genetic and Evolutionary Computation Conference, IWLCS - International Workshop on Learning Classifier Systems, Seattle, Washington, USA, Jul. 2006.
7. Moreira, A., M. Y. Santos, "Enhancing a user context by real-time clustering mobile trajectories", Proceedings of the International Conference on Information Technology: coding and computing, Las Vegas: IEEE Computer Society, 2005 (ISBN 0-7695-2315-3).
8. Machado, R., I. Ramos, J. M. Fernandes. "Specification of Requirements Models". Aybúke Aurum, Claes Wohlim (Eds.), Engineering and Managing Software Requirements, chap. 3, pp. 47-68, Springer-Verlag, Berlin Heidelberg, Germany, July, 2005, ISBN-3-540-25043-3.
9. Santos, M.Y., L. Amaral, "Mining Geo-referenced Databases: a way to improve decision-making", in James Pick (Ed.), GIS in Business, Idea Group Publishing, 2005, ISBN 1-59140-400-2.
10. Soares, F., "An Interpretation of ISO 17799 Security Management Standard", ECIS 2005 - 13th European Conference on Information Systems, Regensburg, Alemanha, May 2005.

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

During the 2003-2006 period, 15 PhD theses and 49 MSc theses were completed:

- 2003: 5 PhD ; 9 MSc
- 2004: 4 PhD; 8 MSc
- 2005: 2 PhD; 11 MSc
- 2006: 4 PhD; 21 MSc

In 2006 around 40 students were enrolled in the PhD program.

PhD 2006:

- P. Branco, Computer-based Facial Expression Analysis for Assessing User Experience.
- A. Andrade, Gênese, Criação e Liderança de Comunidades Virtuais de Interesse Cognitivo.
- E. Cardoso, Ambientes de Ensino Distribuído na Concepção e Implementação da Universidade Flexível.
- F. Sá-Soares, Interpretação da Segurança de Sistemas de Informação Segundo a Teoria da Acção.

PhD 2005:

- M. Nicolau, Encaminhamento Diferenciado para Comunicações em Grupo com Requisitos de Qualidade de Serviço
- P. Tomé, Metodologia de Desenvolvimento de Arquitecturas de Sistemas de Informação.

PhD 2004:

- P. Ribeiro, 2MPspe - Modelo de Melhoria do Processo de Desenvolvimento de Software para Pequenas Empresas
- J. Pereira, Sistemas de Informação para o Novo Paradigma Organizacional: o Contributo dos sistemas de Informação Cooperativos.
- L. Santos, Factores Determinantes do Sucesso de Adopção e Difusão de Serviços de Informação On-line em Sistemas de Gestão de Ciência e Tecnologia.
- M. Lousã, Principais Factores Organizacionais que Influenciam a Adopção, Desenvolvimento e Utilização de Sistemas Workflow Administrativos: Estudos de Casos.

PhD 2003:

- M. Gonçalves, ZACCAR - Sistema de Conhecimento para Apoio à Gestão do Relacionamento com Clientes.
- A. Baptista, Informattica Online - Um Enquadramento para a publicação em Linha de Revistas Científicas.
- A. Santos, Estudo de Impactos de Sistemas Informáticos Integrados de Gestão de Instituições de Saúde do Brasil: Uma abordagem sobre Desempenho.
- J. Varajão, Função de Sistemas de Informação: Contributos para a melhoria do sucesso da adopção de tecnologias de informação e desenvolvimento de sistemas de informação nas organizações.
- J. Silva, A desmaterialização da Gestão de Sistemas de Informação: Impactos na sua organização e nos seus recursos humanos.

Selection of MSc Thesis (2006):

- S. Santos, e-Gov e participação política dos municípios Portugueses.
- R. Figueiredo, Portais Escolares: Estudo de Aceitação de um Projecto para um Portal Web num Contexto de Ensino.
- A. Oliveira, Gestão de Processos de Negócio e sua Articulação com o Desenvolvimento de Sistemas de Informação: Aplicação para a Área de Retalho.
- V. Martins, Integração de Sistemas de Informação: Perspectivas, Normas e Abordagens.
- O. Pires, Utilização das Tecnologias de Informação e Comunicação nos Processos de Ensino Aprendizagem.
- J. Pimenta, Estudo de Modelos de Avaliação da Segurança de Informação.
- F. Pinto, Descoberta de Conhecimento em Bases de Dados como Suporte a Actividades de Business Intelligence- Aplicação na Área do Database Marketing.
- R. Martins, Simplificação de Modelos Através do Uso de Data Mining - Aplicação à Área de Medicina Intensiva.

Patents/prototypes (2000 ca.)

Many of the RG's projects involve the creation of information technology artifacts to be used in organizations and society. Early versions of such artifacts can be considered as prototypes. Furthermore, it is common that their development process adopts some kind of prototyping-based approach.

Examples of such artifacts could be found associated to most projects the RG has been involved during the 2003-2006 period. In some cases they evolved to products that have been incorporated in some work context. In other cases they "disappear" after the reports and articles associated to the projects have been published. In both cases, as it is easy to recover them from some kind of computer-based memory, it is common to use them as demonstrations, displayed in occasions such as science and technology exhibitions.

However, considering the nature of information technology artifacts they are seldom preserved as prototypes and included as such in the list of research results. Normally, only in the cases where the prototypes demand some special purpose physical support, they are kept and presented as such.

In what concerns patents, R&D areas related to information technology fall within a gray zone where it isn't always clear whether it is possible to file patents to many research results. Considering the existing ambiguity and following the UMinho's policy related to intellectual policy, the RG began to pay attention to this aspect.

So far, it is possible to report one case:

Adriano Moreira, Maribel Yasmina Santos, PAT36455/07: "Processo de cálculo automático do contorno convexo ou côncavo de um conjunto arbitrário de pontos" – "Concave Hull - Automatic Calculation Process of the Convex or Concave Envelope of an Arbitrary Set of Points", request submitted in March, 8th, 2007 (this patent resulted from work developed within the LOCAL Project. The patent request was submitted in 2007, but results from work developed during 2006).

Organization of conferences (2000 ca.)

RG's members got involved in the organization of scientific/technical events, either as members of organizational committees or as member of the scientific committees:

- Organization committee: 4 (2003), 2 (2005), 6 (2006)
- Scientific/Program committee: 19 (2003), 35 (2004), 43 (2005), 45 (2006)
- Organization of Workshops and Seminars: 2 (2003), 3 (2004), 5 (2005), 4 (2006)

Selection of events:

Organized Conferences and Workshops (selected list):

- EIPub'03 – 7th. ICCS/IFIP International Conference on Electronic Publishing – From Information to Knowledge.
- ACSD'03 – 3rd. International Conference on Application of Concurrency to System Design.
- CoopMedia'03 – 2ª Workshop de Sistemas de Informação Multimédia, Cooperativos e Distribuídos.
- ECNN'04 Workshop – Evolutionary Computation and Neural Networks, EIS 2004: 4th. International Symposium on Engineering of Intelligent Systems.
- OASIS Workshop at the IFIP WG 8.2
- MOMPES'05, MOMPES'06 – International Workshop on Model Driven Methodologies for Pervasive and Embedded Software.
- AGILE'05 – 8th. AGILE International Conference on Geographic Information Science.
- DIPES'06 – IFIP Working Conference on Distributed and Parallel Embedded Systems.
- IFIP WG 8.2 Working Conference on the IS role in leveraging the Intelligence and Creativity of SME's.
- IWIRCRIS'06 – International Workshop on Information Retrieval on Current Research Information Systems.
- SoftWars'06 – International Conference on Social and Ethical Impact of Technology.
- CSMU'06 – Conference on Mobile and Ubiquitous Systems.

Scientific/Program Committees (selected list):

- ICKEDS'03, ICKEDS'04, International Conference on Knowledge Engineering and Decision Support.
- ICEIS'03, ICEIS'04, ICEIS'05, ICEIS'06, International Conference on Enterprise Information Systems.
- EIPub'03, EIPub'04, EIPub'06, ICCS/IFIP Conference on Electronic Publishing.
- PKDD'05, 9th. European Conference on Principles and Practice of Knowledge Discovery in Databases.
- ICIS'05, ICIS'06, International Conference on Information Systems.

Industry contract research (2000 ca.)

Several RG projects involve institutions that hire the RG services. Although not all of such institutions can be classified as industry, they all correspond to institutions that benefit from the RG competences and R&D results.

Two technological projects have been promoted (and co-funded) by a Portuguese agency for innovation – Agência de Inovação (AdI). These projects necessarily involve a company, interested in the research results, which assume a part of the project financial needs.

Several other projects have been funded by governmental bodies, local government associations, or local government initiatives (e.g., initiatives related to digital cities and regions). These projects mainly focus on aspects related to the information society.

Projects in areas such as e-government and information services have also been sponsored by government bodies (e.g., mission unit for the information and knowledge society; science and technology observatory; Ministry of Justice).

The center's host institution – University of Minho – is also a contractor, especially in projects related with information services. Projects involving UMinho include products associated to: institutional repository; electronic voting; peer-to-peer communication; electronic CVs service.

Internationalization (2000 ca.)

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

RG's internationalization evidences include collaborative publications and participation in international consortia that carry out R&D projects. The results in these 2 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 RG is involved in the national collaboration program between Portugal and the Carnegie Mellon University (software engineering stream). Other contacts have been established aiming to create (or to adhere to) international graduate programs (e.g., information systems, information science, computer networks, computer graphics).

Recognizing that internationalization relies on the strength of individual networking, some initiatives have been set up aiming at stimulating networking, e.g.: motivate young members of the Information Systems Dep. to do their doctoral studies abroad or to involve foreign researchers as co-supervisors when they do their studies at UMinho; invite foreign researchers to visit UMinho for teaching in the graduate programs and to collaborate with researchers; encourage RG members to participate in committees either related to the organization of events or related to international bodies;

encourage researchers to use their sabbatical leaves to visit other institutions.

A reasonable number of contacts and collaboration involve researchers and institutions in Latin America. Portugal occupies a particular position in the world that brings up two different spheres of internationalization in research and education: the global world where English is the lingua franca; the world of Portuguese and Spanish speaking countries. This luso-hispanic world constitutes an important market from the point of view of educational institutions and the language affinity among its countries facilitates the establishment of collaborative relations. This explains the relevance of international collaboration in those two realms.

Future Research

Objectives

Funding, source, dates

Previous publications in the area

Special Requirements

[Print](#)

[Visão Global](#)

[Opções](#)

- » [Página de Entrada](#)
- » [Regulamento](#)
- » [Ajuda](#)
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- » [Visão global do Relatório \(para impressão\)](#)
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- » [Unit Report Form \(Exemplo\) Parte B - Research Group\(s\)](#)

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Group Description	
Research Unit:	CENTRO ALGORITMI UID:319 (L700319) (LCOMP-Norte-Braga-319)
Group Name/Designation:	Systems Engineering
Group Reference:	RG-X-COMP-Norte-Braga-319-1127
Principal Investigador:	Edite Manuela da Graça Pinto Fernandes
Time Interval:	(2003-2007)
Location of Group (Host Institution):	Universidade do Minho
Keywords:	Nonlinear Optimization; Operations Research and Logistics; Applied Statistics; n/a
Funding, source, dates:	- Application of Branch-and-Price Algorithms in Scheduling,, POSI/ SRI/ 48873/2002, 40000 € (2004-2007), PI: Carvalho, V. (UM). - Um método de redução para programação semi-infinita não linear, POCI/MAT/58957/2004, 12000 € (2005-2007), PI: Vaz, A.I.F. (UM) (members: Fernandes, E.M.G.P., Monteiro, M.T.T., Costa, L., Pereira, A.I.N.). - Optimização sem derivadas e aplicações, POCI/MAT/59442/2004, 23000 €, (2005-2007), PI: Vicente, L.N. (UC) (member: Vaz, A.I.F.). - Mathematical Analysis of Piezoelectric Problems, POCI/MAT/59502/2004, 9904€ (2005-2007), PI: Figueiredo, I.N. (UC) (members: Oliveira, P., Costa, L.). - Models, algorithms and tools for large scale integer optimization, POS_C/EIA/57203/2004, 70000 €, (2005-2008), PI: Carvalho, V. (UM). - Sheet cutting and process optimization for furniture enterprises, COOP-CT-2006-032998, (funded by the European Commission, 6th Framework Programme on Research, Technological Development and Demonstration), Total funding:1200000 €, Uminho funding: 138500 €, (2006-2008), PI: Carvalho, V. (UM).

PI and Researchers

Researchers in the Group (Ph.D. Only)

- (CV) Ana Cristina da Silva Braga
- (CV) Ana Isabel Pinheiro Nunes Pereira
- (CV) Ana Maria Alves Coutinho da Rocha
- (CV) António Ismael de Freitas Vaz
- (CV) Celina Maria Godinho da Silva Pinto Leão
- (CV) Cláudio Manuel Martins Alves
- (CV) Edite Manuela da Graça Pinto Fernandes
- (CV) Eusébio Manuel Pinto Nunes
- (CV) Filipe Pereira Pinto da Cunha e Alvelos
- (CV) Guilherme Augusto Borges Pereira
- (CV) Joao Luis Honorio Matias
- (CV) José António Vasconcelos Oliveira
- (CV) Jose Manuel Henriques Telhada
- (CV) José Manuel Vasconcelos Valério de Carvalho
- (CV) Lino Antonio Antunes Fernandes da Costa
- (CV) Luís Miguel da Silva Dias
- (CV) Manuel Carlos Barbosa Figueiredo
- (CV) Maria Sameiro Faria Brandao Soares Carvalho
- (CV) MARIA TERESA TORRES MONTEIRO
- (CV) Pedro Nuno Ferreira Pinto Oliveira
- (CV) Sérgio Dinis Teixeira de Sousa

Other Researchers in the Group (Ph.D. Only)

- (CV) António José Marques Guimarães Rodrigues
- (CV) Isabel Alexandra Costa Pinho do Espírito Santo
- (CV) Isabel da Silva Lopes

Other Researchers in the Group (non Ph.D.)

n/a

Objectives and Achievements

General Objectives

The research activities of the Systems Engineering (SE) group bring together researchers from the following areas:

Confidencial

Nonlinear Optimization (including global, semi-infinite, multi-objective, smooth and non-smooth programming), Integer and Linear Optimization, Logistics and Transportation, Modelling and Simulation, Quality, Reliability and Maintenance, and Applied Statistics. The research is mainly organized around projects that have specific goals within a particular area of the Systems Engineering:

Nonlinear Optimization - fundamental research activities and the development of new optimization algorithms for solving real-world problems, such as: electric energy market problem (mathematical program with complementarity constraints), air pollution control and robot trajectory planning (semi-infinite programming problem), optimal design of wastewater treatment plants (non-smooth finite nonlinear problem), piezoelectric anisotropic problems (multi-objective optimization problem); travelling salesman and repairman problems (large linear program); astrophysics (global optimization).

Optimization – Large Scale Integer Programming and Metaheuristics, and their application in Cutting and Packing, Scheduling and Manufacturing.

Logistics and Transportation – Supply Chain Management, Transportation Systems, Forecasting and Inventory.

Modeling and Simulation - Automatic translation and generation, and applications in manufacturing.

Quality, Reliability and Maintenance - Quality Management Systems, Certification and Accreditation, and Reliability.

Applied Statistics - design of experiments and data analysis and research on Receiver Operating Characteristic analysis.

ICTs in engineering education - follows the trends in engineering education as a multi and inter disciplinary task (Numerical Methods, Process Control and Automation subjects).

Main Achievements

1. Substantial increase in PhDs:

The SE group has now 23 PhDs members, including A.Rodrigues who is serving as Rector of the University. More than half of them got their degrees only recently (2 in 2007, 11 in 2003-2006).

2. Quality of the publications increased in relation to previous evaluation period.

3. Master degree proposals increased:

Due to previous FCT excellent evaluation, the group proposed new MSc courses in Systems Statistics (from 2007/08) and Systems Engineering (from 2008/09), as well as the Integrated Master in Management and Industrial Engineering (from 2006/07).

4. Internationalization and research cooperation increased:

There are now joint publications and research projects, and the group became attractive to international post-doctoral researchers.

5. Links with surrounding industry increased:

There are ongoing projects involving PhD students with grants funded by the Program Bolsas de Doutoramento em Empresa (BDE) of FCT.

Several MSc students had/have thesis work related to their employing companies (Blaupunkt, Delphi, HOFESA, FAL, Kromberg & Schubert).

6. Involvement in R&D multidisciplinary projects increased:

There are joint projects with researchers from other areas, such as biological, chemical and mechanics engineering, economics, medicine, and informatics, and other faculties from the Coimbra, Porto and Minho Universities.

7. International research impact increased:

As a result of the ongoing research, an extension of AMPL to SIP problems, SIPAMPL software, and a solver NSIPS, is now publicly available in the NEOS Server (<http://neos.mcs.anl.gov/neos/solvers/index.html>). The Pswarm (Patern Swarm) solver is also publicly available in the NEOS Server.

Productivity

Publications in peer review Journals (3000 ca.)

(Up to a max of 10. Always indicate at the end of the citation, impact factor of the journal (IF=) and number of citations (n^o C=). Give title and full citation in original language. DO NOT translate)

The number of Citations (n^oC) is from ISI. The Cited Half-life (CHI) is also included.

- Ben Amor, H.; Desrosiers, J.; Carvalho, V., Dual-optimal Inequalities for Stabilized Column Generation, Operations Research, 54, 3, pp. 454-463, 2006. (IP=1.234)(CHI>10.0).
- Carvalho, V., Using extra dual cuts to accelerate convergence in column generation, INFORMS Journal on Computing, 17, 2, pp. 175-182, 2005. (IP=0.865) (n^oC =3) (CHI=6.4).
- Costa, L.; Oliveira, P., An Adaptive Sharing Elitist Evolution Strategy for Multiobjective Optimization, Evolutionary Computation, MIT Press, V. 11 (4), 417-438, 2003 (IP= 1.325) (CHI=7.1) (n^oC= 2).
- Costa, L.; Fernandes, L.; Figueiredo, I.; Júdice, J.; Leal, R.; Oliveira, P., Multiple- and single-objective approaches to laminate optimization with genetic algorithms, Structural and Multidisciplinary Optimization, V. 27 (1-2), 55-65, 2004 (IP=1.019) (CHI=4) (n^o C=2).
- Faria, J., Matos, M., Nunes, E., Optimal design of work-in-process buffers, International Journal of Production Economics 99 (2006) pp.144-155; (IP=1.183) (CHI=6.2).
- Oliveira, J.A., Scheduling the truckload operations in automatic warehouses, European Journal of Operational Research, 179, 3, pp. 723-735, 2007. (IP=0.918)(CHI=8.4).
- Serra R.; Braga, A.C.; Venâncio, A., Mycotoxin producing and other fungi isolated from grapes for wine production, with particular emphasis on Ochratoxin A, Research in Microbiology, V. 156, 515-521, 2005 (IP=2.426) (CHI=4.9)(n^o C= 11).
- Sousa, S., Aspinwall, E., Guimarães Rodrigues, A., Performance Measures In English SMEs: Survey Results, Benchmarking- An International Journal, 2006. 13(1/2), pp. 120-134.
- Vaz, A.I.F.; Fernandes, E.M.G.P.; Gomes, M.P.S.F., An interior-point method for semi-infinite programming, Optimization Methods and Software, V. 18 (6), 673-687, 2003 (IP=0.477)(CHI=5.9).
- Vaz, A.I.F.; Fernandes, E.M.G.P.; Gomes, M.P.S.F., SIPAMPL: Semi-Infinite Programming with AMPL, ACM Transactions on Mathematical Software, V. 30 (1), 47-61, 2004 (IP=1.463)(CHI >10)(n^o C= 2).

Other publications (3000 ca.)

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

- Antunes, A.M.S.; Monteiro, M.T.T. A Filter Algorithm and other NLP Solvers: Performance Comparative Analysis. Lecture Notes in Economics and Mathematical Systems, ISSN: 0075-8442, Springer-Verlag, V. 563, 425-434, 2006.
- Ben Amor, H., Carvalho, V., Cutting Stock Problems, in Column Generation, Guy Desaulniers, Jacques Desrosiers, and Marius M. Solomon (eds.), pp. 131-162, Springer US, 2005, ISBN: 0-387-25485-4.
- Costa, L.; Oliveira, P., An Elitist Genetic Algorithm for Multiobjective Optimization, Metaheuristics: Computer Decision-Making, M.G.C. Resende et al. (Eds), Kluwer, chapter 10, (217-236) ISBN 1-4020-7653-3, 2003.
- Faria, J., Matos, M., and Nunes, E., Integrated reliability management in industrial production systems, in Safety and Reliability for Managing Risk, C. Guedes Soares and E. Zio (eds), Vol. 2, pp. 1181-1187, 2006, Taylor & Francis, ISBN

978-0-415-42313-7.

5. Lopes, I., Leitão, A., Pereira, G., Maintenance float system with periodic overhauls, in Safety and Reliability for Managing Risk, C. G. Soares and E. Zio (eds), Vol. 1, pp. 613-618, 2006, Taylor & Francis, ISBN 978-0-415-42313-7.
6. Oliveira, J.A., A Genetic Algorithm with a Quasi-local Search for the Job Shop Problem with Recirculation, in Applied Soft Computing Technologies: The Challenge of Complexity, A. Abraham, B. Baets, M. Köppen and B. Nickolay (eds.), pp. 221-234, Springer, 2005, ISBN: 978-3-540-31649-7.
7. Pereira, A.I.P.N.; Fernandes, E.M.G.P., A new algorithm for identifying all global maximizers based on simulated annealing, 6th. World Congress of Structural and Multidisciplinary Optimization, J. Herskowitz et al. (Eds.), ISBN 85-285-0070-5, (15 pp), Brasil, 2005.
8. Sampaio, P., Saraiva, P., Rodrigues A., "ISO 9000 Certification Research: a State-of-the-Art", in ASQ World Conference on Quality and Improvement Proceedings, Milwaukee, WI, Vol. 60, No. 0, pp. 1-14, American Society for Quality.
9. Santos M.; Silva-Fernandes, A.; Oliveira, P.; Sousa, N.; Maciel, P., Evidence for abnormal early development in a mouse. Genes, Brain and Behavior. nº 1, 1-10, 2006 (IP=4.091)(CHI=2.4).
10. Vaz, A.I.F.; Fernandes, E.M.G.P., Tools for robotic trajectory planning using cubic splines and semi-infinite programming. Lecture Notes in Economics and Mathematical Systems, ISSN: 0075-8442, Springer-Verlag, V. 563, 399-413, 2006.

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

- Leão, C.P., Modelling and Simulation of Separation/Reaction Process, PhD thesis, UPorto, 2003, sup: Rodrigues, A.E.
- Figueiredo, M., Forecasting, Monitoring and Stock Control in the Mail Order Environment, PhD thesis Univ. Lancaster, U.K., 2003. sup: R.Eglese (Lancaster), A.Rodrigues.
- Matias, J.L.H., Técnicas de penalidade e barreira baseadas em métodos de pesquisa directa e a ferramenta PNL-Pesdir, PhD thesis, UTAD, 2003, sup: Fernandes, E.M.G.P.
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- Lopes, M., Aplicação do método de partição e geração de colunas à programação de máquinas paralelas, PhD thesis, UM, 2005 sup: V.Carvalho.
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- Nunes, M.J.L., Metodologias de Desenvolvimento de Novos Produtos Industriais, PhD thesis, UM, 2005, sup: Braga, A.C.; Paisana, A.V.
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- Rodrigues, H.S.F., Problema de Optimização com Restrições de Complementaridade: uma aplicação ao mercado de energia eléctrica, MSc thesis, UM, 2006, sup: Monteiro, M.T.T.
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- Guerreiro, A., Simulação Distribuída para Projecto e Controlo de Sistemas de Produção Distribuídos e Virtuais, PhD thesis, UM 2006 sup: G.Putnik, A.Rodrigues.
- Abelenda, C.S.S., Avaliação do conforto de protectores individuais auditivos, MSc thesis, UM, 2006, sup: Arezes, P. and Braga, A.C.
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- Espírito Santo, I.A.C.P., Desenho óptimo de estações de águas residuais através da modelação de funções custo, PhD thesis, UM, 2007, sup: Fernandes, E.M.G.P.; Araújo, M.M.

Patents/propotypes (2000 ca.)

Software publicly available:

An extension of AMPL to semi-infinite programming problems, SIPAMPL software, and a solver NSIPS for semi-infinite programming -

in the NEOS Server (<http://neos.mcs.anl.gov/neos/solvers/index.html>).

MLOPSOA – Software for multi-local optimization with interface to AMPL.

Pswarm – Software for global optimization with interface to AMPL. Developed in C (serial and parallel versions) and MATLAB. Also available in the NEOS server.

PNL-Pesdir tool – software for non-smooth constrained nonlinear optimization (<http://www.norg.uminho.pt>).

PPSDONL - Augmented Lagrangian pattern search solver for non-smooth nonlinear optimization problems with interface to AMPL.

The following software prototypes were developed in PhD thesis work:

-- S+ (AIMS, Automatic Interactive Modelling of Simulation) -

Automatic generation of simulation models using the Activity Cycle Diagrams paradigm.

-- MLCSP – Multiple Lengths Cutting Stock Problem

Algorithm that provides the optimal solution for the Multiple Lengths Cutting Stock Problem (with constraints for the availability of the stocks rolls).

-- ADDING – Automatic Dantzig-Wolfe decomposition for integer column generation

Tool for automatic reformulation of models of selected decompositions which can also be used to assess the strength of the corresponding linear programming relaxations.

-- MMASSI/TI– A Multicriteria Decision Support System for the Selection of Information Systems/Information Technologies.

Organization of conferences (2000 ca.)

- Carvalho, V., Fernandes, E.M.G.P.; Oliveira, P., Program Committee, Optimization 2004, Lisboa, 2004.
- Carvalho, V., Matias, J.L.H., Program Committee, I Congresso de Estatística e Investigação Operacional da Galiza e Norte de Portugal/VII Congrso Galego de Estadística e Investigación de Operacións, Guimarães, 2005.
- Carvalho, V., Fernandes, E.M.G.P., Oliveira, P., Programme Committee, IO 2004, Porto, 2004.
- Carvalho, V., Programme Committee INOC 2005 - International Network Optimization Conference, Lisboa, Março de 2005.
- Carvalho, V., Carvalho, S., Fernandes, E.M.G.P., Oliveira, P., Programme Committee, IO 2006, Lisboa, 2006.
- Carvalho, V., Programme Committee (Pres), 3rd ESICUP Meeting, The EURO Special Interest Group on Cutting and Packing, Porto, Portugal, March 16-18, 2006.
- Carvalho, V., Programme Committee (Pres), Workshop Integer Programming, Combinatorial Optimization and Heuristics, Braga, 2006.
- Carvalho, V., Programme Committee (Pres), VII International Workshop on Cutting, Packing and Related Topics, Leiria, Portugal, 2007.
- Carvalho, V., Programme Committee (Pres), VII International Workshop on Cutting, Packing and Related Topics, Leiria, Portugal, , 2007.
- Carvalho, V., Fernandes, E.M.G.P.; Oliveira, P.; Vaz, A.I.F., Program Committee, Optimization 2007, Porto, 2007.
- Carvalho, V., Fernandes, E.M.G.P.; Oliveira, P.; Vaz, A.I.F., Program Committee, ORP3 Conference, Guimarães, 2007.
- Costa, L., Program Committee, Conference on Evolutionary Computation (CEC-2004).
- Costa, L., Program Committee, EMO 2005 (Evolutionary Multiobjective Optimization), México, 2005.
- Costa, L., Program Committee, CEC 2005 (IEEE World Congress on Evolutionary Computation), United Kingdom, 2005.
- Costa, L., Program Committee, GECCO 2006 (Genetic and Evolutionary Computation Conference), Seattle, USA, 2006.
- Costa, L., Program Committee, CEC 2006 (IEEE World Congress on Evolutionary Computation), Vancouver, Canada, 2006.
- Oliveira, P., Organizing Committee, Optimization 2004, Lisboa, 2004.
- Oliveira, P., Program Committee, Conference on Evolutionary Computation (CEC-2004).
- Oliveira, P., Local Program Committee, 56th Session of the International Statistics Institute, Lisbon, August 2007.
- Vaz, A.I.F., Organizing Committee, ORP3 Conference, Guimarães 2007 (12 members of the group are involved).

Industry contract research (2000 ca.)

Research contract: Coindu, S.A., Portugal (fabric and leather car set manufacturer with annual sales of 90M€) in operations planning and leather cutting. (50000 euros) 2006-2007. Coordinator: V.Carvalho. A PhD student, who was awarded an FCT BDE grant (Company-university partnership PhD grant), is involved in this project.

Research contract: Moldartpóvoa, (manufacturer of frames for pictures/paintings; leader in Portugal with growing sales across Europe) development of a quality management system (QMS). (6000 euros) 2006. Coordinators: E. Nunes and S. Sousa.

Internationalization (2000 ca.)

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

1. Collaborative publications and research:

- V.Carvalho with J.Desrosiers (Université de Montréal, Canada), in column generation.
- V. Carvalho with Hatem Ben Amor (Université de Montréal, Canada), in column generation and cutting stock.
- V. Carvalho, C. Alves with F. Clautiaux (Université de Lille, France) (Former post-doc with grant FCT - SFRH/ BPD/ 24139/ 2005) in dual feasible functions.
- V.Carvalho, F. Alvelos with A. Frangioni (Università di Pisa, Italy) in column generation and non-differentiable optimization.
- E.M.G.P. Fernandes, A.I.F. Vaz with M.P. Gomes (Imperial College, UK) on semi-infinite programming and robot trajectory applications.

2. Collaborative work for PhD supervision:

- A.Rodrigues with E. Aspinwall (University of Birmingham, U.K.) - supervision of S. Sousa.
- A. Rodrigues with R. Eglese (University of Lancaster, U.K.) – supervision of M. Figueiredo
- E.M.G.P. Fernandes with M.P. Gomes (Imperial College, U.K.) – supervision of A.I.F. Vaz.

3. Ongoing collaborative research

There is ongoing research, but no publications yet, with

- V. Carvalho, C. Alves with G.Scheithauer, G. Belov (Dresden University of Technology, Germany), in cutting and packing.
- V. Carvalho, C. Alves, F. Alvelos with F. Pezzella (Università Politecnica delle Marche, Italy)
- V. Carvalho, C. Alves, F. Alvelos with Cláudio Arbib (Università degli Studi dell'Aquila, Italy)

4. NSIPS and SIPAMPL Software citations:

<http://www-neos.mcs.anl.gov/neos/solvers/sio:nsips/AMPL.html>. (NSIPS in NEOS Server)

<http://www.scicomp.uni-erlangen.de/archives/SW/opt.html>.
<http://www.math.hu-berlin.de/~skoerke/links.html>. SIPAMPL homepage.
http://rac.uits.iu.edu/education_and_training/numerics.shtml. SIPAMPL homepage.
NSIPS and SIPAMPL homepages:
<http://gams.nist.gov/OtherSources.html>
<http://www.numerical.rl.ac.uk/external/optimization.shtml>.
<http://www.uni-koeln.de/themen/or/software.html>.
http://www.mat.univie.ac.at/~neum/glopt/software_l.html.
<http://www-unix.mcs.anl.gov/otc/Guide/faq/nonlinear-programming-faq.html>.
5. An MPCC problem, proposed by Monteiro M.T.T., made available in MacMPEC ampl collection (monteiro.mod, <http://www-unix.mcs.anl.gov/~leyffer/MacMPEC/>).

Future Research
Objectives
Funding, source, dates
Previous publications in the area
Special Requirements

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Group Description	
Research Unit:	CENTRO ALGORITMI uid:319 (L700319) (LCOMP-Norte-Braga-319)
Group Name/Designation:	Industrial electronics
Group Reference:	RG-COMP-Norte-Braga-319-2959
Principal Investigador:	Carlos Alberto Caridade Monteiro e Couto
Time Interval:	(2007-2010)
Location of Group (Host Institution):	Universidade do Minho
Keywords:	Robotics, Automation and Instrumentation; Energy and Power Electronics; Embedded Systems; Communications Systems and Services
Funding, source, dates:	- EU, JAST, IST-2-003747-IP, 2004-2008, 560.000€ - EU, ArteSimit, IST-2000-29689, 2001-2004, 167.000€ - FCT, CoopDyn, POSI/SRI/38051/2001, 2002-2006, 62.000€ - FCT, Anthropomorphic Robotic Systems, REEQ/17/2001, 2005-2007, 92.000€ - FCT, Online Monit./Control Knitting Process, POSI/SRI/39824/2001, 2002-2004, 60.000€ - FCT, Dif. Thermal Analyzer for Shear Induced Crystallization Studies, POCTI/CTM/33061/99, 2000-2004, 34.916€ - FCT, High Resol. On-line Yarn Evenness An., POSI/P/EEI/13189, 1999-2003, 50.000€ - FCT, SCAPS, POCTI/EME/61425/2004, 2005-2007, 33.600€ - ADI- IDEIA, Adv. Weighing Elect. Indicator, ADI2004/M 2.3/0012, 2003-2005, 20.000€ - ADI-POCTI, MICROPYROM, 2004-2007, 425.000€ - ADI-PRIME, SINUS, DEMTEC/020/1/03, 2005-2007, 706.488€ - FCT, Dev. Interfaces Renewable Energy Sources, POCTI/ESE/48242/2002, 2004-2007, 30.000€ - FCT, Dev. Active Filters Power Quality Improv., POCTI/ESE/41170/2001, 2002-2006, 65.000€ - PRIME, TECNOVOZ, 03/00165, 2006-2008, 118.768€ - EU Socrates/Grundtvig, SAVI, 2004-2006, 39.000€ - Internal projects, 2003-2006, 67.600€

PI and Researchers
Researchers in the Group (Ph.D. Only)
(CV) Adriano Jose da Conceicao Tavares
(CV) Antonio Fernando Macedo Ribeiro
(CV) Carlos Alberto Batista da Silva
(CV) Carlos Alberto Caridade Monteiro e Couto
(CV) Cristina Manuela Peixoto dos Santos
(CV) ESTELA Guerreiro Silva BICHO
(CV) Filomena Maria Rocha Menezes Oliveira Soares
(CV) Jaime Francisco Cruz Fonseca
(CV) João Carlos Aparício Paulo Fernandes
(CV) Joao Luis Marques Pereira Monteiro
(CV) João Luiz Afonso
(CV) João Miguel Clemente de Sena Esteves
(CV) Joaquim José dos Santos Esteves Neves
(CV) José Araujo Mendes
(CV) José Augusto Afonso
(CV) Jose Manuel Tavares Vieira Cabral
(CV) Júlio Manuel de Sousa Barreiros Martins
(CV) Luis Filipe Botelho Ribeiro
(CV) Manuel João Sepúlveda Mesquita de Freitas
(CV) Paulo José Guimarães Garrido
Other Researchers in the Group (Ph.D. Only)
(CV) Paulo Francisco Silva Cardoso
Other Researchers in the Group (non Ph.D.)
n/a

Confidencial

Objectives and Achievements

General Objectives

This group congregates a relatively large number of researchers organized in 5 areas: 1-Mobile and Anthropomorphic Robotics; 2-Automation, Control and Instrumentation; 3-Energy and Power Electronics; 4-Embedded Systems; 5-Communications Systems and Services. The idea is that the researchers of these areas work in cooperative sub-groups, and that these sub-groups increase in size and competitiveness, becoming autonomous groups in the future.

The main goals for each of the above mentioned areas were:

- 1- To build jointly-acting autonomous systems (robot-robot, human-robot) that communicate and work intelligently on mutual tasks (e.g. joint transportation of objects, robotic football, joint construction): i) to build control architectures for multi-robot motion coordination, ii) to build neuron-cognitive inspired architectures that endow the robots with cognitive behaviour, iii) to investigate how such systems can be synthesized using methods from the theory of non-linear dynamical systems.
- 2- Development of solutions requested by industry and by other department/ research groups. The added value was on Mechatronics Systems; Computer Vision and Image Processing; Instrumentation, Acquisition, Automations and Control; and on Multisensor Fusion and Integration using Soft Computing Techniques.
- 3- To develop R&D on: Shunt and Series Active Power Filters (control systems and power electronics hardware); Low-Cost Power Quality Monitoring Systems; and Optimized Interfaces for Renewable Energy Systems with the Power Grid. To develop Power Quality studies in Portuguese industries.
- 4- To study, modelling, simulating, and designing concurrent, real-time, embedded systems. The focus was on assembly of systems and tools based on the use of languages to generate retargetable tools adapted to the application/system. A major problem addressed was the design of a language capable to describe development tools, such as, full systems simulators, debuggers and compilers.
- 5- To research on: Real-time Data Acquisition and Control Systems; Integration of Services on the Public Access Network; Medium Access Control for Wireless Radio Networks; Real-time Traffic Scheduling Based on Quality of Service; Error Control Techniques; Interfaces and Distributed Applications for Blind-People Virtual Communities.

Main Achievements

The achievements are presented separately to the 5 sub-groups:

- 1- Development and validation of: i) A dynamic control architecture for cooperative object transportation (Innovation Prize 2003 for Young Engineers); ii) A prototype of an omnidirectional wheelchair for disabled people (BES 2006 Prize) iii) A dynamic neural field-based robot control architecture for implementing cognitive capacities for human-robot interactions. 4 papers in Int. Journals and 1 submitted, 3 Chapters in Books, 25 papers in Int. Confs.
- 2- Several R&D projects, with internal and external funding, developed in collaboration with other departments: Web teleoperation of industrial robot; Data monitoring and control software for tri-axial testing machine; Road surface texture acquisition using stereo vision and laser stripe; Vacuum chamber automation; MICROTEST - software for data monitoring and control of testing polymeric materials; On-line monitoring and control of knitting process; Differential thermal analyzer for shear induced crystallization studies; High resolution on-line yarn evenness analysis. Outcomes apart from publications include laboratorial prototypes, products and patents.
- 3- Development of 4 prototypes in the Power Quality area (Active Power Filters and Power Quality Monitors). 27 full papers in Int. Confs, 5 in Nat. Confs, and 11 in Nat. Journals. 1 PhD and 4 MsC concluded. 3 Projects with a total funding of 800.000€.
- 4- A framework architectural model and a UML profile that supports the specific concepts in embedded systems, such as: Automatic Generation of Retargetable Processor Simulators; Real-time Operating Systems using Aspect Programming. Simulators for ARM, SPARC and 8051 processors were generated. Also developed: A fault-tolerant middleware for BOSS operating; An IDE for video surveillance systems.
- 5- A S-link to giga bit ethernet adapter; Frame segmentation procedure for LHCb data acquisition system; A wireless Bluetooth based distributed data acquisition and control system; Low power real-time medium access control protocol for wireless sensor and actuator networks; System architecture for low bit rate traffic aggregation in control applications; Scheduling algorithms to perform traffic aggregation based on QoS parameters; A virtual orchestra software for the visually impaired. 17 papers in Int. Confs; a Teacher's/Trainer's Handbook and online manual for the visually impaired.

Productivity

Publications in peer review Journals (3000 ca.)

(Up to a max of 10. Always indicate at the end of the citation, impact factor of the journal (IF=) and number of citations (n^o C=). Give title and full citation in original language. DO NOT translate)

1. W. Erlhagen, A. Mukovsky and E. Bicho, "A Dynamic Model for Action Understanding and Goal-Directed Imitation", Brain Research 1083:174-188, 2006 - ISI Web of Knowledge: (IP = 2.341) (n^oC = 7).
2. W. Erlhagen, A. Mukovskiy, E. Bicho, G. Panin, C. Kiss, A. Knoll, H. van Schie and H. Bekkering, "Goal-directed Imitation in Robots: a Bio-inspired Approach to Action Understanding and Skill learning", Robotics and Autonomous Systems 54(5): 353-360, 2006 - ISI Web of Knowledge: (IP = 0.832) (n^oC = 7).
3. C. P. Santos, "Computer Vision and Fuzzy Rules applied to an Industrial Desktop Robot", Assembly Automation, Emerald Group Publishing Limited ISSN 0144-5154, Vol. 26, N. 1, pp. 59-68, 2006 - ISI Web of Knowledge: (IP = 0.307).
4. F. Vaz, J. Ferreira, E. Ribeiro, L. Rebouta, S. Lanceros-Mendez, J.A. Mendes, E. Alves, Ph. Goudeau, J.P. Riviere, F. Ribeiro, I. Moutinho, K. Pischow, J. de Rijk, "Influence of Nitrogen Content on the Structural, Mechanical and Electrical Properties of TiN Thin Films", Surface and Coatings Technology, 191 317-323, 2005 - ISI Web of Knowledge: (IP = 1.559) (n^oC = 5).
5. J. A. Martins, Wd. Zhang, A. M. Brito, U. Infante, M. Romero, F. O. Soares, "Isothermal and Nonisothermal Crystallization of Polymers: Analysis with a Shear Differential Thermal Analyzer", Review of Scientific Instruments 76, 105105, 2005 - ISI Web of Knowledge: (IP = 1.541) (n^oC = 2).
6. A.Valente, Raul Morais, C. Couto and J. H. Correia, "Modeling, Simulation and Testing of a Silicon Soil Moisture Sensor Based on the Dual-Probe Heat-Pulse Method", Journal Sensors and Actuators A, Vol. 115, pp.434-439, Elsevier Science, September 2004 - ISI Web of Knowledge: (IP = 1.462) (n^oC = 3).
7. Raul Morais, A. Valente, C. Couto and J. H. Correia, "A Wireless RF CMOS Mixed-Signal Interface for Soil Moisture Measurements", Journal Sensors and Actuators A, Vol. 115, pp.376-384, Elsevier Science, September 2004 - ISI Web of Knowledge: (IP = 1.462) (n^oC = 2).
8. V. Carvalho, J.G. Pinto, J.L. Monteiro, R. Vasconcelos, F. O. Soares, "Yarn Parameterization Based On Mass Analysis", Journal on Sensors And Actuators - Elsevier Science A: Physical, Vol. 115, Issues 2-3, 21, p540-548, September 2004 - ISI Web of Knowledge: (IP = 1.434) (n^oC = 1).
9. Mihalic F, Milanovic M, Couto C, "Improved frequency characteristics of the randomized PWM boost rectifier", International Journal of Electronics 90 (4): 235-242, Taylor & Francis Ltd, England, April 2003 - ISI Web of Knowledge: (IP = 0.213) (n^oC = 1).

10. J. A. Martins, W. Zhang, V. Carvalho, A. M. Brito, F. O. Soares, "Evaluation of the Sample Temperature Increase During the Quiescent and Shear-Induced Isothermal Crystallization of Polyethylene", Polymer – Elsevier, Vol 44, N. 26, 2003, p8071-8079, 2003 - ISI Web of Knowledge: (IP = 2.340) (n°C = 3).

Other publications (3000 ca.)

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

1. Cristina P Santos, Manuel J Ferreira, "Computer Vision and Fuzzy Rules Applied to a Dispensing Application in an Industrial Desktop Robot", Munir Merdan (Eds), Industrial Robots – from Design to Applications, Advanced Robotics Systems International, 2006.
2. W.Erlhagen, A.Mukovskiy, E.Bicho, G.Panin, C.Kiss, A.knoll, H. van Schie, H.Bekkering, "Action-Understanding and Imitation Learning in a Robot-Human Task", Artificial Neural Networks: Biological Inspirations, Lecture Notes on Computer Science, pp. 261-268, Springer Verlag, 2005.
3. Fonseca, J., Martins, J. and Couto, C., "Acquisition the Profile of Surfaces with Complementary Sensor Fusion Techniques", Chapter 15 in DAAAM International Scientific Book, 2005, B. Katalinic (Ed.), Published by DAAAM International, Vienna, Austria, ISBN: 3-901509-43-7, ISSN 1726-9687.
4. F. Guhr, L. Ferreira da Silva, Filomena Oliveira Soares, H. Carvalho, "Industrial Applications of Fuzzy Algorithms: Fuzzy Logic Based Control Strategies for an Electromagnetic Actuated Sewing Machine Presser Foot", IEEE ICIT' 04 – IEEE International Conference on Industrial Technology, Hammamet, Tunisia, December 8-10, 2004.
5. João L. Afonso, M. J. Sepúlveda Freitas, and Júlio S. Martins, "p-q Theory Power Components Calculations" – ISIE'2003 - IEEE International Symposium on Industrial Electronics, Rio de Janeiro, Brasil, 9-11 June 2003, ISBN: 0 7803 7912 8.
6. Ricardo Pregitzer, J. C. Costa, Júlio S. Martins, and João L. Afonso, "Simulation and Implementation Results of a 3 Phase 4 Wire Shunt Active Power Filter", ICHQP'2006 - International Conference on Harmonics and Quality of Power, Cascais, Portugal, 1-5 Oct. 2006.
7. A. Tavares, C. Lima, C. Silva, J. Metrôlho and C. Couto, "WCET Prediction using an ADL to Describe the Architecture of the Embedded Processors". Design of Embedded Control Systems, Editors: M. Adamsky, A. Karatkevich, and M. Wegrzyn, Section 2, pages 39–50, Springer Verlag, 2005, ISBN 0-387-23630- 9.
8. S. Lopes, C. Silva, A. Tavares, and J. Monteiro, "Development of Embedded Systems Using OORT", Design of Embedded Control Systems, Editors: M. Adamsky, A. Karatkevich, and M. Wegrzyn, Section 5, pages 207–220, Springer Verlag, 2005, ISBN 0-387-23630- 9.
9. J. M. Cabral, J. G. Rocha, J. E. Neves, J. Ruela, "Scheduling Algorithms to support QoS and Service Integration in Sensor and Actuator Networks", International Conference on Industrial Technology - ICIT'06, Mumbai, December 2006.
10. J. A. Afonso, J. E. Neves, "Scheduling of real-time traffic in IEEE 802.11 networks", European Conference on the Use of Modern Information and Communication Technologies - ECUMICT'2004, Ghent, Belgium, April 2004.

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

PhD Thesis completed:

1. Cristina Manuela Peixoto Santos, "Attractor dynamics based generation of timed robotic trajectories", University of Minho, 2003.
2. Manuel João Ferreira, "Desenvolvimento de um protótipo para a identificação, classificação e quantificação de defeitos, aplicável em ambiente industrial", University of Minho, 2004.
3. J.C. Aparício Fernandes, "Análise de Imagens Texturadas com base em Matrizes de Co-ocorrência Modificadas", University of Minho, 2004.
4. Manuel João Sepúlveda Freitas, "Implementação de um Filtro Activo de Potência para Optimização da Interface entre a Rede e outros Sistemas Eléctricos", University of Minho, 2004.
5. João Miguel Clemente de Sena Esteves, "Metodologia de Autocalização Absoluta em Ambientes Quase-Estruturados", University of Minho, 2005.
6. Cabral, J. M., "A System Architecture for Low Bit Rate Traffic Aggregation in Control Applications", University of Minho, 2005.
7. José Augusto Afonso, "Acesso Local sem Fios em Redes de Comunicação - Escalonamento de Tráfego de Tempo Real em Sistemas de Aquisição de Dados e Controlo", University of Minho, 2005.

Master Dissertations completed:

1. Ricardo Luís Guerreiro Pregitzer, "Simulações Computacionais de Filtros Activos de Potência em Condições Reais de Operação", University of Minho, 2006.
2. Manuel Carvalheira, "Controlo de um veículo aéreo semi-autónomo", University of Minho, 2006.
3. Vitor Dias Rodrigues, "Monitorização e Adaptação automática de uma arquitectura de controlo baseada em atratores móveis de sistemas dinâmicos", University of Minho, 2006.
4. Teotónio Silva, "Integração de Sistemas de Comunicação: - Acessos ADSL", University of Minho, 2006.
5. José Carlos Almeida Ribeiro, "Receptor de Rádio-Frequência (RF) em tecnologia CMOS para comunicações sem fios a 433 MHz", University of Minho, 2006
6. Isabel Mendes Pinto, "Representações dinâmicas para a geração de comportamento preditivo em sistemas duo-agente cooperativos", University of Minho, 2005.
7. Eliana da Costa e Silva, "Geração de trajectórias em tempo real: um estudo comparativo", University of Minho, 2005.
8. Maria Fernanda Teixeira Moreira, "Estudo do Potencial de Produção de Energias Alternativas em Portugal", University of Minho, 2005.
9. Ferreira, N. J. M., "Análise da Tecnologia de Transferência de Energia e Informação Sem Fios", University of Minho, 2005.
10. Emílio Ferreira do Couto, "Simulações e Análise de um Filtro Activo Paralelo Trifásico com Controlo Baseado na Teoria p-q", University of Minho, 2004.
11. José dos Santos Teixeira Batista, "Sistema de Monitorização da Qualidade da Energia Eléctrica Baseado em PC", University of Minho, 2004.
12. Rogério Cunha, "Gestão de um Modelo Didáctico de uma Rede de Média e Baixa Tensão: Implementação de um Sistema Computorizado", University of Minho, 2004.
13. Carlos Machado "Sistema Inteligente para Auto-Parametriação em Tempo Real de Serra Circular para Corte de Tubos Metálicos", University of Minho, 2004.
14. José Gabriel Pinto, "Medição de Massa de Fio Têxtil, em Tempo Real, com Resolução de 1 mm", University of Minho, 2004.
15. Alexandrino Silva, "Medição e Análise de Parâmetros em Máquinas de Ensaio Multiaxiais", University of Minho, 2004.
16. Vítor Carvalho, "Parametriação de Fio Têxtil Baseado na Análise de Massa", University of Minho, 2003.

Patents/propotypes (2000 ca.)

Patents:

1. Internacional Patent nº 2006000022, "Omnidirectional Electric Wheelchair Control System", 2006.
2. Portuguese Patent nº 103354, "Sistema p/ cadeira de rodas omnidireccional motorizada", 2005.
3. Portuguese Patent nº 103034, "Multiaxial Dynamometer".
4. Portuguese Patent nº 103157, "Differential thermal analyser for shear induced crystallization studies – Shear DTA".
5. Provisional patent application USPTO nº 60743832, "Music chat environment for interactive playing from remote sites", 2006.
6. Portuguese Patent nº 103551, "Sistema p/ Monitorização Cinética do Corpo", 2006.
7. Portuguese Patent nº 103612, "Sistema Bidireccional de Monitorização e Controlo de Dados em Tempo-Real s/ Fios c/ Robustez Acrescida", 2006.

Prototypes:

1. Bluetooth Based Wireless Distributed Data Acquisition and Control System, presented at Hannover Messe 2006 Exhibition, Hannover, Germany, 2006.
2. Software framework for camera acquisition and image analysis for the AIBO platform integrated with the Webots simulator from cyberbotics.
3. WISEControl - general purpose Wireless Sensor and Control network platform.
4. ArgoUML plug-in for supporting UML profiles.
5. Mobile Autonomous Robot "Afonsinho" developed to Robótica'2006.
6. Industrial electric vehicle for transporting raw materials for the textil industry, with the company Industrial, Lda (it is being commercialized).
7. Mobile Autonomous Robot "TugoBot" developed to Eurobor'2006, Catania, Italy.
8. 5 footballer robots developed to RoboCup'2005, Osaka, Japan.
9. Prototype of an omnidirectional wheelchair for disabled people under 30 kg (children). This prototype was first presented on the Normédica/Ajutec fair (Exponor - Porto) in 2005, being shown up on several TV programs (Praça da Alegria, Conosco, Telejornal RTP1, Jornal 2, etc).
10. Prototype of an omnidirectional wheelchair for disabled people for up to 120 Kg (adults) in coloboration with OrtoMai company.
11. 5 footballer robots (2006), with whistle recognition.
12. Mobile autonomous robot (car shapped) to the Autonomous Driving League.
13. Portable Three-Phase Power Quality Monitoring System (5 units built - used for studies in industries).
14. Laboratory prototype of a Three-Phase 3-Wire Shunt Active Power Filter - 115 V, 15 A.
15. Laboratory prototype of a Three-Phase 4-Wire Shunt Active Power Filter - 230 V, 20 A.
16. Single-Phase 4-Wire Shunt Active Power Filter prototype - 230 V, 20 A.

Organization of conferences (2000 ca.)

- Robotica'2006, (received over 800 participants, and more than 250 robots), 28 April to 1 May 2006, Multi-Usos Pavillion, Guimarães, Portugal.
 - "Robótica na Indústria e nos Serviços" - Symposium with the ROBÓTICA magazine, 3 March 2006, University of Minho, Guimarães, (with the industrial local association and over 300 participants).
 - "Exploring Space" - Invited Speech given by Prof. Calude Nicollier (ESA Astronaut), University of Minho, 28 April 2006.
 - Co-organization of EGPGV'06, Eurographics - Symposium on Parallel Graphics and Visualizalation, May 2006, University of Minho, Braga.
 - Co-Organization of the 1st Robotics Sports Meeting, Multi-Usos Pavillion, Guimarães, with robotics competitions to qualify for the RoboCup'2004 Júnior Leagues.
 - Co-Organization of 1st "Tertúlias em Inteligência Artificial (TeIA) – Robótica Autónoma e Inteligência Artificial" – APPIA, 25 Oct. 2006, University of Minho, Braga.
 - Co-Organization (General Co-Chairman) of ISIE'2003 - IEEE International Symposium on Industrial Electronics, Rio de Janeiro, Brazil, June, 2003.
 - Co-Organization (General Co-Chairman) of ICIT'04 - IEEE International Conference on Industrial Technology, Hammamet, Tunisia, 8-10 December 2004.
 - Co-Organization (General Program Co-Chairman) of ETFA'2003 - 9th IEEE International Conference on Emerging Technologies and Factory Automation, Lisbon, Portugal, 16-19 September, 2003.
 - 2nd Symposium of Power Electronics, University of Minho, Guimarães, 28 September 2005.
- Members of Organizing Committees of the Conferences:
- ISIE'2005, Dubrovnik, Croácia (Member of the International Advisory Board).
 - ISIE'2006, Montreal, Canada (Finance Chair).
 - IECON'2005, Raleigh, USA (International Publicity Co-Chair).
 - ICIT'2005, Hong Kong, (Member of the International Advisory Board).
 - ICIT'2006, Mumbai, India, (Member of the International Advisory Board).
 - ETFA'2005, Catania, Italy, (Member of the International Advisory Committee).
 - ETFA'2006, Prague, Czech Republic, (Member of the International Publicity Committee).
 - Controlo 2006, Lisbon, Portugal, (Member of the Program Committee).
 - RoboCup'2004 (Middle Size League Local Chair).
 - RoboCup'2005, Osaka, Japan.
 - 1st Int. Conf. on Dextrous Autonomous Robots and Humanoids, 2005, Yverdon-les-Bains, Switzerland.
 - 3rd Int. Conf. "Hands on Science" - HSci 2006, Braga, Portugal.

Industry contract research (2000 ca.)

- Research agreement with Honda Research Institute Europe (Offenbach, Germany) - Dynamic Field-based Modelling of Cognitive Capacities.
- Research agreement with the company Qimonda (Vila do Conde, Portugal) for the development of an Autonomous Mobile Robot for Samples Transportation and Distribution.
- Protocol established with the company Lincis to develop new embedded technologies in the field of Computer Vision, 15.000€/year.
- Protocol with the company OrtoMaia to develop an Omnidirectional Wheelchair.
- Protocol with the company A Industrial, Lda. to develop Footballer Robots.
- Partnership with the company Cyberbotics to develop new functionalities for the AIBO Platform to be integrated onto the webots simulator.
- Project funded by the company CORSAR-Equipamentos e Produtos Industriais Lda, "Control and Monitorization of Cloro/Redox", 23.000€.
- Project funded by the company Ainoga – S.G.P.S., SA, "Boia da Vida", 27.000€.

- Project SINUS – Technology for Dynamic Compensation of Harmonics, Power Factor and Unbalances – DEMTEC/020/1/03, development of prototypes to be tested in the companies Lameirinho - Indústria Têxtil, S.A., Alliance UniChem Farmacêutica, S.A, Hospital Pedro Hispano, 706.488€.
- Studies in the Area of Power Quality - Program “Minho Rumo à Excelência”, Associação Industrial do Minho (AIMinho), 6.575€ .
- Project TECNOVOZ PRIME 03/00165; Companies: CPCHS – Healthcare Solutions, S.A; Anditec - Tecnologias de Reabilitação, Lda; Datelka , Lda; EDISOFT SA; Priberam Informática, S.A; Promosoft SIS – Software de Sistemas, S.A; RTP - Rádio e Televisão de Portugal, S.A; Tecmic S.A; 118.768€.
- Project AIVA, Companies: Files & Bytes Lda.; Enermeter Lda.; INOV-Inesc Inovação; Élio – Artigos de Desportos Náuticos, Lda.; Motorávia – Engenharia Aeronáutica, S.A.; REN – Rede Eléctrica Nacional, S.A.
- Project PERSCRUTA - FCT PEAM/P/IF/0012/97, “Programa de Combate e Prevenção de Incêndios Florestais”, CNEFF/FCT, with the development of a patented prototype (nº 102.300 – INPI).
- Participation on Hannover Messe 06 with the work: WISEControl - General Purpose Wireless Sensor and Control Network Platform.
- Participation on the “Salon de Inventos e Inovación Tecnológica, Imaginaria 2004”, Vilagarcía, Espanha (invited by TecMinho).
- Participation on the ORTO PRO CARE’2006 Int. Fair, Madrid, to promote the Omnidireccional Wheelchair prototype.

Internationalization (2000 ca.)

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

- European Project JAST – cooperation with 7 institutions from 4 different countries, with 5 Joint PhD supervisions (with the Universities of Bochum, Parma and Nijmegen).
- Research agreement with Honda Research Institute Europe, Offenbach, Germany, 1 Joint PhD supervision.
- Member of the European Networks of Excellence euCognition.
- Member of Euron2.
- Joint Project - Development of Electromechanical Drives and Active Power Line Conditioners for the Efficient Use of Electrical Energy – Cooperation Project with IST and COPPE/Federal University of Rio de Janeiro - GRICES/CAPES, 2003-2006.
- Joint PhD supervision – Alþan Program - with COPPE/Federal University of Rio de Janeiro, Brazil.
- Joint PhD supervision – FCT - with Fraunhofer FIRST, Germany.

Collaborative Publications:

- L. F. C. Monteiro, M. Aredes, J. C. C. Costa e J. L. Afonso, “Algumas Contribuições para o Controle de Filtros Ativos”, CBA 2004, Gramado, Brasil, 21-24 Sept. 2004.
- R. G. Pregitzer, T. N. Sousa, J. L. Afonso, L. F. C. Monteiro and M. Aredes, “Comparison of Fundamental Positive-Sequence Detectors for Highly Distorted and Unbalanced Systems”, CEE’05 – IEEE 1st International Conference on Electrical Engineering, Coimbra, Portugal, ISBN: 972-99064-3-2, 10-12 Oct. 2005.
- L. F. C. Monteiro, J. C. C. Costa, M. Aredes, J. L. Afonso, “A Control Strategy for a Three-Level Unified Power Quality Conditioner”, 8th COBEP - Recife, Brazil, 14-17 July 2005.
- J. E. Neves, N. Neufeld, R. Jacobsson and B. Jost, “New Packet Fragmentation for S-Link to Giga Bit Ethernet Adapter”, Conf. on Systemics, Cybernetics and Informatics, SCI 2003, Orlando, USA, Jul 2003.
- J. E. Neves, R. Jacobsson, N. Neufeld and B. Jost, “S-Link to Giga Bit Ethernet Adapter - New Frame Segmentation for LHCb Data Acquisition System”, Computing in High Energy and Nuclear Physics, CHEP03, La Jolla, USA, March 2003.
- F. Afonso, C. Silva, S. Montenegro and A. Tavares, “Implementation of middleware fault tolerance support for real-time embedded applications”, 18th Euromicro Conference on Real-Time Systems, Dresden, Germany, 5–7 July 2006.
- F. Afonso, C. Silva, S. Montenegro and A. Tavares, “Middleware fault tolerance support for the boss embedded operating system”, 4th Workshop on Intelligent Solutions in Embedded Systems, Vienna University of Technology, Austria, 30 June 2006.

Future Research

Objectives

The organization in Sub-Groups will be maintained as referred in item 9 of part B.1: 1-Mobile and Anthropomorphic Robotics; 2-Automation, Control and Instrumentation; 3-Energy and Power Electronics; 4-Embedded Systems; 5-Communications Systems and Services. The objectives listed below are numbered accordingly.

1.

- Control architectures for automatic generation, modulation and planning of complex motor behaviours for legged robots with many DOFs and for movement coordination/cooperation between different platforms;
- Socially intelligent robots, i.e. to build dynamic control architectures to endow autonomous robots with the capacity of reading motor intention for human-robot interaction tasks;
- Robots that provide assistance to disabled people;
- Development of Reinforcement Learning (RL) schemes for social robotics.

2- Projects from theory and methods in automation and control to application oriented ones, often in cooperation with industry:

- On vision and image processing :

- new algorithms to analyse surfaces of different industrial sectors;
- computer vision technologies, based on advanced processing and image analysis algorithms;
- new algorithms for medical image registration and visualization.

- Multi-sensor fusion and integration using soft-computing techniques.

- Sensor instrumentation, data acquisition, automation and new control strategies for industrial applications: textile, footwear, cork and mechanical industries.

- Mechatronics systems prototypes to the local industry.

- Virtual and Remote Labs for control experiments including the design and implementation of a middleware architecture.

3- R&D for the development of:

- Prototypes of Shunt Active Power Filters with Integrated Monitoring Systems to be used in industrial, commercial and residential facilities;
- Unified Power Quality Conditioners (UPQCs);
- Power Electronics systems to optimize the operation of Renewable Energy sources and Energy Storage devices, and to improve Energy Efficiency.

Realization of Power Quality studies to keep the research tied to real needs.

4- Extend previous work on retargetable processor simulators to generate cycle-accurate and full system simulators (interaction with operating system and environment). A very compact description of a processor should be achieved.

Extend this approach to generate: Assemblers, SystemC, Debuggers, Profilers and Compilers based on a common description.

Extend the IDE for Video Surveillance Systems to support Video Intelligence by integrating Computer Vision algorithms highly optimized and tailored to the system.

5- R&D in the following areas:

- Multimedia network and service infrastructures
- Dynamic and reconfigurable service architectures
- Adaptive and intuitive learning systems
- Wireless sensor networks
- Pervasive networks
- Modelling and simulation of communication networks
- Remote control in domotics applications.
- Assistive Internet technology for blinds
- Open design dissemination

This Group intends to stimulate the development of cooperative work with the Group of Industrial Electronics of the Centre ISR (Research Unit with the Faculty of Engineering of the University of Porto), in the domains of Power Quality, Renewable Energy and Power Electronics. The competences of both Groups are complimentary. It is an objective to improve research results and to increase capacity of cooperation at national and international levels with other research institutions and with industry.

Funding, source, dates

- EU, Project JAST - Joint Action Science Technology, IST-2-003747-IP, 2004-2008, 560.000€.
- FCT, Anthropomorphic Robotic Systems, REEQ/17/2001, 2005-2007, 92.000€.
- ADI-POCTI, Project MICROPYROM - Self Calibrated Minipyrometer Based on Dual Silicon Micromachined Thermoelectric Sensors, 2004-2007, 425.000€.
- ADI-PRIME, Project SINUS – Technology for Dynamic Compensation of Harmonics, Power Factor and Unbalances, DEMTEC/020/1/03, 2005-2007, 706.488€.
- FCT, Development of Interfaces for Renewable Energy Sources, POCTI/ESE/48242/2002, 2004-2007, 30.000€.
- PRIME, Project TECNOVOZ, 03/00165, 2006-2008, 118.768€.
- FCT, Safety Control of Automated Production Systems (SCAPS), POCTI/EME/61425/2004, 2005-2007, 33.600€.
- FCT, PTDC/EEA-TEL/68625/2006, “Quality of service in wireless sensor and actuator networks”, 2007-2010, 86.090,00 €.
- Protocol with the company Lincis to develop new embedded technologies in the field of Computer Vision, 2006-2008, 15.000€/year.
- 10 PhD students funded by FCT or Alþan.
- PTDC/CTM/69477/2006 – “Advanced Materials for Radio-Frequency Applications”, Paulo Mendes (Principal Investigator), Budget 163.550,00 € (pending).
- ADI-IDEIA, IMLT – iMagnetic Level Transmitter, 2008-2010, 141.210€ (pending).
- FP7-ENERGY-2007-2-TREN, ProCool - Solar Process Heat for Cooling Applications, 2008-2011, 132.400€ (pending).
- FCT, UPQC-IM - Development of Unified Power Quality Conditioners with Integrated Monitoring, 2008-2010, 188.000€ (pending).
- FCT, RESCOM - Renewable Energy Source Connection Manager, 2008-2010, 120.000€ (pending).

Previous publications in the area

1. W. Erlhagen and E. Bicho, “The dynamic neural field approach to cognitive robotics”, Journal of Neural Engineering 3 (2006):R36-R54 (more than 500 full paper downloads from the European Network of Excellence “euCognition” webpage).
2. V. Carvalho, P. Cardoso, M. Belsley, R. M. Vasconcelos, Filomena Oliveira Soares, “Yarn hairiness parameterization using a coherent signal processing technique”, Sensors and Actuators A: Physical, Available on-line doi:10.1016/j.sna.2007.02.019, 2007 - ISI Web of Knowledge: (IP = 1.434).
3. L. G. B. Rolim, A. Ortiz, M. Aredes, R. Pregitzer, J. G. Pinto, João L. Afonso, “Custom Power Interfaces for Renewable Energy Sources”, Proceedings of ISIE’2007, IEEE International Symposium on Industrial Electronics, 4-7 June 2007, Vigo, Spain, ISBN:1-4244-0755-9.
4. Afonso, F., Silva C., Montenegro S. and Tavares A., “Applying Aspects to a Real-Time Embedded Operating System”, In Proceedings of the Sixth AOSD Workshop on Aspects, Components and Patterns for Infrastructure Software, ACP4IS, Vancouver, FL, Canada, 2007.
5. R. M. Garcia, P. Carvalhal, M. J. Ferreira., L. F. Silva, H. Almeida, C. Santos, J. A. Afonso, “A Flexible Framework for Data Exchange and Presentation between Wireless Sensor Networks and Personal Devices”, IEEE EUROCON 2007, Warsaw, Poland, September 2007.

Special Requirements

- Humanoid Robotic Manipulator with several degrees-of-freedom.
- CAE - Computer Aided Design for Engineering for development and simulation of t systems behavior.
- Wireless network modules.
- Webcams / IPcams.
- PLCs (Programmable Logic Controllers).
- Computers and Accessories.
- High-Frequency Power Analyser (to determine energy efficiency in Power Electronics equipments).
- Power Electronics IGBTs modules, drivers and cooling systems.
- Electrical and Electronics components.
- High-frequency sensors for currents and voltages measurements.
- PCB (Printed Circuit Board) development system and accessories.
- Digital Signal Processors boards for digital control systems development.
- Power Quality Analyser.
- Digital oscilloscopes with isolated channels.
- Solar Photovoltaic Panels facility for renewable energy production.
- Small Wind Power facility for renewable energy production.
- Meteorological station for monitoring of solar radiation and wind.
- Energy Storage devices: Fuel Cells, Ultracapacitors, Flywheels.
- Prototype for the study of the Peltier effect for electrical energy production.
- PHD students and invited researchers.

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Group Description	
Research Unit:	CENTRO ALGORITMI uid:319 (L700319) (LCOMP-Norte-Braga-319)
Group Name/Designation:	Micro/Nanotechnologies and Biomedical Applications
Group Reference:	RG-COMP-Norte-Braga-319-2976
Principal Investigador:	José Higinio Gomes Correia
Time Interval:	(2007-2010)
Location of Group (Host Institution):	Universidade do Minho
Keywords:	e-wearables; lab-on-a-chip; x-ray microdetectors; biomedical devices
Funding, source, dates:	"SU-8 microfluidic system integrated in a microlaboratory for biological fluids analyses, May 2005 to April 2007, School of Engineering (IN2TEC Program), University of Minho, and Algoritmi Centre, 20.000,00€ . FCT/POCTI/ESE/38468/2001, "On-chip CMOS-compatible RF micromachined inductors for wireless communications", finished 30 November 2005, 65.000,00 €. FCT/POCTI/CTM/33751/2000, "X-rays microdetectors in silicon for medical imaging based on scintillator films", finished on 31 August 2004, 70.000,00 €. FCT/POCTI/ESE/33747/2000, "Laboratorial microsystem in silicon for biological fluid analysis: a lab-on-chip in CMOS technology", finished on 30 September 2004, 90000,00 €. ADI/IDEIA/PELLISAQUAE- a smart suit for hydrotherapy in swimming-pools (consortium P&R TÊXTEIS S.A., LMA Ltd, CITEVE, DEI), March 2003-August 2007, 442.000,00 €. FCT/POCI2010/REEQ/379/EEI/2005, "RF microsystems in silicon for biomedical applications: a lab-on-a-chip", October 2005 – October 2007, 281.500,00 €. ADI/PRIME-03/00165- "Tecnovoz- speech synthesis and recognition, 118.000,00 €, 2003.

PI and Researchers

Researchers in the Group (Ph.D. Only)

- (CV) Carlos Manuel Gregorio Santos Lima
- (CV) Graca Maria Henriques Minas
- (CV) José Gerardo Vieira da Rocha
- (CV) José Higinio Gomes Correia
- (CV) Paulo Mateus Mendes

Other Researchers in the Group (Ph.D. Only)

n/a

Other Researchers in the Group (non Ph.D.)

n/a

Objectives and Achievements

General Objectives

- Development, design, and fabrication of:
- 1) Solid-state integrated sensors, microactuators and micro/nano systems.
 - 2) Analog and digital integrated circuits.
 - 3) Wearable systems for monitoring human posture, heart-rate and respiratory frequency.
 - 4) Microcomputer-based instrumentation and data-acquisition systems for biomedical applications.
 - 5) Neural microsystems for brain-computer interface.
 - 6) Lab-on-a-chip.
 - 7) X-rays microdetectors for medical imaging (digital radiography, CT).
 - 8) Wireless sensor networks.
 - 9) Chip-size antenna.
 - 10) Energy scavenging thermoelectric microsystems.
 - 11) RF transceivers in CMOS technology.

Main Achievements

The conclusion of 3 projects that originated 3 prototypes with respective international and Portuguese patents and in the future can be commercial products: X-rays microdetectors based in CMOS technology for medical imaging, Lab-on-a-chip for biological analysis using white light, chip-size antenna for short-range communications.
 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.
 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.

Confidencial

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).

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.

Productivity

Publications in peer review Journals (3000 ca.)

(Up to a max of 10. Always indicate at the end of the citation, impact factor of the journal (IF=) and number of citations (n° C=). Give title and full citation in original language. DO NOT translate)

The impact factor and number of citations were obtained in the ISI Web of Knowledge.

1. G. Minas, R. F. Wolffenbuttel, J. H. Correia, A Lab-on-a-Chip for Spectrophotometric Analysis of Biological Fluids, Journal Lab-on-a-Chip, The Royal Society of Chemistry, Vol. 5, (2005), p. 1303-1309. IP=5.625 n°C=2.
2. J. G. Rocha, C. G. J. Schabmueller, N. F. Ramos, S. Lanceros-Mendez, M. F. Costa, A. G. R. Evans, R. F. Wolffenbuttel and J. H. Correia, X-ray Detector Based on a Bulk Micromachined Photodiode Combined with a Scintillating Crystal, Journal Microelectromech. Microeng. 13, 2003, pp. S45-S50. IP=2.499 (n°C=9).
3. G. Minas, J. S. Martins, J. C. Ribeiro, R. F. Wolffenbuttel, J. H. Correia, Biological microsystem for measuring uric acid in biological fluids. Journal Sensors and Actuators A, Elsevier, Vol. 110 (2004), p. 33-38. IP=1.434. n°C=7.
4. G. Minas, J. S. Martins, J. C. Ribeiro, R. F. Wolffenbuttel, J. H. Correia, An array of Fabry-Perot Optical-Channels for Biological Fluids Analysis. Journal Sensors and Actuators A, Elsevier, Vol. 115 (2004), p. 362-367. IP=1.434. n°C=2.
5. A. Polyakov, S. Sinaga, P.M. Mendes, M. Bartek, J.H. Correia, J.N. Burghartz, "High-Resistivity Polycrystalline Silicon as RF Substrate in Wafer-Level Packaging, Electronic Letters, Vol. 41, No. 2, pp. 100-101, January, 2005. IP=1.063 . n°C=2.
6. J. C. Ribeiro, G. Minas, P. Turmezei, R. F. Wolffenbuttel, J. H. Correia, A SU-8 Fluidic Microsystem for Biological Fluids Analysis, Journal Sensors and Actuators A, Elsevier, Vol. 123 124 (2005), p. 77-81. IP=1.434. n°C=1.
7. P.M. Mendes, A. Polyakov, M. Bartek, J.N. Burghartz, J.H. Correia, "Integrated Chip-Size Antenna for Wireless Microsystems: Fabrication and Design Considerations", Journal Sensors and Actuators, Vol. 125, No. 2, 10, , pp. 217-222, January 2006, IP=1.434. n°C=2.
8. P. Carmo, P.M. Mendes, C. Couto, J.H. Correia; "5.7 GHz on-chip antenna/RF CMOS transceiver for wireless sensor networks," Journal Sensors and Actuators A, Vol. 132, pp. 47-51, November 2006. IP=1.434. n°C=1.
9. G. Minas, G. de Graaf, R. F. Wolffenbuttel, J. H. Correia, A MCM-based Microsystem for Colorimetric Detection of Biomolecules in Biological Fluids, IEEE Sensors Journal, IEEE, Vol. 6, N. 4 (2006) p. 1003-1009. IP= 1.100. n°C=0.
10. J. G. Rocha, N. F. Ramos, S. Lanceros-Mendez, R. F. Wolffenbuttel and J. H. Correia, CMOS X-rays Detector Array Based on Scintillating Light Guides, Journal Sensors and Actuators A 110, 2004, pp. 119-123. IP= 1.434 n° C=7.

Other publications (3000 ca.)

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

1. J. C. Ribeiro, G. Minas, P. Turmezei, R. F. Wolffenbuttel, J. H. Correia - A SU-8 Fluidic Microsystem for Biological Fluids Analysis. In "Proceedings of Eurosensors XVIII". Roma, Itália, 13-15 September 2004, p. 126-127.
2. G. Minas, J. C. Ribeiro, G. de Graaf, R. F. Wolffenbuttel, J. H. Correia - A MCM based Microsystem for Biological Fluids Analysis by Optical Absorption. In "Proceedings of IEEE Sensors 2004". Viena, Austria, 24-27 October 2004, p. 223-226.
3. J. G. Rocha, G. Minas, L. M. Gonçalves, S. Lanceros-Mendez – Scintillating microcavities for x-ray imaging sensors. In "Proceedings of MME 2006", Southampton, UK, 3-5 September 2006, p. 149-152.
4. J. G. Rocha, S. Lanceros-Mendez and J. H. Correia, "Modeling of the Performance of Scintillator Based X-ray Detectors," Proc. IEEE Sensors 2004, Viena, Austria, 24-27 Outubro 2004.
5. L. M. Gonçalves, C. Couto, P. Alpuim, D. M. Rowe, J.H. Correia, Thermoelectric Microstructures of Bi2Te3/Sb2Te3 for a Self-calibrated Micropyrometer, in Proc. Transducers 2005, pp. 904-907, Seoul, Korea, June 5-9, 2005.
6. P.M. Mendes, M. Bartek, J.N. Burghartz, J.H. Correia, "Novel Very Small Dual-Band Chip-Size Antenna for Wireless Sensor Networks", IEEE RAWCON 2004, Atlanta, USA pp. 419-422, September, 2004.
7. P.M. Mendes, A. Polyakov, M. Bartek, J.N. Burghartz, J.H. Correia, "An Integrated Folded-Patch Antenna for Wireless Microsystems", IEEE Sensors 2004, Vienna, Austria, pp.485-488, October, 2004.
8. N. S. Dias, P. M. Mendes, J. H. Correia, "Subject Age in P300 BCI", 2nd International IEEE EMBS Conference on Neural Engineering, , Arlington, Virginia, USA, pp. 579-582, March, 2005.
9. J. P. Carmo, N. Dias, P. M. Mendes, C. Couto, J. H. Correia, Low-power 2.4-GHz RF transceiver for wireless EEG module plug-and-play, Proc. 13th IEEE International Conference on Electronics Circuits and Systems, pp. 1144-1147, Nice, França, Dezembro 2006.
10. N. S. Dias, D. Klayton, M. Liu, V. Nguyen, D. Wu, W. X. Yan, M. Yen, Y. Zhao, P. M. Mendes, J. H. Correia, P. M. Cammer, S. J. Schiff, Brain-machine interface for wheel chair control, Proc. Neuroscience, No. 25, pp.1-2, 15 October 2006, Atlanta, GA, USA.

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

PhD theses:

- J. A. Afonso, Local access in wireless communications networks: traffic scheduling in real time for data-acquisition and control systems, UM, 7 January 2005.
- P. M. Mendes, Chip-size antennas for RF wireless microsystems, UM, 5 December 2005.
- J. G. Rocha, X-rays microdetectors in silicon based in scintillators for digital radiography, 9 January 2004, 9 June 2004.
- R. Morais, Sensorial micro-interface in technology CMOS for agriculture, UTAD-Portugal, 14 June 2004.
- G. M. Minas, Lab-on-a-chip for biological fluid analysis, UM, 15 October 2004.
- L. A. Rocha, Dynamics and nonlinearities of the electro-mechanical coupling in inertial MEMS, TUDelft-The Netherlands, 24 January 2005.

Master Theses:

- D. A. Duraes, Silicon bulk-micromachining system for fabricating 3D microstructures, UM, 5 May 2004.
- J. C. Ribeiro, RF Receptor in CMOS technology for wireless communications at 433 MHz, UM, 4 October 2006.

Patents/prototypes (2000 ca.)

WO2006006113: MicroLaboratory for biological fluids analysis using white light illumination, by G. Minas, J. C. Ribeiro, J. H. Correia (Departamento de Electrónica Industrial da Universidade do Minho), published in World Intellectual Property Organization 19 January 2006.

PT-103159: MicroLab for fluids analysis, G. Minas, J. C. Ribeiro, J. H. Correia (University of Minho), published 31 December 2005.
 PCT/IB2006/053268 J. G. Rocha and S. Lanceros-Mendez, "X-ray imaging matrix with light guides and intelligent pixel sensors, radiation or high energy particle detector devices that contain it, its fabrication process and its use," 2006.
 PT-35326-06 J. G. Rocha, G. Minas, V. Sencadas and S. Lanceros-Mendez, Flux based-sensor in piezoelectric, 2006.
 PT-33637-05 J. G. Rocha and S. Lanceros-Mendez, "X-rays imaging array with light guides and smart pixels, 2005.
 PT- 103551, H. R. Silva, L. A. Rocha, J. A. Afonso, J. H. Correia, Body kinetic monitoring system, 7 August 2006.
 PT- 103612, J. A. Afonso, L. A. Rocha, H. R. Silva, J. H. Correia, "Bidirectional system for monitoring and controlling data in real time, 7 December 2006.
 PT- 103299, P. M. Mendes, J. H. Correia, Integrated and tunable microantenna, 29 June 2005.

Organization of conferences (2000 ca.)

1. EUROSENSORS XVII: The 17th European Conference on Solid State Transducers, 21-24 September 2003, University of Minho, Guimaraes, Portugal. The premier European forum in sensors, actuators and micro/nanotechnologies.

Industry contract research (2000 ca.)

Process Simulation in semiconductor technology: simulation of mold filling characteristics in microchips, Qimonda S.A. Portugal, Vila do Conde, started on 6 July 2006.

Internationalization (2000 ca.)

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

1. G. Minas, R. F. Wolffenbuttel, J. H. Correia - An array of highly selective Fabry-Perot optical-channels for biological fluids analysis by optical absorption using white light source for illumination. In Journal of Optics A: pure and applied optics, Institute Of Physics, Vol. 8 (2006), p. 272-278. IP=1.295. n^oC=0.
2. J. G. Rocha, C. G. J. Schabmueller, N. F. Ramos, S. Lanceros-Mendez, M. V. Moreira, A. G. R. Evans, R. F. Wolffenbuttel and J. H. Correia, "Comparison Between Bulk Micromachined and CMOS X-ray Detectors," Sensors and Actuators A 115, 2004, pp. 215-220. IP= 1.434. n^oC=1.
3. L. M. Goncalves, C. Couto, P. Alpuim, D. M. Rowe, J.H. Correia, Thermoelectric Properties of Bi₂Te₃ / Sb₂Te₃ Thin Films, Materials Science Forum 514-516, Trans Tech Publications, p156-160, (2005) IP= 0.399
4. L.M. Goncalves, C. Couto, P. Alpuim, D.M. Rowe and J.H. Correia, Thermoelectric microstructures of Bi₂Te₃/Sb₂Te₃ for a self-calibrated micro-pyrometer, Sensors and Actuators A: Physical, 130-131 p346-351, (2006) IP= IP= 1.434.
5. P.M. Mendes, A. Polyakov, M. Bartek, J.N. Burghartz, J.H. Correia, "Integrated Chip-Size Antenna for Wireless Microsystems: Fabrication and Design Considerations", Sensors and Actuators A Physical, Vol. 125, No. 2, 10 January 2006, pp. 217-222. IP= 1.434.
6. S.M. Sinaga, P.M. Mendes, "Chip-level electromagnetic isolation - PACD project B1 progress report June 2003", progress report PACD project B1 (Philips CFT, The Netherlands), pp. 1-13, June, 2003.
7. A. Polyakov, M. Bartek, J.N. Burghartz, P.M. Mendes, B. Rejaei, "Wafer-Level Chip-Scale Packaging for RF Applications - progress report February 2003", progress report PACD project B2 (Philips CFT, The Netherlands), pp. 1-13, February , 2003.
- 8.A. Polyakov, M. Bartek, J.N. Burghartz, P. Mendes, H. Zurló, "Wafer-Level Chip-Scale Packaging for RF Applications - progress report May 2003", progress report PACD project B2 (Philips CFT, The Netherlands), Dimes, TU Delft, pp. 1-16, May, 2003
9. P. M. Mendes, "5-6 GHz On-chip Antennas Using Wafer-level Packaging Techniques", Technical Report, Technical University of Delft, The Netherlands, 27 pp, April 2006.
10. J. Cabral and A. S. Holmes (Imperial College, UK), "A novel seesaw-type RF MEMS switch", IEEE Melecon 2006, Malaga, Spain.

Future Research

Objectives

The Micro-nanotechnologies area in University of Minho - Centro Algoritmi has been active in the last 8 years with a young team investigating in micro-nanosensors, microactuators, MEMS (MicroElectroMechanical Systems) and micro-nanoelectronics. The advent of the nanotechnology with application in the biomedical field opens new opportunities (medical electronics devices and micro/nanotechnologies subjects are represented in Algoritmi center and can be crossed with success). The resulting progress should pave the way to more innovative and powerful in-vivo diagnostics tools. In general terms nanotechnology will have great impact on the methodologies available for both disease and drug discovery and consequently impact on the scope and throughput of pharmaceutical developments. Advancement in in-vivo diagnostics will also rely on molecular imaging and on minimally invasive, implantable devices. In molecular imaging, the goal is to create highly sensitive, highly reliable detection agents that can also deliver and monitor therapy. In micro/nanodiagnosics, the ultimate goal is to identify disease at the earliest stage possible, ideally at the level of a single cell. To achieve this goal, research and development activities in micro/nanotechnology need to be undertaken to improve the effectiveness of in vivo and in-vitro diagnostics. Micro/nanotechnology can offer diagnostic tools of better sensitivity, specificity and reliability. It also offers the possibility to take different measurements in parallel or to integrate several analytical steps from sample preparation to detection into a single miniaturized device. Such a device could, thanks to nanotechnology, contain enough hard wired intelligence and robustness to be used by the patient and deliver a multitude of data to the practitioner. Furthermore, the use of micro/nanoelectronics will improve the sensitivity of sensors based on already established methods.

Drug-delivering microchip technology, resulting from the convergence of controlled release and fabrication technologies evolved for the electronics industry, is also benefiting from the application of nanotechnology. Further miniaturization and the ability to store and release chemicals on demand offer new treatment options in the fight against disease.

Therefore, the goals for the next years is 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. Also, the setup of a system for direct laser writing avoiding the fabrication of dedicated masks will benefit the group and it will be in a position to successfully compete with laboratories worldwide.

Funding, source, dates

FCT/PTDC/BIO/70017/2006, Lab-on-a-chip with fluid acoustic microagitation, July 2007 to June 2010, 83.000,00 €.
 FCT/PTDC/EEA-ELC/70803/2006, BIOSWIM - Body Interface System based on Wearable Integrated Monitorization,

98.381,00 €.

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

FCT/PTDC/EEA-ENE/66855/2006, Thermoelectric energy scavenging microsystem, Sept. 2007 August 2010, (Principal Investigator), 120.000,00 €.

PORTUGAL-SPAIN INTERNATIONAL NANOTECHNOLOGY LABORATORY CALL, CNT-based sensors for neural applications, 400.000,00 € (pending).

PORTUGAL-SPAIN INTERNATIONAL NANOTECHNOLOGY LABORATORY CALL, NANOSAFE: chemical and biological NANOsensors and nano-delivery Systems for combined detection and Active control in Food Safety and quality assurance, 400.000,00 € (pending).

FCT/PTDC/EEA-TEL/65286/2006 - "MEMS –Micro-Antenna for Wireless Biomedical Devices", 157.550,00€ (pending).

IDEIA-ADI - IMLT – "iMagnetic Level Transmitter – Magnetic field sensor direction applied for measuring the level of gas in tanks contactless", ADI, 141.210,36 € (pending).

FCT/PTDC/EEA-TEL/68692/2006- "Robust Speech Recognition", Carlos Lima, 100.000,00 € (pending).

Previous publications in the area

1. L. M. Goncalves, J G Rocha, C Couto, P Alpuim, GaoMin, D M Rowe, J H Correia, Fabrication of flexible thermoelectric microcoolers using planar thin-film technologies, Journal Micromechanics and Microengineering, IOP, pp.5168-5173, July 2007. IP=2.499.
2. L. M. Goncalves, J. G. Rocha, S. Lanceros-Mendez, On-chip Array of Thermoelectric Peltier Microcoolers, in Proc. Transducers 2007, pp. 2178-2182, Lyon, France, June 10-14, 2007.
3. J. G. Rocha, G. Minas, S. Lanceros-Mendez - Optical coupling between scintillators and standard CMOS detectors. In Nuclear Instruments and Methods in Physics Research A, Elsevier, Vol. 556, (2006), p. 281-286. IP=1.224. n^oC=0.
4. H.R. Silva, L.A. Rocha, J.A. Afonso, P.C. Morim, P.M. Oliveira, J.H. Correia, "Wireless Hydrotherapy Smart-Suit Network for Posture Monitoring", IEEE International Symposium on Industrial Electronics (ISIE 2007), Vigo, Spain, June 2007.
5. N. S. Dias, K. Nahar, P. M. Mendes, S. J. Schiff, J. H. Correia, Customized Linear Discriminant Analysis for Brain-Computer Interfaces, has been accepted for presentation at The 3rd International IEEE EMBS Conference on Neural Engineering, in Kohala Coast, Hawaii, USA, , 2 - 5 May, 2007

Special Requirements

1-Direct Writing Laser equipment – an economical laser lithography system, high resolution pattern generator for low volume mask making and direct writing. Capabilities and flexibility of this system make it the ultimate lithographic research tool in MEMS, BioMEMS, Micro Optics, ASICs, Micro Fluidics, Sensors and all other applications that require the fabrication of low-cost microstructures and will avoid the fabrication of masks.

2-A CarbonNanoTube fabrication system based in electrolysis for developing the new generation of sensors and actuators at nanoscale. The use of integrated CNT nanoelectrodes with electronics for neural implants will open a new way in neural biomedical devices.

3- A lightsource, F/1, 1.5 with High Grade Fused Silica, A0.22; F/2.3. (UV lamp source + optical fiber) for testing optical devices and to upgrade the optical measurement setup with new and more sophisticated accessories.

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Group Description	
Research Unit:	CENTRO ALGORITMI uid: 319 (L700319) (LCOMP-Norte-Braga-319)
Group Name/Designation:	Knowledge and Information Systems and Services
Group Reference:	RG-COMP-Norte-Braga-319-2171
Principal Investigador:	Joao Alvaro Brandao Soares de Carvalho
Time Interval:	(2007-2010)
Location of Group (Host Institution):	Universidade do Minho
Keywords:	Information systems and technologies; Information services and digital libraries; Intelligent information systems and business intelligence; Business process management and e-government
Funding, source, dates:	<p>During 2003-2006 the RG had 19 funded projects. For each year, the number of running projects and corresponding funding was:</p> <ul style="list-style-type: none"> - 2003: 11 projects, 398 k€ - 2004: 10 projects, 196 k€ - 2005: 8 projects, 148 k€ - 2006: 8 projects, 92 k€ <p>Selection of projects:</p> <p>INFOCITIZEN, Agent based negotiation for inter and intra-enterprise coordination employing a European Information Architecture for Public Administration, IST-2000-28759, Set. 2001 – Ago. 2003, 109.735,53 €</p> <p>Omnipaper, Smart Access to European Newspapers, IST-2001-32174, Jan. 2002 – Dez. 2004, 162.875,00 €</p> <p>DeGóis - Plataforma Nacional de Ciência e Tecnologia, FACC/2002/DIV/40011, Jan. 2002 – Dez. 2005, 338.924,00 €</p> <p>Avaliação dos web sites da Administração Directa e Indirecta do Estado, UMIC, Fev. 2003 – Jan. 2004, 24.800 €</p> <p>Internet Congestion Control Using Neural Networks, CRUP/British Council, B-53/05, Abr. 2005 – Abr. 2006, 2.800 €.</p> <p>WeKnow, Sócrates/Minerva, 225456-CP-1-2005-1-DE-Minerva, Set. 2005 – Set. 2007, 9.432,00 €</p>
PI and Researchers	
Researchers in the Group (Ph.D. Only)	
(CV) Ana Alice Rodrigues Pereira Baptista (CV) Anabela Mesquita Teixeira Sarmento (CV) Carlos Alberto Baptista de Sousa Pinto (CV) Claus Kaldeich (CV) Henrique Manuel Dinis Santos (CV) Isabel Maria Pinto Ramos (CV) Joao Alvaro Brandao Soares de Carvalho (CV) Jose Carlos Baptista do Nascimento e Silva (CV) José Filipe de Sá Rodrigues Soares (CV) José Luís Mota Pereira (CV) Leonel Duarte dos Santos (CV) Luis Alfredo Martins Amaral (CV) Manuel Filipe Vieira Torres dos Santos (CV) Maribel Yasmina Campos Alves Santos (CV) Paulo Alexandre Ribeiro Cortez (CV) Paulo José Guimarães Garrido (CV) Paulo Rogério Perfeito Tomé (CV) Pedro Correia Cravo Pimenta (CV) Rui Manuel Dinis de Sousa	
Other Researchers in the Group (Ph.D. Only)	
n/a	
Other Researchers in the Group (non Ph.D.)	
n/a	
Objectives and Achievements	
General Objectives	

The Knowledge and Information Systems and Services research group (KISSrg) resulted from a recent split of a former research group – information systems group.

KISSrg builds upon emerging developments in information technology (IT). It acknowledges the potential of IT on changing work practices, supporting decision making, transforming organizational structures, and leading to novel information services. These practices, structures, and services lead to new paradigms of work organization and to a more important role played by services in contemporary knowledge and information-centered economy and life.

KISSrg aims at contributing with scientific and technological knowledge relevant to:

- improved organizational performance (either within profit, non profit, or governmental organizations), achieved through the adoption of IT enabled work practices and sustained through activities that look after organizational cognitive capabilities;

- enhanced quality of life in the information society based on human and social oriented information services with recognized added value and highly trustable either from the points of view of reliability or security.

Most of the objectives pursued by the KISSrg are those of its parent group.

There was a first set of objectives related with the re-organization of the parent group and its division in coherent groups with sustained viability prospects.

Another set of objectives addressed common performance aspects. Although no specific goals have been established, 2 aspects have been defined as matters of concern where performance increase was expected:

- quantity and quality of research publications, specially in international refereed journals;

- participation in formal, funded projects as a way to increase R&D performance and to augment the possibilities of engaging in enduring international partnerships;

Other objectives addressed the establishment of a sound scholar culture, regarded as essential to the RG' maturity.

Main Achievements

As described in the report concerning the ceasing Information Systems group, the emergence of the new, coherent and with sustained viability prospects groups was viewed as an achievement.

In what concerns the KISSrg, this included the definition of 2 anchor R&D themes to be viewed as interdependent R&D streams:

- 1) Organizational Well-Being (OWB) - relies on a perspective of organizations based on cognition-related concepts (e.g., perception, memory, attention, reasoning, learning, imagination, etc.). This perspective enables to conceptualize organizational work carried out by either humans or IT applications as a distributed cognitive structure necessary to intelligent behavior, increased performance, enhanced competitiveness, and sustained well being.

- 2) Valuable and Trustable Information Services (VTIS) - pursues the lively evolution of the information society and its enabling platforms. It focuses on IT-based products and services that explore, with increasing intelligence and in a secure way, the growing amount of information available on line on the web. Such products and services bring up, to individuals and organizations, opportunities for new ways of carrying out action, interaction, and collaboration in the realms of business, education, research, leisure, public services and other.

The results achieved during the period 2003-2006 show increases and stability in performance aspects such as: number and quality of publications in international refereed journals and conferences; participation in R&D projects involving international consortia; number of graduate students at MSc and PhD levels; involvement in international groups and committees; involvement in program and organization committees of international conferences.

Productivity

Publications in peer review Journals (3000 ca.)

(Up to a max of 10. Always indicate at the end of the citation, impact factor of the journal (IF=) and number of citations (n^o C=). Give title and full citation in original language. DO NOT translate)

The RG achieved an important increase in publication of all kinds, including in journals with peer review. The figures are:

- International Journals: 1 (2003), 5 (2004), 7 (2005), 8 (2006)

- National Journals: 4 (2003), 1 (2005), 3 (2006)

Selection of publications:

1. Baptista, A.A., "Searching and Browsing Using RDF Encoded Metadata - the Case of Ompaper", Canadian Journal of Communication, 29(3), 2004, Canadá, ISSN: 0705-3657.

2. Cortez, P., M. Rocha, e J. Neves, "Evolving Time Series Forecasting ARMA Models", Journal of Heuristics, Kluwer Academic Publishers, 10(4), pp. 415-429, July 2004, The Netherlands, ISSN: 1381-1231. (IP = 0.740) (n^oC = 0)

3. Silva, A., P. Cortez, M.F. Santos, L. Gomes and J. Neves. "Mortality assessment in intensive care units via adverse events using artificial neural networks". In Artificial Intelligence in Medicine, Elsevier, 36 (3): 223-234, 2006, ISSN:0933-3657 (IP=1.634) (n^oC = 0).

4. Magalhães, S.T., K. Revett e Santos, H., "Generation of Authentication Strings from Graphic Keys", International Journal on Computer Science and Network Security, 6(3), 2006. (ISSN: 1738-7906) (n^oC = 0).

5. Ramos, I, D.M. Berry e J.A. Carvalho. "The Role of Emotion, Values, and Beliefs in the Construction of Innovative Work Realities". Lecture Notes in Computer Science vol. 2311, p. 300-314, 2002. (IP = 0.402) (n^oC - GoogleScholar= 4)

6. Ramos, I., "Multilevel perspectives on Technology and Human Interaction", International Journal of Technology and Human Interaction, 2(4), 2006.

7. Ramos, I., D.M. Berry e J.A. Carvalho, "Requirements engineering for organizational transformation". Information and Software Technology, 47(7), pp. 479-495, 2005. (IP = 0.726) (n^oC = 1)

8. Ramos, I., e D.M. Berry, "Is Emotion Relevant to Requirements Engineering?", Requirements Engineering Journal, pp. 1-5, 2005. (IP = 1.103) (n^oC - GoogleScholar = 1)

9. Santos, M.Y. e L. Amaral, "Geo-Spatial Data Mining in the Analysis of a Demographic Database", Soft Computing – A Fusion of Foundations, Methodologies and Applications, Special Issue on Soft Computing Applications to Spatial Data Analysis, 9(5), pp. 374-384, May 2005. (ISSN 1432-7643 – Paper, 1433-7479 – Online). (IP = 0.538) (n^oC = 1)

10. Santos, M.Y. e L.A. Amaral, "Mining geo-referenced data with qualitative spatial reasoning strategies", Computers and Graphics, Special Issue on Visual Knowledge Discovery, Elsevier Science, 28(3), pp. 371-379, 2004. (ISSN 0097-8493). (IP = 0.641) (n^oC = 1)

Other publications (3000 ca.)

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

Summary of other research results published in the 2003-2006 period:

- Books and Book Chapters: 3 (2003), 1 (2004), 12 (2005), 11 (2006)

- Proceedings of international conferences: 28 (2003), 27 (2004), 26 (2005), 43 (2006)

- Proceedings of national conferences: 12 (2003), 16 (2004), 9 (2005), 3 (2006)

- Technical reports and other publications: 13 (2003), 10 (2004), 2 (2005), 13 (2006)

Selection of publications (the criterion used to select the publications included in this section aimed at illustrating the diversity of research themes covered by the RG):

1. Revett, K., S.T. Magalhães e H. Santos, "Enhancing Login Security Through the Use of Keystroke Input Dynamics", Lecture Notes in Computer Science, Springer-Verlag GmbH, Vol. 3832, p: 661-667, Dec. 2005.
2. Santos, M.Y. e L. Amaral, "Mining Geo-referenced Databases: a way to improve decision-making", in James Pick (Ed.), GIS in Business, Idea Group Publishing, 2005 (ISBN 1-59140-400-2)
3. Sarmento, A (2003). The Role of the Organizational Context in the Use of a Workflow System: Lessons from a Case Study, Gordon, S. (Ed.), Computing Information Technology: The Human Side, Hershey: Idea Group Publishing, p. 201-219.
4. Magalhães, S.T., L. Santos e L. Amaral, "Getting the knowledge to the agent – the Rough Sets approach", Proceedings CRIS 2006 8th international Conference on Current Research Information Systems - Enabling Interaction and Quality: Beyond the Hanseatic League, Bergen, Norway, 2006.
5. Pinto, C.S., Ramos, F., "Enhancing Web Supported Learning in Higher Education by Adding a Management Layer to LMS". Proceedings of the 12th International Conference of European University Information Systems (EUNIS2006), Tartu, Estónia, June, 2006.
6. Pinto, F., P. Gago e M.F. Santos, "Data Mining as a new paradigm for Business Intelligence in Database Marketing projects", Proceedings of ICEIS 2006 - 8th International Conference on Enterprise Information Systems, Paphos – Cyprus, Mai. 2006.
7. Pereira, A.M. e I. Ramos, "Competitive intelligence an exploratory study", ECKM 2005 – European Conference on Knowledge Management, Limerick, Ireland, 8-9 Sept. 2005.
8. Kaldeich, C. e J.O. Sá, "Data Warehouse Methodology: A Process Driven Approach", Caise 2004: 16th International Conference on Advanced Information Systems Engineering, LNCS 3084, Riga, Letonia, 2004.
9. Nascimento, J.C. e L.A. Amaral, "The IS Function and IS Professionals in a Virtual IS Context: a Qualitative Research", 10th Americas Conference on Information Systems, New York, New York, Aug. 2004
10. Pereira, T. e A.A. Baptista, "Incorporating a semantically enriched navigation layer onto an RDF Metadatabase", 8th International ICCS Conference in Electronic Publishing, Brasília, Brazil, Jun. 2004.

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

During the 2003-2006 period, 12 PhD theses and 39 MSc theses were completed:

- 2003: 5 PhD ; 5 MSc
- 2004: 4 PhD; 8 MSc
- 2005: 2 PhD; 10 MSc
- 2006: 1 PhD; 16 MSc

In 2006 around 30 students were enrolled in the PhD program.

PhD 2006:

- A. Andrade, Génese, Criação e Liderança de Comunidades Virtuais de Interesse Cognitivo.
- E. Cardoso, Ambientes de Ensino Distribuído na Concepção e Implementação da Universidade Flexível.
- F. Sá-Soares, Interpretação da Segurança de Sistemas de Informação Segundo a Teoria da Acção.

PhD 2005:

- P. Tomé, Metodologia de Desenvolvimento de Arquitecturas de Sistemas de Informação.

PhD 2004:

- J. Pereira, Sistemas de Informação para o Novo Paradigma Organizacional: o Contributo dos sistemas de Informação Cooperativos.
- L. Santos, Factores Determinantes do Sucesso de Adopção e Difusão de SI On-line em Sistemas de Gestão de Ciência e Tecnologia.
- M. Lousã, Principais Factores Organizacionais que Influenciam a Adopção, Desenvolvimento e Utilização de Sistemas Workflow Administrativos: Estudos de Casos.

PhD 2003:

- M. Gonçalves, ZACCAR – Sistema de Conhecimento para Apoio à Gestão do Relacionamento com Clientes.
- A. Baptista, Informattica Online – Um Enquadramento para a publicação em Linha de Revistas Científicas.
- A. Santos, Estudo de Impactos de Sistemas Informáticos Integrados de Gestão de Instituições de Saúde do Brasil: Uma abordagem sobre Desempenho.
- J. Varajão, Função de Sistemas de Informação: Contributos para a melhoria do sucesso da adopção de tecnologias de informação e desenvolvimento de sistemas de informação nas organizações.
- J. Silva, A desmaterialização da Gestão de Sistemas de Informação: Impactos na sua organização e nos seus recursos humanos.

Selection of MSc Thesis:

2006:

- S. Santos, e-Gov e participação política dos municípios Portugueses.
- A. Oliveira, Gestão de Processos de Negócio e sua Articulação com o Desenvolvimento de Sistemas de Informação: Aplicação para a Área de Retailho.
- V. Martins, Integração de SI: Perspectivas, Normas e Abordagens.
- J. Pimenta, Estudo de Modelos de Avaliação da Segurança de Informação.
- F. Pinto, DCBD como Suporte a Actividades de Business Intelligence– Aplicação na Área do Database Marketing.
- N. Guedes, Sistemas de Apoio à Decisão em Tempo Real: áreas de intervenção em Data Warehousing.
- L. Chorão, Credit Scoring: Logit vs. Redes Neuronais Artificiais – Um exemplo aplicado a cartões de crédito.

2005:

- P. Magalhães, Estudo dos padrões de digitação e sua aplicação na autenticação biométrica.
- J. Pereira, Modelos de Data Mining para Multi-previsão: Aplicação à Medicina Intensiva.

2004:

- V. Mendonça, Auditoria de Sistemas de Informação: Uma Proposta para Pequenas e Médias Empresas.
- C. Fernandes, Adopção de eLearning numa instituição de ensino superior: A perspectiva dos pontos críticos.
- C. Sousa, Data Mining: Metodologias, Tecnologias, Modelos e Aplicações.

2003:

- J. Fernandes, Conceitos em Sistemas de Informação: UML e a sua Adequação ao FRISCO.
- A. Yen, Arquitecturas de sistemas de informação: um caso em Moçambique.

Patents/prototypes (2000 ca.)

Many of the RG's projects involve the creation of information technology artifacts to be used in organizations and society. Early versions of such artifacts can be considered as prototypes. Furthermore, it is common that their development process adopts some kind of prototyping-based approach.

Examples of such artifacts could be found associated to most projects the RG has been involved during the 2003-2006 period. In some cases they evolved to products that have been incorporated in some work context. In other cases they "disappear" after the reports and articles associated to the projects have been published. In both cases, as it is easy to recover them from some kind of computer-based memory, it is common to use them as demonstrations, displayed in occasions such as science and technology exhibitions.

However, considering the nature of information technology artifacts they are seldom preserved as prototypes and included as such in the list of research results. Normally, only in the cases where the prototypes demand some special purpose physical support, they are kept and presented as such.

In what concerns patents, R&D areas related to information technology fall within a gray zone where it isn't always clear whether it is possible to file patents to many research results. Considering the existing ambiguity and following the University of Minho's policy related to intellectual policy, the RG began to pay attention to this aspect.

Organization of conferences (2000 ca.)

RG's members got involved in the organization of scientific/technical events, either as members of organizational committees or as member of the scientific committees:

- Organization committee: 1 (2003), 1 (2005), 3 (2006)
- Scientific/Program committee: 12 (2003), 19 (2004), 25 (2005), 30 (2006)
- Organization of Workshops and Seminars: 1 (2003), 2 (2004), 3 (2005), 2 (2006)

Selection of events:

Organized conferences and Workshops

EIPub'03 – 7th. ICCS/IFIP International Conference on Electronic Publishing – From Information to Knowledge.

ECNN'04 Workshop – Evolutionary Computation and Neural Networks, EIS 2004: 4th. International Symposium on Engineering of Intelligent Systems.

OASIS Workshop at the IFIP WG 8.2 (ICIS'2004).

CAPSI'2005 - 6ª Conferência da Associação Portuguesa de Sistemas de Informação.

1ª Encontro do Grupo Português de Business Process Management.

Special Session on Natural-Computing Algorithms to Modelling and Optimization of Bioprocesses at the 7th. International Conference on Adaptive and Natural Computing Algorithms.

IFIP WG 8.2 Working Conference on the IS role in leveraging the Intelligence and Creativity of SME's, 2006

IWIRCRIS'06 – International Workshop on Information Retrieval on Current Research Information Systems.

SoftWars'06 – International Conference on Social and Ethical Impact of Technology.

Scientific/Program Committees

ICKEDS'03, ICKEDS'04, International Conference on Knowledge Engineering and Decision Support.

ICEIS'03, ICEIS'04, ICEIS'05, ICEIS'06, International Conference on Enterprise Information Systems.

EIPub'03, EIPub'04, EIPub'06, ICCS/IFIP Conference on Electronic Publishing.

PKDD'05, 9th. European Conference on Principles and Practice of Knowledge Discovery in Databases.

ICIS'05, ICIS'06, International Conference on Information Systems.

Industry contract research (2000 ca.)

Several RG projects involve institutions that hire the RG services. Although not all of such institutions can be classified as industry, they all correspond to institutions that benefit from the RG competences and R&D results.

Two technological projects have been promoted (and co-funded) by a Portuguese agency for innovation – Agência de Inovação (AdI). These projects necessarily involve a company, interested in the research results, which assume a part of the project financial needs.

Several other projects have been funded by governmental bodies, local government associations, or local government initiatives (e.g., initiatives related to digital cities and regions). These projects mainly focus on aspects related to the information society.

Projects in areas such as e-government and information services have also been sponsored by e-government bodies (e.g., mission unit for the information and knowledge society; science and technology observatory; Ministry of Justice).

The centre's host institution – University of Minho (UMinho) – is also a contractor, especially in projects related with information services. Projects involving UMinho include products associated to: institutional repository; electronic voting; peer-to-peer communication; electronic CVs service.

Internationalization (2000 ca.)

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

RG's internationalization evidences include collaborative publications and participation in international consortia that carry out R&D projects. The results in these 2 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 RG is involved in the national collaboration program between Portugal and the Carnegie Mellon University (software engineering stream). Other contacts have been established aiming to create (or to adhere to) international graduate programs (e.g., information systems, information science, computer networks, computer graphics).

Recognizing that internationalization relies on the strength of individual networking, some initiatives have been set up aiming at stimulating networking, e.g.: motivate young members of the Information Systems Dep. to do their doctoral studies abroad or to involve foreign researchers as co-supervisors when they do their studies at UMinho; invite foreign researchers for visits to UMinho for teaching in the graduate programs and to collaborate with researchers; encourage RG members to participate in committees either related to the organization of events or related to international bodies; encourage researchers to use their sabbatical leaves to visit other institutions.

A reasonable number of contacts and collaboration involve researchers and institutions in Latin America. Portugal occupies a particular position in the world that brings up two different spheres of internationalization in research and education: the global world where English is the lingua franca; the world of Portuguese and Spanish speaking countries. This luso-hispanic world constitutes an important market from the point of view of educational institutions and the language affinity among its countries facilitates the establishment of collaborative relations. This explains the relevance of international collaboration in those two realms.

Future Research

Objectives

General objectives for the KISSrg address its consolidation: increase the number of publications in international refereed journals; increase the participation in R&D projects with international consortia; reinforce the RG's maturity, quality, and internationalization. In this matter, some particular aspects will be pursued: strengthen the criteria to be used for selecting the conferences and journals researchers aim to publish at; promote the statement of the R&D programs the

R&D communities are using implicitly; encourage that PhD thesis are written in English.
 More specific objectives are related to the work being carried out by the several R&D communities associated to the RG: knowledge management; business processes; business intelligence; information services; scholarly communication; information systems security. Although focusing on different problems/opportunities and relying on different scientific and technical areas, work in these communities is shaped by the 2 R&D themes/streams the RG defined: Organizational Well-Being (OWB); Valuable and Trustable Information Services - VTIS.

Expected middle-long term results within the OWB stream include:

- conceptual frameworks laying the foundations for the cognition-oriented perspective of organizations;
- representation techniques adequate to describe organizational work;
- methodologies and techniques for organizational diagnosis and intervention activities;
- methodologies and techniques to solve complex business problems
- novel IT artifacts that enhance organizational cognitive capabilities;
- descriptive, predictive or explanatory models of organizational dynamics.

These results contribute to the establishment of a body of knowledge and to the development of IT-based tools to be used in organizational interventions that aim at enhancing organizations cognitive capabilities and improving organization's well-being.

Expected middle-long term results from the VTIS stream include:

- conceptual frameworks related to the information society, its manifestations, its instruments and its evolution;
- architectural patterns, standard components, and integration mechanisms for information services and their corresponding IT-based platforms addressing any of its facets (e.g., functionality, interface, security, trust);
- novel IT artefacts with potential to constitute valuable and trustable information services;
- business models for information services;
- descriptive, predictive or explanatory models of information services and of information society dynamics.

These results contribute to the establishment of a body of knowledge and to the development of IT-based tools to be used in setting-up and running valuable and trustable information services, which are efficient, and have economic sustainability. Special attention is paid to services to be available in web 2.0 environments that rely on approaches such as self-publishing, self-archiving, and open access, and that exhibit self-organizing behaviour.

Funding, source, dates

The RG has currently (2007) 5 funded projects with a total amount of 221 k€ (values below refer to the projects global duration):

- DeGóis - Plataforma Nacional de C&T, 2004-2007, FCT, 153 k€
- Intellicare – Sistema de Informação Inteligente para Medicina Intensiva, 2004-2007, UMinho, 10 k€
- WeKnow, Sócrates/Minerva, 225456-CP-1-2005-1-DE-Minerva, 2005-2007, 9,5 k€
- GridClass - Learning Classifiers Systems for Grid Data Mining, GRID/GRI/81736/2006, 2007-2010, 51k€
- POAW - Produção de Objectos de Aprendizagem para a Web, 727/4.2/C/REG POS Conhecimento, 2006-2007, 195k€

The RG is expecting the results of 15 projects submitted to several programs, namely: FCT, Portugal; IST, FP7, European Union; FLAD, USA.

The budgets of all the proposals submitted totals around 2,5 million Euro.

Projects with pending funding:

FCT: INSIGHT; e-Pharmacy; Behavioural Biometric Authentication System; Producing consistent ORganizaTional self-RepresentAtions with Information Technology; REpresentational Capabilities for OrGanizational Identity TransfOrmation; SIMulation-BAseD Optimization of BPM; e-trustee; Information Retrieval in Current Research Information Systems Through Rough Sets Theory; Intelligent Decision Support System for Intensive Care; Learning Classifier Systems Based on Particle Swarm; SPAM Telescope Miner: worldwide unsolicited email detection using data mining techniques; An Integrated, Systemic, Strategy-Aligned and Process Oriented Methodology for Effective Organizational Intervention.

EU IST FP7: Symbiotic Data Mining; Relate! because everything is related.

FLAD: Comunicare.

Previous publications in the area

The criterion used to select the publications included in this section aimed at illustrating the diversity of research themes covered by the RG.

1. Baptista, A. A.; Ferreira, M. (2007, May). Tea for two: Bringing Informal Communication to Repositories. D-Lib Magazine 13 (5/6). DOI: 10.1045/may2007-baptista. Available in Open Access at <http://www.dlib.org/dlib/may07/baptista/05baptista.html>
2. Silva, A., P. Cortez, M.F. Santos, L. Gomes and J. Neves. "Mortality assessment in intensive care units via adverse events using artificial neural networks". In Artificial Intelligence in Medicine, Elsevier, 36 (3): 223-234, 2006, ISSN:0933-3657 (IP=1.634) (n°C = 0).
3. Magalhães, S.T., K. Revett e Santos, H., "Generation of Authentication Strings from Graphic Keys", International Journal on Computer Science and Network Security, 6(3), 2006. (ISSN: 1738-7906) (n°C = 0).
4. Ramos, I., D.M. Berry e J.A. Carvalho, "Requirements engineering for organizational transformation". Information and Software Technology, 47(7), pp. 479-495, 2005. (IP = 0.726) (n°C = 1)
5. Santos, M.Y. e L.A. Amaral, "Mining geo-referenced data with qualitative spatial reasoning strategies", Computers and Graphics, Special Issue on Visual Knowledge Discovery, Elsevier Science, 28(3), pp. 371-379, 2004. (ISSN 0097-8493). (IP = 0.641) (n°C = 1)

Special Requirements

Special requirements are mainly related to:

- equipment necessary to overcome limitations that have been identified related to the availability of storage capacity to deal with large amounts of information;
- equipment to support a research program on business processes engineering and management that relies on simulation (with special emphasis on agent-based simulation).

1) The testing of data mining algorithms either in an experimental setting (benchmarking) or using real-world transactional information demand the availability of a data center with a storage capacity of at least 2TB (other specifications include: SCSI/FATA disks and RAID controller). Such server equipment will also enable to explore data warehouse systems and other information storage and retrieval platforms.

Estimated cost ± 20 k€

2) Licenses for software products such as data warehousing, data mining and other business intelligence tools, and simulation platforms (the RG has access to servers that are capable of running these products).

Estimated cost of annual licenses fees ± 10 k€

3) Workstations with high processing capacities to run complex algorithms (2 x 1.5 k€)

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Group Description	
Research Unit:	CENTRO ALGORITMI uid:319 (L700319) (LCOMP-Norte-Braga-319)
Group Name/Designation:	Ubiquitous and Pervasive Computing, Graphics, and Software Methodologies
Group Reference:	RG-COMP-Norte-Braga-319-2184
Principal Investigador:	Adriano Jorge Cardoso Moreira
Time Interval:	(2007-2010)
Location of Group (Host Institution):	Universidade do Minho
Keywords:	Ubiquitous and pervasive computing; communications networks; software process and methodologies; graphic and multimodal systems
Funding, source, dates:	During the period 2003-2006, this RG has been involved in 16 research projects, with a total budget of 1.503.775 € (values for this group's budget only): - LOCAL (FCT, POSI/CHS/44971/2002); Feb04-Jun06 - USE-ME.GOV (IST-002294-2002); Jan04-Feb06 - EPSILON (IST-2001-32389); Nov02-Out05 - VADE (FCT, POSI/CHS/38475/2001); Feb02-Jan04 - SITUACTION (FCT, POSI/EIA/58832/2004); May05-May07 - QoS II (FCT, POSI P/EEI/10168/2001), Jul02-Jun04 - uPAIN (AdI, IDEIA/70/2004/3.1B/00364/007); Jan05-Fev08 - STACOS (FCT, POSI/CHS/48875/2002); Jan04-May07 - SOFTAS (FCT, POSI/EIA/60189/2004); Jun05-May07 - METHODS (FCT, POSI/CHS/37334/2001); Fev02-Jan06 - INFOCITIZEN (IST-2000-28759); Sep01-Aug03 - @RTEC (InterReg III A); Jan03-Dez04 - TORGA.NET (InterReg III A); Jan03-Dez04 - ARTNOUVEAU (IST-2001-37863); Set02-Nov03 - Virtual Showcase – Presenting hybrid exhibits; (IST-2000-28610); Jan01-Jun03 - Pellisaquae-VIS (ADI/2005/M2.3/0022); Jan06-Dez07 - SIDNUET- (Asia-Link/005/103-618); Jul05-Dez07

PI and Researchers

Researchers in the Group (Ph.D. Only)

- (CV) Adérito Fernandes Marcos
- (CV) Adriano Jorge Cardoso Moreira
- (CV) Helena Cristina Coutinho Duarte Rodrigues
- (CV) Isabel Cristina Assis Andrade de Moura
- (CV) Isabel Maria Pinto Ramos
- (CV) Jason Pascoe
- (CV) Joao Alvaro Brandao Soares de Carvalho
- (CV) Joaquim José dos Santos Esteves Neves
- (CV) Leonel Varandas Valbom
- (CV) Manuel João Oliveira Ferreira
- (CV) Maria João Mesquita Rodrigues da Cunha Nicolau Pinto
- (CV) Maribel Yasmína Campos Alves Santos
- (CV) Pedro Miguel Gonzalez de Abreu Ribeiro
- (CV) Pedro Sérgio Oliveira Branco
- (CV) Ricardo Jorge Silvério de Magalhães Machado
- (CV) Rui Joao Peixoto Jose

Other Researchers in the Group (Ph.D. Only)

n/a

Other Researchers in the Group (non Ph.D.)

n/a

Objectives and Achievements

General Objectives

The majority of the researchers that integrate this RG originate from the Information Systems Department of the Engineering School and, until 2006, their research activities were formally developed within the broader Information Systems research group of the Algoritmi Centre. However, since 1998, several research activities started to emerge in specific scientific areas not completely related to Information Systems. Among these, the areas of Mobile and Ubiquitous

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Systems, Computer Graphics, and Software Engineering started to develop their own research programs and to get involved into specific research projects funded by national and international institutions. During the period between 2003 and 2006 these areas, and the corresponding researchers, defined their own research strategies, identified their own research challenges, and started to consolidate as independent research groups. Also during this period, some research projects were run with the participation of researchers from these three areas, showing that, although aiming at becoming independent groups, there is a considerable potential for interdisciplinary activities in many application areas. This multidisciplinary approach to some research challenges is illustrated by the co-authoring of many research papers, some of them listed below.

In this context, the objectives for the 2003-2006 period were defined by the three sub-groups, in their way to become independent, which is expected to happen during the next 2 to 3 years. By 2003, the main objectives of these three sub-groups were to keep working together in common application areas as much as possible, and to launch the basis for a strong international cooperation within each area of expertise. This approach led to the emergence of individual research programs. Further information about these sub-groups and their objectives is available at: <http://ubicomp.algoritmi.uminho.pt>, <http://semag.algoritmi.uminho.pt>, and <http://sgm.algoritmi.uminho.pt>.

Main Achievements

As a whole, this group has been able to achieve most of its objectives for the period 2003-2006, namely:

- the three individual sub-groups consolidated as independent research groups and defined their scope of work. Therefore, the grounds to become formally independent research groups within the next 2 to 3 years are established;
- the group's members published more than 80 papers in peer reviewed journals and conferences, as well as one book and a few book chapters;
- 7 students concluded their PhDs and 9 their MScs within the context of this group's activities;
- the group also strengthened international collaboration through the active involvement in the refereeing of international journals and conferences. Members of this group are frequently involved in the reviewing process of some of the most distinguishing journals and conferences, such as IEEE Pervasive Computing, IEEE Transactions on Mobile Computing, IEEE Transactions on Communications, IEEE Transactions on Software Engineering, IEEE Computer Graphics and Applications, IEEE Transactions on CAD, IEEE Computer, IEEE Software, IEEE Micro, Nordic Journal of Computing, Elsevier Journal on Computer Standards & Interfaces, Elsevier Journal on Computers & Graphics, and also the international conferences on Pervasive Computing and Ubiquitous Computing;
- international collaboration has been also promoted through participation in European projects, including FP5 and FP6. In the last 8 years, the group has acquired considerable experience in these projects and has been able to keep a portfolio of active projects; collaboration has also been realised throughout the INI-GraphicsNet network of institutions;
- 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 Mobile Systems, Technology and Digital Arts, Computer Graphics and Virtual Environments, the Integrated MSc in Communications Engineering, courses in Ubiquitous Systems, and the PhD Programmes in Telecommunications and Computer Science.

Productivity

Publications in peer review Journals (3000 ca.)

(Up to a max of 10. Always indicate at the end of the citation, impact factor of the journal (IF=) and number of citations (n° C=). Give title and full citation in original language. DO NOT translate)

1. Rui José, Adriano Moreira, Helena Rodrigues, Nigel Davies, The AROUND architecture for dynamic location-based services, Mobile Networks and Applications (MONET), the Journal of Special Issues on Mobility of Systems, Users, Data and Computing. ISSN 1383-469X. Kluwer Academic Publishers, Special issue on Mobile & Wireless Data Management., Aug. 2003. Impact Factor (ISI JCR 2003): IP=0,844. N° C=16. (<http://hdl.handle.net/1822/2674>)
2. Pinto, H., R. José. "Pervasive location-based systems: the fundamental challenges between vision and reality". Special issue on Ubiquitous Computing of the International Journal of Pervasive Computing and Communications. 1(1), pp. 7-12, Troubador Publishing Ltd, Mar. 2005
3. Santos, M.Y., L. Amaral, "Geo-Spatial Data Mining in the Analysis of a Demographic Database", Soft Computing – A Fusion of Foundations, Methodologies and Applications, Special Issue on Soft Computing Applications to Spatial Data Analysis, 9(5), pp. 374-384, May 2005. (ISSN 1432-7643 – Paper, 1433-7479 – Online) (ISI JCR 0.538 Impact Factor).
4. Santos, Maribel Yasmina, Luís Alfredo Amaral, "Mining geo-referenced data with qualitative spatial reasoning strategies", Elsevier Journal on Computers & Graphics, Special Issue on "Visual Knowledge Discovery", 28(3), 2004, pp. 371-379 (ISSN 0097-8493) (URI: <http://hdl.handle.net/1822/1343>) (ISI JCR 0.641 Impact Factor).
5. Valbom, L., A. Marcos, "WAVE: Sound and Music in an Immersive Environment", Elsevier Science Journal on Computers and Graphics, Special Issue "Digital Arts", 29(6), Dec. 2005. (ISSN: 0097-8493) (doi:10.1016/j.cag.2005.09.004) (ISI JCR 0.641 Impact Factor)(n° C = 3)
6. Valbom, L., A. Marcos, "An Immersive Musical Instrument Prototype", IEEE Computer Graphics and Applications, July/August 2007 (Vol. 27, No. 4), ISSN: 0272-1716 (<http://doi.ieeeecomputersociety.org/10.1109/MCG.2007.76>) (ISI JCR 1.090 Impact Factor)(n° C = 0)
7. Johan Lilius, Ricardo J. Machado, Dragos Truscan, João M. Fernandes, Ivan Porres. Guest Editors' Foreword: Editorial NJC Special Section on Model-Based Methodologies for Pervasive and Embedded Software. Nordic Journal of Computing (NJC), vol. 12, no. 3, pp. 198-199, Fall, 2005, Helsinki, Finland, [ISSN-1236-6064]
8. Gameiro S., Almeida, L., Marcos A.: "VGLib2D – Class library for the 2D graphic visualisation of large volumes of data". In special edition Advances in Computer Graphics in Portugal of VIRTUAL. Editor-in-Chief: Joaquim Jorge. ISBN: 972-98464-5-6, ISSN: 0873-1837. Oct. 2004. Online: <http://virtual.inesc.pt/aicg04>.
9. Pereira P., Matos N., Grave L., Marcos A.: "ARK multi-user". In special edition Advances in Computer Graphics in Portugal of VIRTUAL. Editor-in-Chief: Joaquim Jorge. ISBN: 972-98464-5-6, ISSN: 0873-1837. Oct. 2004. Online version: <http://virtual.inesc.pt/aicg04>.
10. Hettinger, L., Branco, P., Encarnação, L., M., Bonato, P. (2003). Neuroadaptive technologies: applying neuroergonomics to the design of advance interfaces. Theoretical Issues in Ergonomics Science, vol. 4, Nr. 1-2, 220-237, ISSN 1463-922X

Other publications (3000 ca.)

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

1. Pascoe, J., Rodrigues, H., Ariza, C., An Investigation into a Universal Context Model to Support Context-Aware Applications, Workshop on Context Aware Mobile Systems CAMS'06, On the Move to Meaningful Internet Systems 2006: OTM 2006 Workshops, Springer LNCS 4278 Part II, Eds. Meersman, Tari, Herrero et al, pp. 1884-1893, November 2006.
2. Moreira, A., M.Y. Santos, "Enhancing a user context by real-time clustering mobile trajectories", Proceedings of the International Conference on Information Technology – ITCC 2005, Las Vegas, NV, USA , 4-8 Apr. 2005. (ISBN 0-7695-2315-3) IEEE CS Press (<http://hdl.handle.net/1822/1301>)
3. Machado, R. J., Fernandes, J. M., Monteiro, P., Rodrigues, H., Refinement of Software Architectures by Recursive Model Transformations, J. Munch, M. Vierimaa (Eds.), Proceedings of the 7th International Conference on Product Focused

- Software Process Improvement - PROFES06, Amsterdam, Netherland, June, 2006, pp. 422-428, LNCS Series vol. 4034, Springer-Verlag, Berlin Heidelberg, Germany. (<http://hdl.handle.net/1822/6615>)
4. Branco, P., Encarnação M., A. Marcos, "Let Me See Your Face: an Approach to Monitor Users' Experience", In Proc. SIACC 2006 - Third Ibero-American Symposium on Computer Graphics, Santiago de Compostela, 5-7 July, Spain. Eurographics Proceedings (P. Brunet, N. Correia, G. Baranoski, Eds.), ISBN 3-905673-60-6, pp.45-51
5. Rodrigues, H., Pascoe, J. and Ariza, C., On the Development of an Open Platform for m-Government Services, Krogstie, John; Kautz, Karlhein; Allen, David (Eds.) IFIP Working Conference on Mobile Information Systems, MOBIS 2005, Leeds, UK, December 6-7, 2005 IFIP Series Vol. 191, 2005, ISBN: 978-0-387-29551-0 (<http://hdl.handle.net/1822/6220>)
6. (book chapter) Santos, M.Y., A. Moreira, S. Carneiro, "STICH - Clustering in the identification of Space Models", in John Wang (Ed.), Encyclopedia of Data Warehousing and Mining, Vol. I, Idea Group Reference, Montclair State University, USA. 8.Jul. 2005. (ISBN 1-59140-557-2, hard cover; ISBN 1-59140-559-9, ebook) (<http://hdl.handle.net/1822/5596>)
7. Maria João Nicolau, António Costa, Alexandre Santos, Vasco Freitas, Towards Multi-class Based Multicast Routing, 6th IEEE Int Conf on High Speed Networks and Multimedia Communications (HSNMC 2003), Estoril, Portugal, 23-25 de Julho de 2003, LNCS 2720, pp. 52-61, Ed M. M. Freire et al, Spinger-Verlag Berlin Heidelberg, ISBN 3-540-40542-9, 2003 (<http://hdl.handle.net/1822/2340>)
8. Machado R.J., Fernandes J.M., Monteiro P., Rodrigues H., Transformation of UML Models for Service-Oriented Software Architectures, In 12th IEEE International Conference on the Engineering of Computer Based Systems (ECBS 2005), Greenbelt, MD, E.U.A., pp.173-82, IEEE Computer Society Press, Abr/2005, ISBN 0-7695-2308-0
9. José, R., H. Pinto, "Display-centred applications in Ubiquitous Computing". Workshop on System Support for Ubiquitous Computing at UbiComp 2006 - the 8th Annual Conference on Ubiquitous Computing, Orange County, California, USA, 17-21 Sept. 2006
10. Lavender, T., e A. Marcos, "Some Issues on Artistic and Cultural Heritage Applications", In Proceedings of Artech 2006 - Third International Conference on Digital and Electronic Art, Pontevedra, 17-18 Nov. 2006, Galicia, Spain. ISBN: 84-8158-334-0

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

- Maria João Nicolau, Encaminhamento Diferenciado para Comunicações em Grupo com Requisitos de Qualidade de Serviço, PhD Thesis, Universidade do Minho, June, 2005
- Naima Valigy, Perspectiva do Comércio Electrónico em Moçambique, MSc in Information Systems, Universidade do Minho, November, 2003
- Suzete Maria da Silva Martins de Almeida, Modelo para a disseminação de Informação Geográfica nas Autarquias Locais, MSc in Information Systems, Universidade do Minho, January, 2007.
- Isabel Moura, Bundling: Examinations of Experimental Data. PhD Thesis, University of South Carolina at Columbia, USA, December, 2004.
- Pedro Ribeiro, 2MPspe - Um Modelo de Melhoria do Processo de Desenvolvimento de Software para Pequenas Empresas. PhD Thesis, Universidade do Minho, September, 2004.
- Sérgio Oliveira, Colored Petri Nets in the Animation of UML Models for Requirements Validation. MSc in Information Systems, Universidade do Minho, October, 2006.
- Paula Monteiro, Model-based Transformations for Software Architectures: A Pervasive Application Case Study. MSc in Informatics, Universidade do Minho, May, 2006.
- Nuno Silva, Rejuvenescimento de Aplicações: Uma Experiência com Software de Seguros. MSc in Information Systems, Universidade do Minho, February, 2006.
- António Paiva, Geração Automática de Modelos de Simulação de uma Linha de Produção na Indústria Têxtil. MSc Dissertation, July, 2005.
- Luís Ferreira, Geração Automática de Modelos de Simulação de uma Linha de Produção na Indústria Electrónica. MSc Dissertation, July, 2003.
- Manuel João Oliveira Ferreira, Desenvolvimento de um protótipo para a identificação, classificação e quantificação de defeitos, aplicável em ambiente industrial. PhD Thesis, University of Minho, 2004
- Luiz Manoel Alves dos Santos, in co-supervision with Professor José Luis Moreira da Encarnação from Technische Universität Darmstadt, Germany, with the title: Asymmetric and Adaptive Conference Systems for Enabling Computer-Supported Mobile Activities, Technische Universität Darmstadt, Germany. (PhD)
- Pedro Sérgio Oliveira Branco, Computer-based Facial Expression Analysis for Assessing User Experience, University of Minho, Portugal. Co-supervision of Prof. Miguel Eggeling Encarnação (Rhode Island University, USA). (PhD)
- Leonel Varandas Valbom, Integração de Realidade Virtual no Desenvolvimento de um Modelo de Instrumento Musical Imersivo, University of Minho, Portugal. Co-supervision of Prof. José Luís Encarnação (Technische Universität Darmstadt, Germany). (PhD).
- António Carlos Alves Urbano, Modelos peer-to-peer aplicados a sistemas de comunicação multimédia móveis. MSc in Information Systems, University of Minho. (Master)
- Adriano Fernando Ramos Oliveira, Estudo sobre a Integração da Realidade Aumentada com Interface Multimodal. Master in Computer Graphics and Virtual Environments, University of Minho. (Master)

Patents/prototypes (2000 ca.)

- Patent: Adriano Moreira, Maribel Santos, PAT36455/07: "Processo de cálculo automático do contorno convexo ou côncavo de um conjunto arbitrário de pontos", request submitted in March, 8th, 2007 (this patent resulted from work developed within the LOCAL project. The patent request was submitted in 2007, but from work developed in 2006).
- Prototype: Adriano Moreira, Maribel Santos: Online application that exposes the functionality of the Concave Hull algorithm; available at: <http://local.dsi.uminho.pt:8080/webMathematica/ConcaveHull/>
- Prototype: Ricardo J. Machado. Requirements Animator. Escola de Engenharia da Universidade do Minho, Out/2005. Rapid-prototyping Environment of Interactive Systems to Support the Validation of User's Requirements Based on CPN Tools (in cooperation with Aarhus University). Prototype developed within the project STACOS. <http://www.daimi.au.dk/CPnets/intro/2.html#id12>
- Prototype: Manuel João: 2004 - Displax(r) - Interactive Window (www.displax.com). Developed in consortium with: Centro de Computação Gráfica (www.ccg.pt) and Edigma.com (www.edigma.com). At the present is a commercial product of Edigma.com.
- Prototype: "Augmented Reality Room" (Concluded: Jul. 2003); The final prototype system has been installed for public exposition at Museum D. Diogo de Sousa, Braga, Portugal, during years 2004 and 2005.
- Prototype "WAVE - an Audio Virtual Environment" (Concluded Sept. 2006). The system is under evaluation for eventual commercial exploitation.
- Prototype: "XUE Han Zi" (Concluded and deployed: Oct. 2005). The final prototype has been adapted to be used as a multimedia learning tool for written Chinese by the Center for Oriental Languages and Culture of the University of Minho.
- Prototype: "FaceIT" (Concluded: Dec. 2006). A video-based system for automatic facial expression analysis.

Organization of conferences (2000 ca.)

The members of this group have been involved in the organization of scientific/technical events, either as members of the organizational committees or as members of the scientific committees:

- Organization Committees: 7
- Program Committees: 56
- Organization of Workshops and Seminars: 6

Overall, in the last 3 years, group members have participated in over 50 Program Committees, including ACS D 2006, ACS D 2005, ACS D 2004, ACS D 2003, MOMPES'05 LOCARE '06, eLRL 2005, Artech 2006, Artech 2005, Artech 2004, CISTI2006, CRC2005, CRC2004, CRC2003 EPCG2003, Interacao'2006, DIPES 06, ENCEI 2006, WER'06, CISTI 2006, REC 2005, REC 2006, ICESS 05, CAPSI 2005, INDIN2005, QUATIC'2004, DIPES'04, EDES'2004 ETFA 2003, MIUP'03, SIACG 2002, EPCG 2003, CoopMedia2003, Networking 2006, Insite 2006, GRAPP 2006, iDig 2006, compIMAGE, XATA 2005, Convr2005.

Selection of events:

- (Ricardo Machado (chair), Rui José, Maribel Santos) Org. Committee of the 3rd IEEE/IFIP/ACM/FME Int. Conf. on Application of Concurrency to System Design – ACS D'03, Guimarães, Portugal, June, 2003, IEEE CS Press, USA
- (Rui José) Org. Committee of the “Workshop on Pervasive Display Infrastructures, Interfaces and Applications”. Dublin, Irlanda, May, 2006. <http://ubicomp.algoritmi.uminho.pt/perdisplay>
- (Adriano Moreira (chair), Rui José, Helena Rodrigues) Organization of the Conf. on Mobile and Ubiquitous Systems, Guimarães, June, 2006 <http://ubicomp.algoritmi.uminho.pt/csmu>
- (Maribel Santos) Organizing Committee of the 8th AGILE Conf. on Geographic Information, Estoril, Portugal, Maio, 2005.
- (Ricardo Machado (chair), Maria João Nicolau) Org. Committee of the 5th IFIP Working Conf. on Distributed and Parallel Embedded Systems - DIPES 2006, Braga, Portugal, October, 2006, Springer-Verlag, New York, USA
- (Adérito Marcos) Pres. of the PC, GRAPP 2006 – Int. Conf. on Computer Graphics Theory and Applications”, ESTG - Setúbal, Feb. 2006.
- (Adérito Marcos) Pres. Org. Committee / Conf. Co-chair of SIACG 2002 - 1st Ibero-American Symposium in Computer Graphics, Guimarães, July 2002. In cooperation with ACM SIGGRAPH, EUROGRAPHICS, Brazilian Computer Society, Portuguese and Spanish Chapters of the EUROGRAPHICS.

Industry contract research (2000 ca.)

Some research projects are in direct cooperation with the local industry, namely those that are formalized by AdI (Agência de Inovação). Additionally, there are some PhD research works with explicit involvement of local industry, again formalized by AdI. These two kinds of industry contacts have involved, in the 4-year period of 2003-2006, the following companies: Mobicomp - Mobile Computing and Wireless Solutions, Hospital de Guimarães, and LINCIS - Nonconventional Information Systems (uPAIN project); I2S Informática - Sistemas e Serviços (PhD of Alexandre Bragança); and Blaupunkt Portugal (PhD of Francisco Duarte).

Internationalization (2000 ca.)

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

Collaborative research:

- participation in 8 international research projects (mostly IST);
- membership of the INI-GraphicsNet;
- (Rui José): visit to the Computing Department, Lancaster University, United Kingdom. Cooperation in the area of interactive public displays (5 days), February 2005;
- João Pedro Sousa, School of Computer Science, Carnegie Mellon University. Visit to the Univ. of Minho, within the area of task-driven computing. January 2004;
- Jason Pascoe, post-doc project started in September 2006. Project title: The SmartWatch - an exploration into the user interface, application and form-factor of a socially acceptable wearable computer;
- Kristian Bisgaard Lassen, University of Aarhus (Aarhus, Denmark)
- Jun/2005: 13 days in the University of Minho;
- Jens B. Jørgensen, University of Aarhus (Aarhus, Denmark)
- Jan/2005: 4 days in the University of Minho;
- Ian Oliver, Nokia Research Center (Helsinki, Finland)
- Jun/2003: 3 days in the University of Minho;
- P.S. Thiagarajan, National University of Singapore (Singapore)
- Jun/2003: 3 days in the University of Minho;
- Grant Martin, Cadence Design Systems (Berkeley, California, U.S.A.)
- Jun/2003: 3 days in the University of Minho;

Collaborative publications:

Several publications have been co-authored by foreign researchers (10 full papers in international journals and conferences), and several volume editions have been produced in cooperation with foreign editors (5 books with conference proceedings).

Future Research

Objectives

Since this RG includes three sub-groups on their way to become independent research groups within the Algoritmi Centre, the following list of objectives is related to each of the sub-groups research strategy for the next four years.

The Ubicomp@Uminho group has defined a number of strategic objectives for the next four years that can include: (i) to produce world-class results and set the ground for launching new programs in the coming years; (ii) to extend our international links in academia, industry and society in general; (iii) to contribute for the creation of sustainable and reusable infrastructures that can trigger open innovation through user-centric research.

The scientific objectives and research strategies are mainly structured around long-term research programs that are lead by a specific researcher and represent a long-term commitment to approach in a solid and continued way the issues involved with a particular research topic, namely:

- Embodied Displays for Situated Applications in Pervasive Computing (Rui José)
- Dynamic Space Modelling (Adriano Moreira)
- Motion Prediction (Maribel Santos)

Further information, including details about the current research programs, is available at the web site <http://ubicomp.algoritmi.uminho.pt>.

For the Software Engineering and Management Group (SEMAG):

- Strengthen its research program, by maintaining the effort on its first research line (model-driven methodologies for software development), and by putting more effort to get effective results from the other two research lines (integrated

development environments for software construction; maturity models for software team capability improvement).

- Maintain the effort on organizing MOMPES international workshops in cooperation with well-known researchers from the most prestigious Universities and Research Centers of the world and collocated with the most important and recognized international conferences in the area.
- Maintain the cooperation with those institutions that permit SEMAG researchers to establish privileged relations, namely, IIMF CT128, IPQ CS03, IFIP TC10, IFIP WG10.2, and IEEE Computer Society.

Expected middle-long term results within the Graphic and Multimodal Systems stream include:

- conceptual frameworks laying the foundations for the user-centered design of graphic multimodal systems, with special emphasis on facial recognition and bio-physiological input based approaches;
- methodologies and techniques for information visualization in different application domains, with special emphasis on medical data visual analytics and aesthetical applications/artefacts;
- methodologies and techniques for design, implementation and evaluation of digital artefacts in different application domains, with special emphasis on digital art, education and entertainment and cultural heritage domains;
- novel IT artefacts that enhance perceptive, artistic, educational, entertaining and cultural capabilities.

Funding, source, dates

CURRENT FUNDING (ongoing projects):

- SITUATION (FCT); May05-May07: 60.003 €
- TellMe (Industry contract), Jun07-Jun08: ~28.000 €
- uPAIN (AdI); Jan05-Fev08: 237.130 €
- STACOS (FCT); Jan04-May07: 72.588 €
- SOFTAS (FCT); Jun05-May07: 89.000 €
- Sustainable Software Industry, already approved by CMU-Portugal program: ~250.000€

PENDING FUNDING (this group's budget) (total around 2.5 M€):

- YouTrace – Collaborative Map Construction for Optimized Urban Mobility, submitted to the FP7-ICT-2007-1, May07: 315.808€
- Intelligent knowledge technologies for group tourism (INTEGRO), submitted to FP7-ICT-2007-1: 430.440€
- Embodied Displays for Situated Applications in Pervasive Computing. Application for ERC Starting Independent Research Grant: 980.560€
- SmartEnv – Operating Environment for a Continuous Computing Device, FCT, Aug06: 54.152€
- GUESS – Prediction of a User Position in a Context-aware Mobile Environment through Qualitative Spatial Reasoning, FCT, Aug06: 67.548€
- POOL – Broadband Wireless Metropolitan Area Network Cross-layer Optimisation and Demonstration, FCT, Aug06: 50.652€
- Enhancing Multicast in DiffServ-like Networks, FCT, Aug06: 90.408€
- PerTools - A Toolset for the Development of Interoperable Pervasive Software, AdI, Nov06: 231.220€
- PROTOOL - Prototyping of Software Product Lines, FCT, Sep06: 168.660€
- ASIM - Analysis and Simulation of the Impact of Software Development Models in the Embedded and Information Systems Context, FCT, Sep06: 82.656€

Previous publications in the area

1. Adriano Moreira, Maribel Yasmina Santos, "Concave Hull: a k-nearest neighbours approach for the computation of the region occupied by a set of points", Proceedings of the 2nd International Conference on Computer Graphics Theory and Applications, Barcelona, Spain, 8-11 March, 2007, ISBN: 978-972-8865-71-9
2. Ricardo J. Machado, Kristian Bisgaard Lassen, Sérgio Oliveira, Marco Couto, Patrícia Pinto. Requirements Validation: Execution of UML Models with CPN Tools. International Journal on Software Tools for Technology Transfer (STTT), vol. 9, no. 3-4, pp. 353-370, June, 2007, Springer-Verlag, ISSN-1433-2779
3. Helder Pinto, Rui José, José Creissac Campos "An Interaction Model and Infrastructure for Localized Activities in Pervasive Computing". ICPS'07: IEEE International Conference on Pervasive Services. July 15 - 20, 2007, Istanbul, Turkey
4. Leonel Valbom, Adérito Marcos, "An Immersive Musical Instrument Prototype," IEEE Computer Graphics and Applications, vol. 27, no. 4, pp. 14-19, Jul/Aug, 2007, ISSN: 0272-1716
5. Maribel Yasmina Santos, Adriano Moreira, Decision Trees in the Identification of Space Models, Mediterranean Journal of Computers and Network - Special Issue on Mobile and Ubiquitous Systems, January 2007, ISSN 1744-2397

Special Requirements

- Geographic Information databases: the cost of commercial geographic information databases, such as those with road networks, land cover, house numbers, points-of-interest (POIs), etc., is usually very high (several tens of thousands of Euros per layer), and it turns very difficult for a single project to support such costs. This group has already bought a few of these layers for the national territory, but databases at European wide scale would greatly benefit the research activities in the area of dynamic space modelling and motion prediction, to name just a few. Estimated cost: 150.000€
- SEMAG has been assuming a determinant role in the dissemination and adoption of software engineering standards and software quality procedures in Portugal. Its funding (missions and grants for junior researchers) is paramount to maintain its current leading position in Portugal (through the presidency of IIMF 128, the responsibility for the international affairs of IPQ CS03, and the promotion of SPIN Portugal) and the interaction with the international commissions and committees. For facial expression analysis and character design:
 - 1 licence of emotional Loquendo Text-To-Speech Loquendo in Portuguese and English. Estimated cost: 1.250€ (Loquendo is the only provider of emotional Portuguese voices of good quality. The TTS will be employed for the dialogues of the virtual actors.)
 - 1 licence of a 3D Character Animation System Haptik to be defined. Estimated cost: 2.500€ (The Haptik system includes 3D characters, animations and morphs.)
- Graphic workstations with high processing capacities to run complex computer graphics algorithms and information visualization techniques. Estimated cost: 2x1.500€).

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Group Description	
Research Unit:	CENTRO ALGORITMI uid: 319 (L700319) (LCOMP-Norte-Braga-319)
Group Name/Designation:	Nonlinear Systems Optimization and Statistics
Group Reference:	RG-COMP-Norte-Braga-319-2168
Principal Investigador:	Edite Manuela da Graça Pinto Fernandes
Time Interval:	(2007-2010)
Location of Group (Host Institution):	Universidade do Minho
Keywords:	Semi-infinite programming; global optimization, multi-objective optimization; complementarity constraints programming; applied statistics
Funding, source, dates:	- Um método de redução para programação semi-infinita não linear, POCI/MAT/58957/2004, 12000 € (2005-2007), PI: Vaz, A.I.F. (UM) (members: Fernandes, E.M.G.P., Monteiro, M.T.T., Costa, L., Pereira, A.I.N.). - Optimização sem derivadas e aplicações, POCI/MAT/59442/2004, 23000 €, (2005-2007), PI: Vicente, L.N. (UC) (member: Vaz, A.I.F.). - Mathematical Analysis of Piezoelectric Problems, POCI/MAT/59502/2004, 9904€ (2005-2007), PI: Figueiredo, I.N. (UC) (members: Oliveira, P., Costa, L.). - Modelo de conforto térmico aplicado ao projecto de vestuário, POCTI/EME/62786/2004, 20000€ (2005-2007), PI: Teixeira, S.F.C.F. (UM) (member: Leão, C.P.). - Safety Control of Automated Production Systems (SCAPS), POCTI/EME/61425/2004, 33600€ (2005-2007), P.I.: Machado, J.M. (UM) (member: Leão, C.P.). - Computação Avançada em Engenharia – Reequipment program, FCT, since May 2004, 195000€ , PI: Teixeira, J.C. (UM) (member: Leão, C.P.).

PI and Researchers

Researchers in the Group (Ph.D. Only)

- (CV) Ana Cristina da Silva Braga
- (CV) Ana Isabel Pinheiro Nunes Pereira
- (CV) Ana Maria Alves Coutinho da Rocha
- (CV) António Ismael de Freitas Vaz
- (CV) Celina Maria Godinho da Silva Pinto Leão
- (CV) Edite Manuela da Graça Pinto Fernandes
- (CV) Joao Luis Honorio Matias
- (CV) Lino Antonio Antunes Fernandes da Costa
- (CV) MARIA TERESA TORRES MONTEIRO
- (CV) Pedro Nuno Ferreira Pinto Oliveira

Other Researchers in the Group (Ph.D. Only)

- (CV) Isabel Alexandra Costa Pinho do Espírito Santo

Other Researchers in the Group (non Ph.D.)

n/a

Objectives and Achievements

General Objectives

The research activities of the Nonlinear Systems Optimization and Statistics (NSOS) group bring together researchers mainly from two specific areas: Optimization and Statistics. As far as the Optimization area is concerned, the research work is focused on fundamental research activities and on the development of new optimization algorithms for solving real-world problems.

The research is mainly organized around projects that have specific goals within a particular area of optimization. Current projects consider:

- a theoretical analysis and the use of line search filter methods to guarantee global convergence of SQP and interior-point methods for finite smooth nonlinear optimization;
- the use of penalization and regularization techniques in a nonlinear reformulation of mathematical problems with complementarity constraints;
- the development of multi-local procedures, required for reduction type methods, and of a state of art software for semi-infinite programming;
- the development of global optimization software;
- the development of a pattern search augmented Lagrangian software for non-smooth constrained optimization;
- the use of a Lagrangian relaxation to approximately solve large-scale linear integer programming problems;
- the development of new evolution strategies for multi-objective structural optimization.

Real applications studied so far include: electric energy market problem (mathematical program with complementarity constraints), air pollution control and robot trajectory planning (semi-infinite programming problem), optimal design of

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wastewater treatment plants (non-smooth finite nonlinear problem), piezoelectric anisotropic problems (multi-objective optimization problem); travelling salesman and repairman problems (large linear and integer program); astrophysics (global optimization).

In the Statistics area, there are regular collaborations with professionals from the Health Science area for the design of experiments and data analysis and continuation of the research on Receiver Operating Characteristic analysis.

The project ICTs in engineering education follows the trends in engineering education as a multi and inter disciplinary task (Numerical Methods, Process Control and Automation subjects).

Main Achievements

The NSOS group main achievement is concerned with increase of PhD researchers: 4 (2003) to 10 (2006). Previous Systems Engineering group is now divided into two groups. One is the NSOS. Due to previous FCT excellent evaluation the group will be involved in MSc courses in Systems Statistics, Systems Engineering, Bioinformatics, and in advanced courses in Applied Optimization in Sciences and Engineering (2nd cycle), and Emergent Optimization Techniques (3rd cycle) to start in 2007/08.

The group was involved in PhD examination panels (24), MSc examination panels (15), Aggregation degrees (4), position contests (3).

The group has a collaborative and multidisciplinary policy in the sense that it has been involved in R&D projects with researchers from other areas – biological, chemical and mechanics engineering, economics, medicine, mathematics, informatics - and other universities (Coimbra, Porto).

In the period under evaluation there were specific areas of research that had a relevant impact on the community, due to the high quality scientific publications and/or software publicly available, such as semi-infinite programming, multi-objective optimization and biostatistics.

As a result of the ongoing research, an extension of AMPL to SIP problems, SIPAMPL software, and a solver NSIPS, is now publicly available in the NEOS Server ([HYPERLINK "http://neos.mcs.anl.gov/neos/solvers/index.html"](http://neos.mcs.anl.gov/neos/solvers/index.html) <http://neos.mcs.anl.gov/neos/solvers/index.html>). The Pswarm (Patern Swarm) solver is also publicly available in the NEOS Server.

Papers to be published in 2007 (IP and Cited Half-life(CHI) listed):

- Costa, M.F.P.; Fernandes, E.M.G.P., Practical implementation of an interior point nonmonotone line search filter method, International Journal of Computer Mathematics (IP=0.254)(CHI=6.5).
- Pereira, A.I.P.N.; Fernandes, E.M.G.P., A reduction method for semi-infinite programming by means of a global stochastic approach, Optimization (IP=0.325)(CHI >10).
- Silva, C.E.P.; Monteiro, M.T.T., A Filter algorithm - comparison with NLP solvers. International Journal of Computer Mathematics (IP=0.254) (CHI=6.5).
- Vaz, A.I.F.; Vicente, L.N., A particle swarm pattern search method for bound constrained global optimization. Journal of Global Optimization (IP=0.662)(CHI=7.3).

Productivity

Publications in peer review Journals (3000 ca.)

(Up to a max of 10. Always indicate at the end of the citation, impact factor of the journal (IF=) and number of citations (n° C=). Give title and full citation in original language. DO NOT translate)

The group research work has been focused on multidisciplinary applications so that papers are published in journals from various fields and disciplines. The impact factor (IP) of a journal varies with the field of research and with the discipline. For a more complete evaluation of the group publications the Cited Half-life (CHI) is also included. Self-citations are not included.

1. Costa, L.; Oliveira, P., An Adaptive Sharing Elitist Evolution Strategy for Multiobjective Optimization, Evolutionary Computation, MIT Press, V. 11 (4), 417-438, 2003 (IP= 1.325) (CHI=7.1) (n°C= 2).
2. Costa, L.; Fernandes, L.; Figueiredo, I.; Júdice, J.; Leal, R.; Oliveira, P., Multiple- and single-objective approaches to laminate optimization with genetic algorithms, Structural and Multidisciplinary Optimization, V. 27 (1-2), 55-65, 2004 (IP=1.019) (CHI=4) (n° C=2).
3. Espírito Santo, I.A.C.P., Fernandes, E.M.G.P.; Araújo, M.M.; Ferreira, E.C., NEOS Server usage in wastewater treatment cost minimization, Lecture Notes in Computer Science, V. 3483, 632-641, Springer-Verlag, 2005 (IP=0.402)(CHI=4.4).
4. Leão, C.P.; Rodrigues, A.E., Transient and steady-state models for SMB processes: numerical solutions, Computers & Chemical Engineering, V. 28 (9), 1725-1741, 2004 (IP=1.501) (CHI=7.3)(n°C=4) .
5. Rocha, A.M.A.C., Fernandes, E.M.G.P.; Soares, J.L.C., A first-order ϵ -approximation algorithm for linear programs and a second-order implementation, Lecture Notes in Computer Science, V. 3483, 488-498, Springer-Verlag, 2005 (IP=0.402) (CHI=4.4).
6. Serra R.; Braga, A.C.; Venâncio, A., Mycotoxin producing and other fungi isolated from grapes for wine production, with particular emphasis on Ochratoxin A, Research in Microbiology, V. 156, 515-521, 2005 (IP=2.426) (CHI=4.9)(n° C= 11).
7. Sousa, J.C.; Morreale de Escobar, G.; Oliveira, P.; Saraiva, M.J.; Palha, J.A., Transthyretin is not necessary for thyroid hormone metabolism in conditions of increased hormone demand. J. Endocrinology, V. 187 (2), 257-266, 2005 (IP=3.072)(CHI=7.4).
8. Vaz, A.I.F.; Fernandes, E.M.G.P.; Gomes, M.P.S.F., An interior-point method for semi-infinite programming, Optimization Methods and Software, V. 18 (6), 673-687, 2003 (IP=0.477)(CHI=5.9).
9. Vaz, A.I.F.; Fernandes, E.M.G.P.; Gomes, M.P.S.F., Robot trajectory planning with semi-infinite programming, European Journal of Operational Research, V. 153 (3), 607-617, 2004 (IP=0.824)(CHI=8.2).
10. Vaz, A.I.F.; Fernandes, E.M.G.P.; Gomes, M.P.S.F., SIPAMPL: Semi-Infinite Programming with AMPL, ACM Transactions on Mathematical Software, V. 30 (1), 47-61, 2004 (IP=1.463)(CHI >10)(n° C= 2).

Other publications (3000 ca.)

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

A selection of 10 publications covering the main areas of research in the NSOS group – (Global, Semi-infinite, Multi-objective, Large linear, Non-smooth) Optimization and Applied Statistics is included:

1. Antunes, A.M.S.; Monteiro, M.T.T. A Filter Algorithm and other NLP Solvers: Performance Comparative Analysis. Lecture Notes in Economics and Mathematical Systems, ISSN: 0075-8442, Springer-Verlag, V. 563, 425-434, 2006 (in ISI since 2006).
2. Braga, A.C.; Oliveira, P., Diagnostic analysis based on ROC curves: theory and applications in medicine, International Journal of Health Care Quality Assurance, Emerald, V. 6 (4), 191-198, 2003.
3. Costa, L.; Oliveira, P., An Elitist Genetic Algorithm for Multiobjective Optimization, Metaheuristics: Computer Decision-Making, M.G.C. Resende et al. (Eds), Kluwer, chapter 10, (217-236) ISBN 1-4020-7653-3, 2003.
4. Costa, M.F.P.; Fernandes, E.M.G.P., A primal-dual interior-point algorithm for nonlinear least squares constrained problems, TOP, V. 13, Nº 1, 145-166, 2005. (in ISI since 2006).

5. Matias, J.L.H.; Fernandes, E.M.G.P., A derivative free penalty technique and the PNL-Pesdir tool, XXVIII Congreso de Estadística e Investigación Operativa ISBN 84-689-0438-4, (12 pp), Cádiz, 2004.
6. Pereira, A.I.P.N.; Fernandes, E.M.G.P., A new algorithm for identifying all global maximizers based on simulated annealing, 6th. World Congress of Structural and Multidisciplinary Optimization, J. Herskowitz et al. (Eds.), ISBN 85-285-0070-5, (15 pp), Brasil, 2005.
7. Rocha, A.M.A.C., Fernandes, E.M.G.P.; Soares, J.L.C., Solving the traveling repairman problem with differentiated waiting times through Lagrangian relaxation, VII Congreso Galego de Estadística e Investigación de Operacións, ISBN 972-99841-0-7, (6 pp), Guimarães, 2005.
8. Santos M.; Silva-Fernandes, A.; Oliveira, P.; Sousa, N.; Maciel, P., Evidence for abnormal early development in a mouse. Genes, Brain and Behavior. nº 1, 1-10, 2006 (IP=4.091)(CHI=2.4).
9. Vaz, A.I.F.; Fernandes, E.M.G.P., Nonlinear constrained particle swarm optimization, Technological and Economic Development of Economy, ISSN 1392-8619, Vol. XII, nº1, 30-36, 2006 (in SCOPUS).
10. Vaz, A.I.F.; Fernandes, E.M.G.P., Tools for robotic trajectory planning using cubic splines and semi-infinite programming. Lecture Notes in Economics and Mathematical Systems, ISSN: 0075-8442, Springer-Verlag, V. 563, 399-413, 2006 (in ISI since 2006).

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

- Leão, C.P., Modelling and Simulation of Separation/Reaction Process, PhD thesis, Universidade do Porto, 2003, supervisor: Rodrigues, A.E.
- Matias, J.L.H., Técnicas de penalidade e barreira baseadas em métodos de pesquisa directa e a ferramenta PNL-Pesdir, PhD thesis, Universidade de Trás-os-Montes e Alto Douro, 2003, supervisor: Fernandes, E.M.G.P.
- Vaz, A.I.F., Aplicações, métodos e ferramentas para programação semi-infinita não linear, PhD thesis, Universidade do Minho, 2003, supervisors: Fernandes, E.M.G.P.; Gomes, M.P.S.F.
- Costa, L., Algoritmos Evolucionários em Optimização Uniobjectivo e Multiobjectivo, PhD thesis, Universidade do Minho, 2003, supervisor: Oliveira, P.
- Morais, J.A.M., Análise de Risco e Previsão de Sinistralidade das Empresas de Construção Civil e Obras Públicas, MSc thesis, Universidade do Minho, 2003, supervisor: Oliveira, P.
- Rodrigues, S.M.L., Sistema de Apoio à Decisão na Certificação de Vinhos Verdes, MSc thesis, Universidade do Minho, 2003, supervisor: Oliveira, P.
- Ramadas, G.C.G.V., Variantes do método de Newton na resolução de sistemas de equações não lineares, PhD thesis, Universidade do Minho, 2004, supervisor: Fernandes, E.M.G.P.
- Rocha, A.M.A.C., Algoritmos rápidos e estáveis baseados na relaxação Lagrangeana, PhD thesis, Universidade do Minho, 2005, supervisors: Fernandes, E.M.G.P., Soares, J.L.C.
- Nunes, M.J.L., Metodologias de Desenvolvimento de Novos Produtos Industriais, PhD thesis, Universidade do Minho, 2005, supervisors: Braga, A.C.; Paisana, A.V.
- Cunha, P., Controlo de Qualidade do Betão. MSc thesis, Universidade do Minho, 2006, co-supervisor: Oliveira, P.
- Silva, C.E.P., Um algoritmo de filtros em optimização não linear: a admissibilidade independente da optimização, MSc thesis, Universidade do Minho, 2006, supervisor: Monteiro, M.T.T.
- Rodrigues, H.S.F., Problema de Optimização com Restrições de Complementaridade: uma aplicação ao mercado de energia eléctrica, MSc thesis, Universidade do Minho, 2006, supervisor: Monteiro, M.T.T.
- Pereira, A.I.P.N., Caracterização da função de penalidade exponencial num método de redução para programação semi-infinita, PhD thesis, Universidade do Minho, 2006, supervisor: Fernandes, E.M.G.P.
- Abelenda, C.S.S., Avaliação do conforto de protectores individuais auditivos, MSc thesis, Universidade do Minho, 2006, supervisors: Arezes, P. and Braga, A.C.
- Espírito Santo, I.A.C.P., Desenho óptimo de estações de águas residuais através da modelação de funções custo, PhD thesis, Universidade do Minho, 2007, supervisors: Fernandes, E.M.G.P.; Araújo, M.M.

Patents/prototypes (2000 ca.)

Software publicly available:
 An extension of AMPL to semi-infinite programming problems, SIPAMPL software, and a solver NSIPS for semi-infinite programming - in the NEOS Server (<http://neos.mcs.anl.gov/neos/solvers/index.html>).
 MLOPSOA – Software for multi-local optimization with interface to AMPL.
 Pswarm – Software for global optimization with interface to AMPL. Developed in C (serial and parallel versions) and MATLAB. Also available in the NEOS server.
 PNL-Pesdir tool – software for non-smooth constrained nonlinear optimization (<http://www.norg.uminho.pt>).
 PPSDONL - Augmented Lagrangian pattern search solver for non-smooth nonlinear optimization problems with interface to AMPL.
 Grunenthal Foundation Prize - Pain 2006, Gabapentin associated to Ropivacain improves pain control and quality of life in Trigeminal Neuralgia patients, Lemos, L., Flores, S., Oliveira, P., Almeida, A.

Organization of conferences (2000 ca.)

- Costa, L., Program Committee, Conference on Evolutionary Computation (CEC-2004).
- Costa, L., Program Committee, EMO 2005 (Evolutionary Multiobjective Optimization), México, 2005.
- Costa, L., Program Committee, CEC 2005 (IEEE World Congress on Evolutionary Computation), United Kingdom, 2005.
- Costa, L., Program Committee, GECCO 2006 (Genetic and Evolutionary Computation Conference), Seattle, USA, 2006.
- Costa, L., Program Committee, CEC 2006 (IEEE World Congress on Evolutionary Computation), Vancouver, Canada, 2006.
- Costa, L.; Leão, C.; Monteiro, M.T.; Rocha, A.M.; Vaz, A.I.F., Organizing Committee, ORP3 Conference, Guimarães 2007.
- Fernandes, E.M.G.P.; Oliveira, P., Program Committee, Optimization 2004, Lisboa, 2004.
- Fernandes, E.M.G.P.; Oliveira, P.; Vaz, A.I.F., Program Committee, Optimization 2007, Porto, 2007.
- Fernandes, E.M.G.P.; Oliveira, P.; Vaz, A.I.F., Program Committee, ORP3 Conference, Guimarães, 2007.
- Matias, J.L.H., Program Committee, I Congresso de Estatística e Investigação Operacional da Galiza e Norte de Portugal/VII Congrso Galego de Estadística e Investigación de Operacións, Guimarães, 2005.
- Oliveira, P., Organizing Committee, Optimization 2004, Lisboa, 2004.
- Oliveira, P., Programme Committee, Associação Portuguesa de Investigação Operacional 2006, Lisboa, 2006.
- Oliveira, P., Program Committee, Conference on Evolutionary Computation (CEC-2004).
- Oliveira, P., Local Program Committee, 56th Session of the International Statistics Institute, Lisbon, August 2007.

Internationalization (2000 ca.)

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

List of NSIPS and SIPAMPL Software citations:

<http://www-neos.mcs.anl.gov/neos/solvers/sio:nsips/AMPL.html>. (NSIPS in NEOS Server)

<http://gams.nist.gov/OtherSources.html> . SIPAMPL and NSIPS homepage.

<http://www.scicomp.uni-erlangen.de/archives/SW/opt.html>. NSIPS in NEOS

<http://www.math.hu-berlin.de/~skoerke/links.html>. SIPAMPL homepage.

http://rac.uits.iu.edu/education_and_training/numerics.shtml. SIPAMPL homepage.

<http://www.numerical.rl.ac.uk/external/optimization.shtml>. NSIPS and SIPAMPL homepages.

<http://www.uni-koeln.de/themen/or/software.html>. NSIPS and SIPAMPL homepages.

http://www.mat.univie.ac.at/~neum/glopt/software_I.html. NSIPS and SIPAMPL homepages.

<http://www-unix.mcs.anl.gov/otc/Guide/faq/nonlinear-programming-faq.html>. NSIPS and SIPAMPL homepages.

An MPCC problem, proposed by Monteiro M.T.T., was made available in MacMPEC ampl collection (monteiro.mod, <http://www-unix.mcs.anl.gov/~leyffer/MacMPEC/>).

List of recent refereeing processes:

- Costa, L., E. J. Operational Research, 2003 (1); IEEE T. on Evolutionary Computation, 2005 (1), IEEE T. on Evolutionary Computation, 2006 (3); Evolutionary Computation, 2006 (1).
- Fernandes, E.M.G.P., International J. Computer Mathematics, 2006 (1); Optimization and Engineering, 2006 (1); J. Computational and Applied Mathematics, 2006 (1).
- Leão; C.P., 7th International Conference on Internet and Multimedia Systems and Applications (IMSA'03), 2003 (2); iNEER: INNOVATIONS 2006 - World Innovations in Engineering Education and Research, 2006 (1).
- Oliveira, P., IEEE Transactions on Vehicular Technology (1), Computers and Chemical Engineering (1), A. of Operations Research (1), Evolutionary Computation (1).
- Vaz, A.I.F., Computational Optimization and Appl., 2003 (1); Investigação Operacional, 2005 (1); Conference EUME-2005 (2); International J. Robotics and Automation, 2005 (1), Mathematical and Computer Modelling, 2007 (1), EJOR special edition on Energy, 2007 (1), Int. J. Appl. Math. Stat. (IJAMAS), 2007 (1), J. Global Optimization, 2007 (1), Int. J. Computational Intelligence Research (IJCIR), 2007 (1).

Future Research**Objectives**

The NSOS group is organized into communities that work with different mathematical modelling problems/applications and use the problem specific characteristics to develop new algorithms and software. The communities defined long-term projects that deal with applications from different areas, such as, engineering, science, finance, biomedicine, astrophysics, giving rise to a variety of mathematical modelling problems that are closely related with the following research areas: global and multi-local optimization, non-smooth optimization, multi-objective optimization, finite, smooth and continuous optimization, semi-infinite programming, mixed integer/mixed variable programming, complementarity constraints programming, dynamic systems modelling and statistics. Each community involves at least one PhD researcher and a group of MSc and PhD students. At the present we have 10 PhD and 18 students. There is also collaboration with PhD researchers from other R&D Institutions. New developments in each specific area of optimization are shared within the group so that new ideas can be tested in different context.

A more detailed explanation of what the group expects to accomplish in each research area follows.

In the semi-infinite programming area, a reduction method based on a primal-dual interior-point paradigm with a filter technique to ensure convergence from any initial approximation is under investigation. A derivative-free optimization software will also be required for solving a specific biological engineering application.

In the global optimization context, derivative-free strategies will be developed for specific problems with linear and nonlinear constraints. To obtain high accuracy solutions, hybrid methods that use a stochastic method for the global search and a local search to refine the solution will be tested. For problems with integrality restrictions (mixed integer variables) branch-and-bound type methods, or specific heuristics, will be analyzed. An extension will also be considered to be able to deal with categorical variables known as mixed variable problems.

A filter strategy as well as penalization, regularization or the combination of both is to be implemented in the MATLAB environment, allowing mathematical programming problems with complementarity constraints to be solved.

Other goals include the study of inverse problems on structural design, the development of software for multi-objective Elitist Evolutionary Strategies, the study of representation of multiple objectives in the Pareto space and the reduction of the dimensions in the Pareto space, using statistical multivariate approaches.

In the statistics area, performance measures for Receiver Operating Characteristic analysis and the development of software for incorporating the performance measures will be under investigation. HJ Biplots for large multivariate data manipulation will be studied, with a particular interest on health applications.

Another project will consider the applications of TICE in the development of Virtual and Remote Labs.

Funding, source, dates

- Um método de redução para programação semi-infinita não linear, POCI/MAT/58957/2004, 12000 € (2005-2007), PI: Vaz, A.I.F. (UM) (members: Fernandes, E.M.G.P., Monteiro, M.T.T., Costa, L., Pereira, A.I.N.).

- Optimização sem derivadas e aplicações, POCI/MAT/59442/2004, 23000 €, (2005-2007), PI: Vicente, L.N. (UC) (member: Vaz, A.I.F.).

- Mathematical Analysis of Piezoelectric Problems, POCI/MAT/59502/2004, 9904€ (2005-2007), PI: Figueiredo, I.N. (UC) (members: Oliveira, P., Costa, L.).

- Modelo de conforto térmico aplicado ao projecto de vestuário, POCTI/EME/62786/2004, 20000€ (2005-2007), PI: Teixeira, S.F.C.F. (UM) (member: Leão, C.P.).

- Safety Control of Automated Production Systems (SCAPS), POCTI/EME/61425/2004, 33600€ (2005-2007), P.I.: Machado, J.M. (UM) (member: Leão, C.P.).

- Computação Avançada em Engenharia – Reequipment program, FCT, since May 2004, 195000€ , PI: Teixeira, J.C. (UM) (member: Leão, C.P.).

Projects in evaluation:

- Developments in new materials for thermal comfortable shoes, PTDC/CTM/70183/2006. PI: M.M. Neves (member: Leão, C.P.).

- Differential equations from the concept to the applications: new teaching technologies, PTDC/MAT/66119/2006. PI: Teixeira, S.F. (member: Leão, C.P.).

- WALC – Web Assisted Laboratory for Control Engineering on-line Education, PTDC/ESC/68069/2006. PI: Leão, C.P.

Previous publications in the area

1. Costa, L.; Figueiredo, I.; Oliveira, P.; Leal, R., Actuator effect of a piezoelectric anisotropic plate model. Mechanics of

- Advanced Materials and Structures. V. 13 (5), 403-417, 2006. (IP= 0.922) (nº C=1)
2. Costa, L., A New Parameter-less Evolution Strategy for solving Unconstrained Global Optimization Problems. WSEAS Transactions on Mathematics. V. 5 (1), 1247-1254, 2006.
3. Espírito Santo, I.A.C.P.; Fernandes, E.M.G.P.; Araújo, M.M.; Ferreira, E.C., How wastewater processes can be optimized using LOQO. Lecture Notes in Economics and Mathematical Systems, Springer, V. 563, 435-455, 2006.
4. Gomes, P.S., Leão, C.P., Rodrigues, A.E., Simulation of true moving bed adsorptive reactor: detailed particle model and linear driving force approximations, Chemical Engineering Science, V. 62 (4), 1026-1041, 2007 (IP=1.735)(CHI=8.7).
5. Rodrigues, H.S.F; Monteiro, M.T.T., Solving Mathematical Programs with Complementarity Constraints with Nonlinear Solvers. Lecture Notes in Economics and Mathematical Systems, Springer, V. 563, 415-424, 2006.

Special Requirements

The group subscribes high quality scientific journals since 1998 for which a fund of 3000 € per year is required – SIAM Journals on Optimization, SIAM Journal of Numerical Analysis, SIAM Journal on Control and Optimization, SIAM Journal of Computing, SIAM Review, SIAM Journal on Scientific Computing, Multiscale Modeling and Simulation, Optimization, Optimization Methods & Software; Mathematical Programming Series A and B, Bulletin of the American Mathematical Society, and TOP.

The group has been granted by FCT (Programa Compromisso com a Ciência, 2006) with one Post-Doctoral position. The proposed project covers only a small part of the future planned research activities of the NSOS group. We hope to attract experienced and highly motivated PhD researchers to strengthen our international activities. According to our plan another Post-Doctoral positions would be essential to work on particular mixed variables problems and consider both types of smooth and non-smooth problems. Two grants (for 1st degree holders) for research assistants will be also needed for the extensive algorithm testing tasks (10000€ per year each).

Required equipment: 4 Portable PCs for two Post-Doc and two research assistants (8000 €). A personal computer with large capacity (speed and memory) to allow a better service with the NEOS platform (3000 €). Software licenses, namely AMPL (to remove the actual problem size limit in the available versions) (700 €).

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Group Description	
Research Unit:	CENTRO ALGORITMI UID:319 (L700319) (LCOMP-Norte-Braga-319)
Group Name/Designation:	Systems Engineering, Optimization and Operations Research
Group Reference:	RG-COMP-Norte-Braga-319-2169
Principal Investigator:	José Manuel Vasconcelos Valério de Carvalho
Time Interval:	(2007-2010)
Location of Group (Host Institution):	Universidade do Minho
Keywords:	Optimization; Logistics and Transportation; Modeling and Simulation; Quality and Reliability
Funding, source, dates:	Project POSI/ 1999/ SRI/ 35568, Algorithms for Large Scale Integer Programming, funded by FCT with 60000 euros, (2000-2003). Branch-and-price algorithms (Coordinator: V.Carvalho) Project POSI/ SRI/ 48873 / 2002, Application of Branch-and-Price Algorithms in Scheduling, Funded by FCT with 40000 euros (2004-2007). Applications in scheduling (Coordinator: V.Carvalho) Project POS_C/EIA/57203/2004, Models, algorithms and tools for large scale integer optimization, funded by FCT with 70000 euros (2005-2008). Software tools for cutting and packing, operations planning and network design (Coordinator: V.Carvalho) Project SCOOP (Sheet cutting and process optimization for furniture enterprises) (Contract N° COOP-CT-2006-032998), funded by the European Commission, 6th Framework Programme on Research, Technological Development and Demonstration, specific actions for SMEs, Cooperative Research Projects (2006-2008) Total Funding: 1.200.000 euros. UMinho Funding: 138.500 euros (Coordinator of WorkPackage3: V.Carvalho). Financiamento Plurianual do Centro Algoritmi, FCT, 2003-2006.
PI and Researchers	
Researchers in the Group (Ph.D. Only)	
(CV) Cláudio Manuel Martins Alves	
(CV) Eusébio Manuel Pinto Nunes	
(CV) Filipe Pereira Pinto da Cunha e Alvelos	
(CV) Guilherme Augusto Borges Pereira	
(CV) José António Vasconcelos Oliveira	
(CV) Jose Manuel Henriques Telhada	
(CV) José Manuel Vasconcelos Valério de Carvalho	
(CV) Luís Miguel da Silva Dias	
(CV) Manuel Carlos Barbosa Figueiredo	
(CV) Maria Sameiro Faria Brandao Soares Carvalho	
(CV) Sérgio Dinis Teixeira de Sousa	
Other Researchers in the Group (Ph.D. Only)	
(CV) António José Marques Guimarães Rodrigues	
(CV) Isabel da Silva Lopes	
Other Researchers in the Group (non Ph.D.)	
n/a	
Objectives and Achievements	
General Objectives	
1. Mission Statement: 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 2. 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;	

Confidencial

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 post-doctoral researchers;
Encourage the involvement of postgraduate students in ongoing research projects.

3. Areas of research:

Within each area, research is focused in:

Optimization – Large Scale Integer Programming and Metaheuristics, and their application in Cutting and Packing, Scheduling and Manufacturing.

Logistics and Transportation – Supply Chain Management, Transportation Systems, Forecasting and Inventory.

Modeling and Simulation - Automatic translation and generation, and applications in manufacturing.

Quality, Reliability and Maintenance - Quality Management Systems, Certification and Accreditation, and Reliability.

Main Achievements

1. All researchers belonging to the staff of the University got their Phd degrees

The group has 13 PhDs members, including A.Rodrigues who is serving as Rector of the University. Nevertheless, more than half of them got their degrees only recently (1 in 2007, 6 in 2003-2006).

2. Quality of the publications increased with respect to the previous three-year period

There are now many publications in above average international journals (see below), and one publication in Operations Research, the flagship journal of Operations Research.

3. Internationalization and research cooperation increased

There are now joint publications and research projects, and the group became attractive to international post-doctoral researchers.

4. Links with surrounding industry increased

There are ongoing projects involving PhD students with grants funded by the Program Bolsas de Doutorado em Empresa (BDE) of FCT, with the following companies:

D.S.Teixeira (T. Pinho, grant SFRH / BDE/ 15545/ 2005);

Coindu (P. Brás, grant SFRH / BDE/ 15650/ 2007);

See 13. for further details.

Several MSc students had/have thesis work related to their employing companies (Blaupunkt, Delphi, HOFESA, FAL, Kromberg & Schubert).

5. Three international and one national awards (corresponding papers are listed below)

- 2007 Highly Commended Award to S. Sousa by the Emerald Literati Network for Excellence, in Managing Quality.

- 2006 Best Paper Award to P. Sampaio by the American Society for Quality in the Student Technical Paper Competition (ASQ World Conference on Quality and Improvement, Milwaukee, WI, May 2006).

- 2003 Emerald - Highly Commended Paper Award to S. Sousa by Emerald (Business Excellence International Conference, Portugal, June 2003).

- 2004 Best MSc thesis Paper in Operations Research Award to L. Ferreira and G. Pereira by APDIO (Portuguese Operations Research Society).

6. Some research results

Cutting and Packing: world leading algorithm for the exact solution of multiple lengths cutting stock problem.

Large Scale Integer Programming: dual cutting and stabilization can make column generation algorithms five times faster.

Productivity

Publications in peer review Journals (3000 ca.)

(Up to a max of 10. Always indicate at the end of the citation, impact factor of the journal (IF=) and number of citations (n° C=). Give title and full citation in original language. DO NOT translate)

Aggregate data for Operations Research & Management Science (JCR2006)

Median Impact Factor: 0.635

Aggregate Impact Factor: 0.826

Cited Half-Life (chl): 9.3

Number of Citations (nc) figures are from ISI, Scopus and Scholar.Google, respectively.

1. H. Ben Amor, J. Desrosiers, V.Carvalho, Dual-optimal Inequalities for Stabilized Column Generation, Operations Research, 54, 3, pp. 454-463, 2006. (ip=1.234) (nc=0,1,11) (chl>10.0)

2. J. Faria, M. Matos, E. Nunes, Optimal design of work-in-process buffers, International Journal of Production Economics 99 (2006) pp.144-155; (ip=1.183) (nc=0,0,1) (chl=6.2)

3. S. Sousa, E. Aspinwall, A. Guimarães Rodrigues, Performance Measures In English SMEs: Survey Results, Benchmarking- An International Journal, 2006. 13(1/2), pp. 120-134 (nc=-,0,1)

= = = = = > 2007 Highly Commended Award to Sérgio Sousa by the Emerald Literati Network for Excellence, in Managing Quality

4. V.Carvalho, Using extra dual cuts to accelerate convergence in column generation, INFORMS Journal on Computing, 17, 2, pp. 175-182, 2005. (ip=0.865) (nc=3,5,11) (chl=6.4)

5. S. Sousa, E. Aspinwall, P. Sampaio, and A. Guimarães Rodrigues, Performance measures and quality tools in Portuguese small and medium enterprises: survey results, Total Quality Management & Business Excellence, 16:2, pp.277-307 (2005) (ip= 0.304) (nc=0,0,0) (chl=6.9)

6. J.A. Oliveira, Scheduling the truckload operations in automatic warehouses, European Journal of Operational Research, 179, 3, pp. 723-735, 2007. (ip=0.918) (nc=0,0,0) (chl=8.4)

7. F. Alvelos, V.Carvalho, An extended model and a column generation algorithm for the planar multicommodity flow problem, Networks, 50, 1, pp. 3-16, 2007. (ip=0.485) (nc=-,-,0) (chl>10.0)

8. M. Lopes, V.Carvalho, A branch-and-price algorithm for scheduling parallel machines with sequence dependent setup times, European Journal of Operational Research, 176, 3, pp. 1508-1527, 2007. (ip=0.918) (nc=0,0,1) (chl=8.4)

9. C. Alves, V.Carvalho, Accelerating Column Generation for Variable Sized Bin-Packing Problems, European Journal of Operational Research, 183, 3, pp.1333-1352, 2007 (ip=0.918) (nc=-,-,0) (chl=8.4)

10. C. Alves, V.Carvalho, A Stabilized Branch-and-Price-and-Cut Algorithm for the Multiple Length Cutting Stock Problem, Computers and Operations Research (doi:10.1016/j.cor.2006.08.014) (ip=0.893) (nc=-,-,2) (chl=6.2)

Other publications (3000 ca.)

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

Number of Citations figures (cited by) are from Scholar.Google.

1. Hatem Ben Amor, V.Carvalho, Cutting Stock Problems, in Column Generation, Guy Desaulniers, Jacques Desrosiers, and

- Marius M. Solomon (eds.), pp. 131-162, Springer US, 2005, ISBN: 0-387-25485-4 (cited by 4)
2. J.A. Oliveira, A Genetic Algorithm with a Quasi-local Search for the Job Shop Problem with Recirculation, in Applied Soft Computing Technologies: The Challenge of Complexity, Ajith Abraham, Bernard de Baets, Mario Köppen and Bertram Nickolay (eds.), pp. 221-234, Springer, 2005, ISBN: 978-3-540-31649-7
3. P. Sampaio, P. Saraiva, A. Rodrigues, "ISO 9000 Certification Research: a State-of-the-Art", in ASQ World Conference on Quality and Improvement Proceedings, Milwaukee, WI, Vol. 60, No. 0, pp. 1-14, American Society for Quality.
 = = = = = > 2006 Best Paper Award to Paulo Sampaio by the American Society for Quality in the Student Technical Paper Competition (ASQ World Conference on Quality and Improvement, Milwaukee, WI, May 2006)
4. S. Sousa, E. Aspinwall, and A. Rodrigues, 'Performance Measures in English Small and Medium Enterprises: survey results', in Business Excellence I - Performance Measures, Benchmarking and Best Practices in New Economy, G. Putnik and A. Gunasekaran (eds.), pp. 280-286, 2003, ISBN 972-8692-08-0.
 = = = = = > 2003 Emerald - Highly Commended Paper Award to Sérgio Sousa by Emerald (Business Excellence International Conference, Portugal, June 2003)
5. J. Faria, M. Matos, and E. Nunes, Integrated reliability management in industrial production systems, in Safety and Reliability for Managing Risk, C. Guedes Soares and E. Zio (eds), Vol. 2, pp. 1181-1187, 2006, Taylor & Francis, ISBN 978-0-415-42313-7.
6. L. Dias, A. Rodrigues, G. Pereira, An Activity Oriented Visual Modelling Language with Automatic Translation to Different Paradigms, in 19th European Conference on Modelling and Simulation ECMS 2005, Riga, Letónia. 2005, Yury Mercuryev, Richard Zobel, Eugène Kerckhoffs (eds.), pp. 452-461, ISBN: 1-84233-115-9.
7. I. Lopes, A. Leitão, G. Pereira, Maintenance float system with periodic overhauls, in Safety and Reliability for Managing Risk, C. Guedes Soares and E. Zio (eds), Vol. 1, pp. 613-618, 2006, Taylor & Francis, ISBN 978-0-415-42313-7.
8. T. Pinho, J. Telhada and M.S. Carvalho, E-Logistics in construction: development of a web portal, Doctoral Consortium paper in S. Krishnamurthy and P. Isaías (eds.), IADIS International Conference E-Commerce 2006, Barcelona, pp. 425-429, 2006, ISBN: 972-8924-23-2.
9. Luís Ferreira, Guilherme Pereira, Ricardo Machado, "Geração Automática de Modelos de Simulação de uma Linha de Montagem de Auto Rádio's", Investigação Operacional, 25, 1, pp. 37-62, ISSN 0874-5161, 2005. (available at www.scielo.oces.mctes.pt)
 = = = = = > 2004 Best MSc thesis Paper in Operations Research Award to L. Ferreira and G. Pereira by APDIO (Portuguese Operations Research Society)
10. Filipe Alvelos, V. Carvalho, Comparing Branch-and-price Algorithms for the Unsplittable Multicommodity Flow Problem, INOC 2003, International Network Optimization Conference, Paris, pp. 7-12, 2003, ISSN: 1762-5734. (cited by 3)

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

Post-doc Studies (3):

- F. Clautiaux, PhD U. Compiègne, France (Grant FCT SFRH/BPD/24139/2005), Jan-Jun 2006
 M. Mrad, PhD U. Tunes, Tunisia (Project Scoop Grant UMINHO/BPD/06/2007), Jul 2007-Oct 2008
 T. Chan, PhD U. Hong-Kong, (Project Scoop Grant), planned Aug 2007-Oct 2008

PhD Thesis, U. Minho (8):

- M. Pereira, Modelo multicritério para avaliação e escolha de sistemas/tecnologias de informação a nível industrial, 2004 Adv: M. Carvalho
 M. Lopes, Aplicação do método de partição e geração de colunas à programação de máquinas paralelas, 2005 Adv: V. Carvalho
 F. Alvelos, Branch-and-price and multicommodity flows, 2005 Adv: V. Carvalho
 C. Alves, Cutting and packing: problems, models and exact algorithms, 2005 Adv: V. Carvalho
 L. Dias, Modelação Automática Interactiva de Simulação, 2005 Adv: A. Rodrigues, G. Pereira
 A. Duarte, Aplicação de partição e geração de colunas ao agendamento de máquinas paralelas, 2006 Adv: V. Carvalho
 A. Guerreiro, Simulação Distribuída para Projecto e Controlo de Sistemas de Produção Distribuídos e Virtuais, 2006 Adv: G. Putnik (DPS, UMinho), A. Rodrigues
 I. Lopes, Técnicas Quantitativas no Apoio à Decisão em Sistemas de Manutenção, 2007 Adv: G. Pereira, A. Leitão (IPB)
 PhD Thesis, Other Univ. (3):

- S. Sousa, Quality improvement measures in SMEs. U. Birmingham, U.K., 2005. Adv: E. Aspinwall (Birmingham), A. Rodrigues
 M. Figueiredo, Forecasting, Monitoring and Stock Control in the Mail Order Environment, Univ. Lancaster, U.K., 2003. Adv: R. Eglese (Lancaster), A. Rodrigues
 E. Nunes, Fiabilidade de sistemas com comportamento não-markoviano e com parâmetros incertos, U. Porto, 2005. Adv: M. Matos (FEUP), J. Faria (FEUP)

Ongoing PhD Thesis, U. Minho (6):

- T. Pinho, Definição de um modelo da rede logística na indústria da construção: estudo de um caso. Adv: J. Telhada, M. Carvalho. (SFRH/BDE/15545/2005)
 P. Brás, Posicionamento automático de figuras irregulares. Adv: C. Alves, V. Carvalho. (SFRH/BDE/15650/2007)
 I. Lopes, Problemas de corte de stock a duas dimensões. Adv: V. Carvalho. (SFRH/BD/32151/2006)
 P. Sampaio, Estudo do Fenómeno ISO 9000 - origens, motivações, consequências e perspectivas. Adv: A. Rodrigues, P. Saraiva (U. Coimbra) (SFRH/BD/16032/2004)
 M. Carvalho, Análise e Avaliação de Períodos de Inspeção em Sistemas de Natureza Tecnológica. Adv: J. Telhada, E. Nunes
 C. Pimentel, Métodos híbridos para dimensionamento de lotes e escalonamento integrados Adv: F. Alvelos, V. Carvalho
 MSc Thesis in MSc in Engenharia Industrial, U. Minho (7):
 L. Ferreira, Simulação de Sistemas Computacionais Embebidos no Controlo Distribuído de uma Linha de Montagem de Auto-Rádios, 2003. Adv: G. Pereira, Ricardo Machado (DSI, UMinho)
 A. Paiva, Simulação de Sistemas Computacionais Embebidos na Monitorização Remota de uma Linha de Produção de Meias, 2005. Adv: G. Pereira, Ricardo Machado (DSI, UMinho)
 C. Pimentel, Algoritmos para dimensionamento de lotes de produção, 2005 Adv: F. Alvelos, V. Carvalho
 S. Lopes, Integração de Sistemas de Gestão da Qualidade e Ambiente, 2005 Adv: S. Sousa, F. Romero (DPS, UMinho)
 P. Rodrigues, Programação de operações em armazéns automáticos, 2006 Adv: J. Oliveira
 B. Kùçüksolak, Course structures in Logistics, Istanbul, Turquia, 2006 Co-Adv: M. Carvalho
 P. Brás, Posicionamento automático de figuras irregulares, 2007 Adv: C. Alves
 MSc Thesis in MSc in Sistemas de Informação, U. Minho (1):
 S. Oliveira, Colored Petri Nets in the Animation of UML Models for Requirements Validation, 2006 Adv: R. Machado (DSI, UMinho), G. Pereira

Patents/prototypes (2000 ca.)

- The following software prototypes were developed in PhD thesis work:
 -- S+ (AIMS, Automatic Interactive Modelling of Simulation) -

Automatic generation of simulation models using the Activity Cycle Diagrams paradigm.

-- MLCSP – Multiple Lengths Cutting Stock Problem

Algorithm that provides the optimal solution for the Multiple Lengths Cutting Stock Problem (with constraints for the availability of the stocks rolls).

-- ADDING – Automatic Dantzig-Wolfe decomposition for integer column generation

Tool for automatic reformulation of models of selected decompositions which can also be used to assess the strength of the corresponding linear programming relaxations.

-- MMASSI/TI– A Multicriteria Decision Support System for the Selection of Information Systems/Information Technologies.

Organization of conferences (2000 ca.)

ORP3 2007 - Operational Research Peripatetic Postgraduate Programme, Guimarães, September 2007. Co-president Program Committee: V. Carvalho. Co-president of the Organizing Committee: J. Telhada. A total of 8 member of the group are involved in both committees.

3rd ESICUP Meeting, The EURO Special Interest Group on Cutting and Packing, Porto, Portugal, March 16-18, 2006.

President Program Committee: V. Carvalho.

VII International Workshop on Cutting, Packing and Related Topics, Leiria, Portugal, September 9 to 12, 2007. President

Program Committee: V. Carvalho.

Workshop Integer Programming, Combinatorial Optimization and Heuristics, Braga, 9th February 2006. President

Organizing Committee: V. Carvalho.

Optimization 2004, Lisboa, 25-28 Julho 2004. Member Program Committee: V. Carvalho.

INOC 2005 - International Network Optimization Conference, Lisboa, Março de 2005. Member Program Committee: V.

Carvalho.

Optimization 07, Porto, 22-25 Julho 2007. Member Program Committee: V. Carvalho.

I Congresso de Estatística e Investigação Operacional da Galiza e Norte de Portugal - VII Congresso Galego de Estadística e Investigación de Operacións, Guimarães, 2005. Member Program Committee: V. Carvalho.

IO 2004, 11^o Congresso da Associação Portuguesa de Investigação Operacional, Porto, 2004. Member Program

Committee: V. Carvalho.

IO 2006, 12^o Congresso da Associação Portuguesa de Investigação Operacional, 8-11 de Outubro de 2006, ISEG, Lisboa.

Member Program Committee: V. Carvalho, S. Carvalho.

Industry contract research (2000 ca.)

Research contract: Coindu, S.A., Portugal (fabric and leather car set manufacturer with annual sales of 90M€) in operations planning and leather cutting. (50000 euros) 2006-2007. Coordinator: V.Carvalho. A PhD student, who was awarded an FCT BDE grant (Company-university partnership PhD grant), is involved in this project.

Research contract: Moldartpóvoa, (manufacturer of frames for pictures/paintings; leader in Portugal with growing sales across Europe) development of a quality management system (QMS). (6000 euros) 2006. Coordinators: E. Nunes and S. Sousa.

Internationalization (2000 ca.)

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

1. Collaborative publications and research:

V.Carvalho with J.Desrosiers (Université de Montréal, Canada), in column generation.

V. Carvalho with Hatem Ben Amor (Université de Montréal, Canada), in column generation and cutting stock.

V. Carvalho, C. Alves with F. Clautiaux (Université de Lille, France) (Former post-doc with grant FCT - SFRH/ BPD/ 24139/ 2005) in dual feasible functions

V.Carvalho, F. Alvelos with A. Frangioni (Università di Pisa, Italy) in column generation and non-differentiable optimization.

2. Collaborative work for PhD supervision:

A.Rodrigues with E. Aspinwall (University of Birmingham, U.K.) - supervision of S. Sousa.

A. Rodrigues with R. Eglese (University of Lancaster, U.K.) – supervision of M. Figueiredo

3. Ongoing collaborative research

There is ongoing research, but no publications yet, with

V. Carvalho, C. Alves with G.Scheithauer, G. Belov (Dresden University of Technology, Germany), in cutting and packing.

V. Carvalho, C. Alves, F. Alvelos with F. Pezzella (Università Politecnica delle Marche, Italy)

V. Carvalho, C. Alves, F. Alvelos with Cláudio Arbib (Università degli Studi dell'Aquila, Italy)

L. Gouveia (University of Lisbon, Portugal)

4. Graduate Training Networks

Graduate Training Network with Massachusetts Institute of Technology (MIT), Instituto Superior Técnico (IST) and Faculdade de Engenharia da Universidade do Porto (FEUP). Several members of the group are involved in teaching Operations Research, Operations Management and Supply Chain Management courses in the LTI and TME Programs of EDAM (Engineering Design and Advanced Manufacturing) of the MIT-Portugal Program.

Module of Summer School: V.Carvalho, Cutting Stock Problems, Summer School on Column Generation, Ecole Polytechnique, Université de Montréal, 15-19th May 2006.

Short Course: V.Carvalho, Optimization Algorithms for cutting stock and packing problems, Facoltà di Ingegneria, Università Politecnica delle Marche, Ancona, Italy, 17-18th May 2007.

Future Research

Objectives

We will pursue the mission statement and the objectives stated in the 2003-2007 Individual Group Research Report.

1. Internationalization and Cooperation

Actions were already taken to start research cooperation with other international centers of excellence in Operations Research, as follows:

Start research cooperation with MIT, USA. Several members of the group are involved in teaching Operations Research, Operations Management and Supply Chain Management courses in the LTI and TME Programs of EDAM (Engineering Design and Advanced Manufacturing) of the MIT-Portugal Program. Several contacts were established in a V.Carvalho visit to MIT, and research cooperation in the areas mentioned above is envisaged with MIT staff, in particular with Stanley Gershwin.

Start new research contracts with industry and services, in particular with the Industrial Affiliates of EDAM, aiming at an increase in the number of Phd degrees awarded and the job placement of the graduates in the companies.

Start research cooperation with Jacques Carlier (Université de Technologie de Compiègne, France) in the areas of

Optimization and Dual feasible functions for Operations Planning and Cutting and Packing.

Continue research cooperation with Richard Eglese (Lancaster University, UK) in the areas of Forecasting and Inventory Management, and start research cooperation in the areas of Optimization and Reverse Logistics.

2. New projects and researchers for the group

In the last three years, 7 members of the group got their PhD degrees. Now, some research areas within the group gained a critical mass that enables targeting larger scope projects and to establish new international links. One of the areas envisaged is Quality and Accreditation of Health Services.

The group had 2 post-docs assigned in the Program "Compromisso com a Ciência", funded by the Portuguese Government. The call for the positions was already released.

New grantees are expected for a new project will start in the area of Transportation Systems.

Two PhD students from The Czech Republic will develop work under the supervision of J.A.Oliveira and L.Dias (Erasmus Program)

3. Other objectives

Strive to create an adequate research environment for a University with a "research-university" status, aiming at mitigating the following current problems:

heavy teaching duties

- an overworked faculty has weekly teaching load is 8-12 hours, during 30 weeks / year, yielding an overall teaching load of 240-360 hours per year.

heavy administrative duties

- faculty often has to perform administrative duties. There are only one administrative and one technical staff in Gualtar Campus for the administrative support of 13 +10 = 23 faculty.

heavy examination loads

- there are 3 final exams per course. Students are given the choice of picking one out of two dates for their final exam, and, if they flunk, they have an extra chance.

lack of time for concentrated research

- each final exams period takes about 6 weeks. There are two final exams period, one per semester.

Funding, source, dates

1. Ongoing Projects

Project POSI/ SRI/ 48873 / 2002, Application of Branch-and-Price Algorithms in Scheduling,

Funded by FCT with 40000 euros (2004-2007). Applications in scheduling (Coordinator: V.Carvalho). Still about one fourth of the budget to be executed.

Project POS_C/EIA/57203/2004, Models, algorithms and tools for large scale integer optimization, funded by FCT with 70000 euros (2005-2008). Software tools for cutting and packing, operations planning and network design (Coordinator: V.Carvalho). Still about one half of the budget to be executed.

Project SCOOP (Sheet cutting and process optimization for furniture enterprises) (Contract N° COOP-CT-2006-032998), funded by the European Commission, 6th Framework Programme on Research, Technological Development and Demonstration, specific actions for SMEs, Cooperative Research Projects (2006-2008) Total Funding: 1.200.000 euros. UMinho Funding: 138.500 euros (Coordinator of WorkPackage3: V.Carvalho). Still about one half of the budget to be executed.

2. New Projects about to start.

Project PTDC/TRA/72871/2006, ASTRA - Alternative System of Transport for Rural Areas, funded by FCT, 116263 Euros (2007-2010). Approved (Coordinator: J. Telhada) Entire budget to be executed.

3. Pending funds (approval expected by the end of July 2007)

Project PTDC/EIA/64820/2006 ASPAS: Algorithms and Software for Hard Packing and Scheduling Problems, pending funding by FCT (Coordinator: C.Alves)

Previous publications in the area

Aggregate data for Operations Research & Management Science (JCR2006)

Median Impact Factor: 0.635

Aggregate Impact Factor: 0.826

Cited Half-Life (chl): 9.3

Citation figures are from ISI, Scopus and Scholar.Google, respectively

1. H. Ben Amor, J. Desrosiers, V.Carvalho, Dual-optimal Inequalities for Stabilized Column Generation, Operations Research, 54, 3, pp. 454-463, 2006. (ip=1.234) (nc=0,1,11) (chl>10.0)

2. J. Faria, M. Matos, E. Nunes, Optimal design of work-in-process buffers, International Journal of Production Economics 99 (2006) pp.144-155; (ip=1.183) (nc=0,0,1) (chl=6.2)

3. V.Carvalho, Using extra dual cuts to accelerate convergence in column generation, INFORMS Journal on Computing, 17, 2, pp. 175-182, 2005. (ip=0.865) (nc=3,5,11) (chl=6.4)

4. V. Carvalho, LP Models for Bin-Packing and Cutting Stock Problems, European Journal of Operational Research, 141, 2, 253-273, 2002. (ip=0.918) (nc=8,22,38) (chl=8.4)

5. V. Carvalho, A note on branch-and-price algorithms for the one-dimensional cutting stock problem, Computational Optimization and Applications, 21, 3, 339-340, 2002. (ip=0.800) (nc=3,4,3) (chl=5.9)

All papers above are within their cited half-life.

Special Requirements

1. One administrative officer

One full time administrative officer to support the administrative burden of the several projects going on the research group, to work in the Campus of Gualtar.

2. Interchange

15000 euros to foster new research areas and to fuel the fast start of the new cooperation projects, for short-period visits of the members of the research group to partner research groups, and visits of their staff to the University of Minho.

Partners of the following Universities are envisaged:

- Université de Technologie de Compiègne, France

- University of Lancaster, U.K.

- University of Leeds, U.K.

- Universitat Politècnica de Catalunya, Spain

3. Equipment and software licenses

3000 euros (2 personal computers and software licenses)