ANNUAL REPORT
2010
INESC-ID, a research institute associated with Instituto Superior Técnico and INESC, was launched in the year 2000 and is devoted to advanced research and development in the domains of electronics, telecommunications, and information technologies. In 2004 it was awarded the status of “Laboratório Associado” of the Portuguese Ministry of Science, Technology and Higher Education.

In close cooperation with its partners, INESC-ID is intensively involved in a number of high visibility projects that define the state of the art in these areas, both at national and international levels. In particular, INESC-ID was successful in obtaining a large number of FP7 contracts, being the most successful Portuguese institution, for its size, in the ICT area.

INESC-ID has the particularity of integrating long term research and more immediate, but equally important technology transfer projects. These two types of activities are crucial for creating a sustainable value for the society by developing new technologies.

This report presents, in a structured way, a brief description of the institution and an overview of the most important results of the activities developed, together with some key management initiatives developed in 2010.

A list of the most significant research projects undertaken in 2010 is included, in order to provide a picture, although incomplete, of the main competences of INESC-ID. A more detailed list of activities, organized by research unit, is also provided, and is complemented by a full list of projects, publications, dissertations, and seminars, included as annexes to the main document.

In this year, INESC-ID continues growing not only in the number of high qualified PhD researchers, but also in all the indicators: the number of publications and funded research projects.
01. WHO WE ARE

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INESC-ID is a research institute dedicated to advanced research and development in the areas of Electronics, Communications, and Information Technologies.

INESC-ID was created in 2000, as a result of the reorganization of the R&D activities of its parent institution, INESC, in Lisbon.

INESC-ID is a not for profit, privately owned institution, declared officially of public interest. It is owned 51% by IST - Instituto Superior Técnico - and 49% by INESC – Instituto de Engenharia de Sistemas e Computadores.

INESC-ID operates in two locations, near (or inside) the two campuses of IST, namely Alameda and Taguspark.

1.1 ASSOCIATE LABORATORY

INESC-ID was awarded the status of “Laboratório Associado” in December 2004. This has increased the funding and enabled the recruitment of a number of postdoctoral researchers and support staff.

The activities of INESC-ID in 2010 are structured into five research lines:

Spoken Language Systems

Information and Decision Support Systems

Interactive Virtual Environments

Embedded Electronic Systems

Communication Networks and Mobility

Some research lines are composed of different research groups, but the research and administrative planning, once centred in the groups, has progressively moved towards the research lines.
Fig. 1 – INESC-ID Organization Chart
1.2 INSTITUCIONAL STRUCTURE

1.2.1 Management structure
INESC-ID is structured according to the organization chart shown below. Current management of the organization is ensured by the Board of Directors, assisted by the Project Support Office (GAP), the Human Resources Office (GARH), and other administrative support units, which provide services sub-contracted to INESC (holding) or to INESC INOV: Financial Control Department (DFA), Budget Control Department (DAF), Legal Support, Infrastructures Department (DGI), and Computer Network Support.

Board of Directors
The Board of Directors is composed of three members proposed by the Scientific Council and appointed by the General Council. It is in charge of the general management of the Institution. In 2010 the Board was composed by Leonel Sousa (chairman), José Carlos Monteiro and Luís Rodrigues.

General Council
The General Council is composed by three representatives of IST (Instituto Superior Técnico), two of INESC, and by the chairman of the Scientific Council of INESC-ID. The General Council approves the annual technical and financial reports, as well as the plan and the budget. It appoints the board of directors under proposal by the Scientific Council. In 2010 the General Council was composed by António Cruz Serra, Arlindo Oliveira, Paulo Martins, José Tribolet, Abílio Ançã Henriques and João Miranda Lemos.

Audit Board
The Audit Board is composed of three members appointed by the General Council. It examines and certifies the accounts of the Institution. In 2010 the Fiscal Council was composed by Hermínio Ribeiro, Dr. João Catarino and Grant Thornton & Associados – Sociedade de Revisores Oficiais de Contas, Lda.

Scientific Council
The Scientific Council is composed of all researchers with a Ph.D. degree. It is responsible for the strategic planning and for the organization of the research units, and evaluates the research projects, annual budget, plan, and report. The Scientific Council is assisted by the Advisory Board which visits INESC-ID on a regular basis.
Board of the Scientific Council

The Scientific Council has a managing board composed of a chairman and two other members. In 2010 the Board of the Scientific Council was composed by Prof. Luís Silveira, Prof. Inês Lynce, and Prof. João Miranda Lemos (chairman).

Scientific Council Coordinating Committee

The Coordinating Committee is composed of the Board of the Scientific Council and representatives of the thematic areas.

Advisory Board

The Advisory Board is composed by external advisors that provide advice concerning the strategy and plans of the Institution. The members of the Advisory Board are currently Profs. Franco Maloberti (Univ. Pavia, Italy), Srinivas Devadas (MIT, USA), Morris Sloman (Imperial College, London, UK), and Carlos Principe (Univ. Flórida, USA).

Human Resources Office

The Human Resources Office (GARH – Gabinete de Apoio aos Recursos Humanos) is responsible for the management of the human resources of INESC-ID.

Projects Support Office

The Projects Support Office (GAP – Gabinete de Apoio aos Projectos) is responsible for the control of the execution of national projects. It also provides administrative support to the activity of the Board of Directors.

Administrative Support

The Administrative Support is provided by five secretaries that support the researchers of the different R&D groups.

Financial Control Department

The Financial Control Department (DFA – Departamento Financeiro e Administrativo) is in charge of all the accounting and finance matters.

Budget Control Department

The Budget Control Department (DAF - Departamento Administrativo e Financeiro) controls the financial execution of the projects and units of INESC-ID. It also handles regular budget control, acquisitions, and project financial reporting for national and European funding agencies.

Legal Support Department

The Legal Support Department gives advice on all the legal matters concerning INESC-ID.

Infrastructures Department

The Infrastructures Department (DGI – Departamento de Gestão de Infraestruturas) handles all matters directly related with the buildings where INESC-ID is settled, including the telephone service.
Network Support Department
The Network Support Department is responsible for the maintenance of the computer network and servers.

1.2.2 Scientific Structure
The research developed at INESC-ID is organized in five Research Units, and each research unit is organized around several research groups.
Each research unit has one or two Coordinators, elected among the researchers with a doctoral degree. The functions of the Coordinators are as follows:

• Represent the research unit of the Coordinating Committee of the Scientific Council;
• Coordinate the activities of the various groups which belong to the research unit;
• Promote the preparation of proposals for R&D projects;
• Coordinate the preparation of plans and reports concerning to the research unit.

Each research unit integrates different research groups, which are listed below together with their coordinators in 2010:

SPOKEN LANGUAGE SYSTEMS
Coordinator: Isabel Trancoso
Individual groups do not exist within this research unit.

INFORMATION AND DECISION SUPPORT SYSTEMS
Coordinators: Prof. Alberto Silva, Prof. João Cachopo
SW Algorithms and Tools for Constraint Solving – Prof. Inês Lynce
Knowledge Discovery and Bioinformatics – Prof. Ana Teresa Freitas
Distributed Systems – Prof. Luís Rodrigues
Software Engineering – Prof. João Cachopo
Information Systems – Prof. Alberto Silva
Data Management and Information Retrieval – Prof. Helena Sofia Pinto

INTERACTIVE VIRTUAL ENVIRONMENTS
Coordinator: Prof. Joaquim Jorge
Intelligent Agents and Synthetic Characters – Prof. Ana Paiva
Intelligent Multimodal Interfaces – Prof. Joaquim Jorge

EMBEDDED ELECTRONIC SYSTEMS
Coordinators: Prof. João Paulo Teixeira, Prof. Jorge Fernandes
Analogue and Mixed-Signal Circuits – Prof. Jorge Fernandes
Control of Dynamic Systems – Prof. João Miranda Lemos
Signal Processing Systems – Prof. Gonçalo Tavares
Quality, Test and Co-Design of HW/SW Systems – Prof. João Paulo Teixeira
Electronic System Design and Automation – Prof. Horácio Neto
Algorithms for Optimization and Simulation – Prof. Luís Silveira

COMMUNICATION NETWORKS AND MOBILITY
Coordinator Prof. Augusto Casaca
Individual groups do not exist within this research unit.
2.1 OBJECTIVES

INESC-ID aims to produce added value to people and society in the field of Information and Communication Technologies (ICT). The mission of INESC-ID is to develop tomorrow’s technologies by excelling in research, today.

The main objectives of INESC-ID are: to integrate competences from researchers in electrical engineering and computer science to advance the state of the art in computers, telecommunications, and information systems; to support the first stages of the value generation chain: basic research, applied research, and advanced education; in cooperation with other institutions, to perform technology transfer, to support the creation of technology based startups, and to provide technical support.

Tangible results of the activity of the institution are: publications in national and international journals and conferences; methodologies, tools, patents, and prototypes to be transferred to the academic, scientific or industrial sectors, advanced professional education and training.

In order to fulfill its mission, INESC-ID values internationalization, networking, partnership and visibility.

R&D activities cover a broad (although focused) range of research areas and application markets, such as wireless communications, electronic equipment, health care, medical imaging, industrial automation, e-learning, and enterprise information systems. INESC-ID also acts as a service provider, to stimulate cooperation with industry, to focus research on practical issues, and to make the economic market aware of its capabilities. Close ties with professionals qualified by INESC-ID are encouraged, not only for lifelong education support, but also for networking activities.

The scientific activities of INESC-ID are financed by a number of funding agencies, of which the most important are FCT-Fundação para a Ciência e Tecnologia, ADI – Agência de Inovação, and the European Comission. Additionally, INESC-ID also participates in other funding programs involving government funding with the purpose of developing R&D in companies through consortiums with research partner institutions.
Develop tomorrow’s technologies by excelling in research, today!
2.2 MAIN ACHIEVEMENTS

In the last year the institution has worked hard to fulfill its mission. Our research is now quite visible at an international level, and its quality is recognized. Among the most significant achievements, we would like to highlight the following activities:

- The exceptional quality of the publications of INESC-ID researchers has been recognized in 2010 with several best paper awards, in national and international conferences;

- The organization of the international conferences RECOMB’10 and EKAW’10, that required the participation and the effort of the institution as a whole;

- The success of the five INESC-ID startup companies. Three of them (Coreworks, VoiceInteraction and PetSys) were created in early years as a result of a very significant technology transference. In 2009 there is also the participation in a fourth startup company, NWC, a highly innovative company in the implementation and development of specific social and network applications. The newest participation is SiliconGate, a start-up that operates in the field of microelectronics and develops and licenses high performance power management blocks that are key elements in any mobile equipment;

- The celebration of INESC-ID 10th anniversary also brought a blend of wide interest discussion themes to both academic community and general public. National and international renowned researchers were specially invited for this event.

- The increasing in scientific productivity results in about 90 international journal papers and the participation in more than 300 international conferences. Moreover, about 15 PhD theses were finished in 2010.

- From a total of 35 research projects that started in 2010, 7 are European funded and 28 are national funding (FCT and ADI). In 2010 there were a total of 93 research projects ongoing (25 European, 2 managed by ADI and 66 funded by FCT). Besides that, we also have some contracts with companies.
03. HUMAN RESOURCES
The majority of the researchers of INESC-ID are members of the academic staff and post-graduate students of IST. There are also researchers from other Universities and Polytechnic Institutes and a small number of contracted postdoctoral researchers.

On 31 December 2010 INESC-ID had 285 collaborators, 106 of which with a Ph.D. degree and 88 with a M.Sc. degree.

Since INESC-ID focuses its activity on the rapid growth areas of information technology, communications and electronics, an increase is to be expected in the number of researchers with higher degrees within the next few years. Many researchers are carrying out their post-graduate work at INESC-ID. Table I summarizes the qualifications of INESC-ID researchers.

<table>
<thead>
<tr>
<th>Academic Degree</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habilitation</td>
<td>19</td>
</tr>
<tr>
<td>PhD Degree</td>
<td>87</td>
</tr>
<tr>
<td>MSc Degree</td>
<td>88</td>
</tr>
<tr>
<td>1st Degree</td>
<td>83</td>
</tr>
<tr>
<td>Undergraduate Students</td>
<td>1</td>
</tr>
<tr>
<td>High School</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>285</strong></td>
</tr>
</tbody>
</table>

The increase of technical and scientific activity, as a result of the status of Associate Laboratory, leads to the need to improve technical support and administrative services. The institution is mostly composed by researchers with a PhD, which reflects the motivation given to our collaborators to develop a structured researcher career.

INESC-ID also has a very young structure, due to the amount of fellowships and young researchers; more than 60% have ages between 20 and 40 year old and have a PhD or MSc degree.
04. OUTCOME
A main source of national funding of INESC-ID is FCT – Fundação para a Ciência e Tecnologia, through direct funding of the associate laboratory projects awarded in a nationwide competitive basis. National funding is also provided by AdI – Agência de Inovação. Another main source of funding are European Union projects.

The following set of tables summarizes the activities carried out in 2010 and the results achieved.

### Projects

<table>
<thead>
<tr>
<th>Type of Project</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Programs (research projects ongoing)</td>
<td>17</td>
</tr>
<tr>
<td>National Programs (research projects ongoing)</td>
<td>68</td>
</tr>
<tr>
<td>Contracts with companies</td>
<td>13</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>98</strong></td>
</tr>
</tbody>
</table>

### R&D

<table>
<thead>
<tr>
<th>Publication Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Books</td>
<td>6</td>
</tr>
<tr>
<td>International Journals</td>
<td>90</td>
</tr>
<tr>
<td>National Journals</td>
<td>3</td>
</tr>
<tr>
<td>Book Chapters</td>
<td>18</td>
</tr>
<tr>
<td>International Conferences</td>
<td>298</td>
</tr>
<tr>
<td>National Conferences</td>
<td>41</td>
</tr>
<tr>
<td>Patents</td>
<td>2</td>
</tr>
<tr>
<td>Technical Reports</td>
<td>48</td>
</tr>
<tr>
<td>Special Issues of Journals (editor)</td>
<td>3</td>
</tr>
<tr>
<td>Conference Proceedings</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>512</strong></td>
</tr>
</tbody>
</table>

### Dissertations

<table>
<thead>
<tr>
<th>Type</th>
<th>Ongoing</th>
<th>Completed</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PhD Theses</td>
<td>148</td>
<td>15</td>
<td>163</td>
</tr>
<tr>
<td>MSc Theses</td>
<td>228</td>
<td>137</td>
<td>365</td>
</tr>
<tr>
<td>Graduation Theses</td>
<td>37</td>
<td>3</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>413</strong></td>
<td><strong>155</strong></td>
<td><strong>568</strong></td>
</tr>
</tbody>
</table>

### Organization of Scientific Events

<table>
<thead>
<tr>
<th>Type of Action</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate Editor of Journal</td>
<td>9</td>
</tr>
<tr>
<td>Committee Chair</td>
<td>12</td>
</tr>
<tr>
<td>Committee Member</td>
<td>86</td>
</tr>
<tr>
<td>General Chair</td>
<td>2</td>
</tr>
<tr>
<td>Invited Speaker</td>
<td>16</td>
</tr>
<tr>
<td>Reviewer</td>
<td>116</td>
</tr>
</tbody>
</table>
INESC-ID participates in the programs between Portugal and CMU (Carnegie-Mellon University) and with Portugal/MIT (Massachusetts Institute of Technology). Other partnerships include Cadence Design Systems, TU Darmstadt, IST, ISCTE, Universidade da Madeira, Escola Superior de Tecnologia e Gestão de Beja, and Escola Superior de Tecnologia de Setúbal. In addition to the above formal partnerships, there is a large number of cooperation agreements with other institutions within the framework of the research projects.

INESC-ID promotes cooperation with other institutes and universities, and also with foreign students. In 2010 took place several activities in cooperation with Europyouth, which is a specialist training agency that promotes consultancy, administration, technical assistance and the evaluation of professional training programs through fellowships.

Two short-term internships were developed within the direct supervision of INESC-ID researchers for young foreign students. These internships were a good example of high success cooperation with Europyouth.

Among the referred cooperation there were also organized some external visits to INESC-ID research groups and activities. Greek students, teachers and researchers visited institution campuses at Alameda and Taguspark, learning methods and sharing research and academic experiences.
06. TECHNOLOGY TRANSFER
Our research and development activities cover a broad range of research areas and application markets, such as wireless communications, electronic equipment, health care, medical imaging, industrial automation, e-learning, and enterprise information systems. INESC-ID also acts as a service provider, stimulating cooperation with industry and focusing research on day life issues, providing a high level of technology transfer.

Several "start-up" companies have been created by researchers and former graduate students associated with INESC-ID. This is an interesting indicator of the industrial technology impact of INESC-ID.

**INESC-ID currently has equity in the following start-up companies:**

**Coreworks \ digital integrated circuit design**
Coreworks, founded in 2001 by two researchers of INESC-ID, is a provider of Semiconductor Intellectual Property (SIP) for multi-standard multimedia and communications applications, such as digital television, internet protocol television (IPTV), portable audio players, mobile Internet devices, and software defined radio. Their products have been implemented in a wide variety of technologies, for more than 30 customers worldwide. The company received an A-series investment round from Espírito Santo Ventures in 2006.

**SiliconGate \ mixed-signal circuit design**
SiliconGate operates in the field of microelectronics and develops and licences high performance Power Management blocks that are key elements in any mobile equipment. Funded in 2008, SiliconGate brought together the experience of senior designers from Industry with the research expertise of an INESC-ID research group. Recently, Wolfson Microelectronics plc, a global leader in high-performance mixed-signal semiconductor solutions for the consumer electronics market, has selected SiliconGate to provide high-performance power management IP in a four year contract.

**PETsys \ medical imaging**
PETsys, SA was established in 2008 to exploit the results of a research project, started in 2003, on PET (positron emission tomography) systems for mammography. The shareholders are 5 institutions, and 15 individuals that participated in the project, together with a Belgium business angel.

PETsys has acquired the rights to use the internationally patented PET scanner technology that allows early cancer detection with higher resolution (1-2 mm against 5-10 mm) and higher sensitivity (x10) than with standard devices.
**VoiceInteraction \ speech processing**

VoiceInteraction was founded in 2008 by researchers from the Spoken Language Systems Lab of INESC-ID, following the work developed in TECNOVOZ, a technology transfer project funded by the Portuguese Innovation Agency (AdI).

Based on a solid background of R&D, VoiceInteraction offers innovative solutions in the area of speech processing. Their solutions are based on speech recognition, speech synthesis, 3D facial animation, and spoken dialogue systems technologies. The applications cover different areas: subtitling systems for RTP (public national TV broadcaster), media clipping, dictation systems for hospitals, spoken dialogue systems for kiosks in monuments.

**NetworkConcept \ communication networks**

NWC Network Concept, Lda was founded in 2008. It had origin in a joint project by Instituto Superior Técnico (IST) and INESC-ID to develop a software multi-services platform, Kelius.

Kelius integrates all the services in residential or professional environments, including Internet, video surveillance, television, and telephone.

The control is performed through an interface implemented in a computer or in a Personal Digital Assistant (PDA). The new methods and techniques behind this platform are patented.

Besides owning equity in each company, there is close connection of these start-ups with INESC-ID due to partnerships for R&D projects.
07. VISIBILITY
7.1 Annual General Meeting

INESC-ID has been organizing each year a strategic planning meeting. These meetings, that have taken place since 2004, have involved the participation of external invitees with high impact backgrounds. The 2010 meeting took place in October, were senior researchers met to discuss issues related with the strategic development of the institution for the next ten years, with special emphasis on the actual status of the institution. A special attention was given to the Technological Basis Entrepreneurship and also to the Research Evaluation. Prof. João Gabriel, as the director of the FCT/UC and Prof. Francisco Veloso, from the Department of Engineering and Public Policies/CMU were this year invited speakers for the general annual meeting.

7.2 Seminars

INESC-ID has also a very active schedule of seminars, presented by our researchers and/or invited speakers. These seminars are organized in a regular basis, in order to promote collaboration between researchers and research groups and also across disciplines. These seminars are opened for all the scientific community: students, researchers and general public are welcomed to participate. A significant amount of external speakers were invited to present and participate in some of these seminars. During 2010, 63 seminars were organized by our research groups at INESC-ID facilities. These seminars are described in the annexes of this report.
QUAL O VALOR ECONÔMICO DO CONHECIMENTO E DA INVESTIGAÇÃO? COMEÇOU O FIM DA WEB? PODEREMOS SUBSTITUIR ARTIFICIALMENTE ALGUMAS FUNÇÕES DO CÉREBRO?

www.inesc-id.pt/10anos
7.3 10 years overview

In 2010, for the celebration of its 10th anniversary, INESC-ID promoted a series of discussion sessions on science, research and innovation. National and international renowned researchers discussed some of the biggest challenges in the next decade.

A challenging event with an outstanding quality that promoted INESC-ID’s image and work through the society. This event took place at Culturgest and Instituto Superior Técnico, during October and November 2010.

The celebrations closed on November 15th with an outstanding concert by the pianist Sequeira Costa and the Orquestra Metropolitana de Lisboa, under the direction of the conductor Evgeny Bushkov.

**Wednesday, October 27, 18h**
Debate: “Knowledge’s economic value”
Moderated by Luís Caldas de Oliveira, INESC-ID
Invited panel:
Joaquim Sárvulo Rodrigues, Espírito Santo Ventures
Rogério Carapuça, Novabase
Nicolau Santos, Expresso

**Wednesday, November 3, 18h**
Debate: “The future of web search”
Moderated by Arlindo Oliveira, INESC-ID
Invited panel:
Fernando Pereira, Google Research
Ricardo Baeza-Yates, Yahoo! Research Labs
Celso Martinho, Sapo, Portugal Telecom

**Monday, November 15, 18h**
Debate: “Understanding the brain”
Moderated by Leonel Sousa, INESC-ID
Invited panel:
Fernando Lopes da Silva, University of Amsterdam
José Carlos Príncipe, University of Florida
Zachary Mainen, CF Neuroscience programme, Champalimaud Foundation
7.4 Prizes and international Recognition

INESC-ID researchers were awarded the following prizes recognizing the excellence of the R&D activities developed:

- Isabel Trancoso received the 2010 IEEE Signal Processing Society Meritorious Service Award;
- 2010 Prof. Luís Vidigal Award, given to Engº Mário Ferreira for his work “Live Streaming in Overlay Networks”, with the supervision of Prof. Luís Rodrigues;
- Nuno Sebastião, Nuno Roma and Paulo Flores received the Best Paper Award at VI Jornadas sobre Sistemas Reconfiguráveis (REC2010), with the paper “Scalable Accelerator Architecture for local Alignment of DNA Sequences”;
- Tiago Dias, Nuno Roma and Leonel Sousa received the Best Poster Award in the Conference for Design and Architectures for Signal and Image Processing (DASIP2010), with “Hardware/Software co-design of H.264/AVC encoders for multi-core embedded systems”;
- Sara Silva and Alberto Moraglio received the Best Paper Award at EuroGP2010, with the paper “Geometric Differential Evolution on the Space of Genetic Programs”;
- Sara Silva, Maria J. Vasconcelos and Joana B. Melo received the Best Paper Award at EvolASP2010, with the paper “Bloat Free Genetic Programming versus Classification Trees for Identification of Burned Areas in Satellite Imagery”;
- Hugo Meinedo received the InterSpeech 2010 Paralinguistic Challenge Award, sub-challenge Gender, at Humaine Association/Interspeech2010, for “Age and Gender Classification using Fusion of Acoustic and Prosodic Features”;
- Susana Vinga Martins, Clara Azevedo, Carla Madal, Patricia Rodrigues, Nuno Oliveira and Bárbara Campos, were distinguished with an honorable mention at the XXX Congresso Nacional de Ortopedia e Traumatologia, with the communication “A rotura do subescapular é uma lesão rara ou raramente diagnosticada? Estudo retrospectivo de 55 cirurgias artroscópicas consecutivas da coifa dos rotadores”;
- Jorge Fernandes, Miguel Martins and Moisés Piedade received and Outstanding Paper Award at the 17th International Conference on Mixed Design of Integrated Circuits and Systems (MIXDES2010), with the paper “An Energy Harvesting Circuit for Self-Powered Sensors”;
- Sara Madeira was distinguished by UTL/CGD2010 Award with an honourable mention in the category of Young Researcher;
- Susana Vinga Martins was awarded with the prize UTL/CGD2010 Award for Young Researchers in the category of Informatic Engineering;
- Helena Sarmento and Bruno Fernandes received the Second Best Award at the IEEE Latin American Symposium on circuits and Systems, with the paper “A 128 FFT Core Implementation for Multiband Full-Rate Ultra-WideBand Receivers”;
- Marcelino Santos, José F. da Rocha and José Dores Costa received the Best Paper Award at the XXV Conference on Design of Circuits and Integrated Systems (DCIS2010), with the paper “Designing a Two Slope Gate Driver to Limit Internal Voltage Spikes in a Buck Converter”.

Besides the prizes listed above, a team of students from electronics, electrical and computer and informatics engineering that won the International Formula Student Class 2, of the 13th International Formula Student competition organized in Silverstone, were supported and supervised by the SIPS research group of INESC-ID.

Also the winning team of the ImagineCup 2010 in Portugal was also supervised by Prof. Paulo Ferreira, a senior researcher from the Distributed Systems group.
In 2010 internal prizes were launched. The commission nominated to this purpose is the INESC-ID Advisory Board, composed by Profs. Franco Maloberti (Univ. Pavia, Italy), Srinivas Devadas (MIT, USA), Morris Sloman (Imperial College, London, UK), and Carlos Principe (Univ. Flórida, USA). The commission selected for the Best PhD Student Award Jorge Semião, for the Best Young Researcher Prof. Manuel João Fonseca, and, for the Best Senior Researcher Prof. Joaquim Jorge.

7.5 Exhibitions

In 2010 the effort to improve the external image of the institution continued. INESC-ID has organized and participated in several events of high visibility, such as:

- The celebration of INESC-ID 10th anniversary, were a serie of discussion sessions on science, research and innovation were promoted. National and international renowned researchers discussed some of the biggest challenges in the next decade. A challenging event with an outstanding quality, that took place at Culturgest and Instituto Superior Técnico, during October and November 2010;

- Portugal Tecnológico, an exhibition dedicated to technology and scientific results and organized by the Ministry of Science, Technology and Higher Education. This event took place in September 2010;

- Ciência 2010 – Ciência em Portugal, an exhibition and meeting organized by the Ministry of Science, Technology and Higher Education and the Associate Laboratory Council, with the goal of promoting public exposure of science in Portugal and stimulate the dialogue between scientists. This event took place in July 2010 at Centro de Congressos de Lisboa;

- Futurália 2010, an event dedicated to education, training and employment. INESC-ID was represented in this high impact event that occurred in March 2010 with the research project CleanDrive;

- Exhibition “Rotas da Matemática”, promoted by the Universidade Técnica de Lisboa, and that occurred in March 2010. INESC-ID also participated in this event with the research project CleanDrive;

These events/exhibitions allow not only a closer relation between INESC-ID and other scientific organizations, but also an important promotion of our activities near the general public and companies. These activities help to strength important connections in order to improve technology transference.

Besides the high impact exhibitions, INESC-ID also promoted and stimulated external visits, mostly from other organizations and groups of external researchers or students from abroad. Some examples are the visit of researchers from the Beijing Institute of Technology, in November, and from Latin America universities in March.
08. HIGHLIGHTS
8.1 CLOUD-TM

Cloud Computing has emerged as a new paradigm for deploying, managing and offering services using a pay-for-what-you-use pricing model. In the cloud, resources are dispensed “elastically”, allocating new ones to ensure adequate Quality of Service levels in face of load surges, and releasing them, once that the spike has subsided, in order to minimize costs.

Unfortunately, designing and implementing software services that are actually able to match the scalability potentialities of large-scale Cloud infrastructures remains an extremely challenging task.

One of the key technological roadblocks that needs to be faced to bring about the potential of cloud computing is the development of programming models and tools that simplify the design and implementation of applications for the cloud, bringing the power of parallel computing into the hands of ordinary programmers.

Problem. This problem is closely related to another critical issue arising when developing large-scale distributed applications: how to manage concurrent manipulations to the shared state of applications. Decades of literature in areas such as replicated databases, web infrastructures, and high-performance computing have taught a fundamental lesson. The design space of distributed state consistency mechanisms is so vast that no universal, one-size-fits-all solution exists. On the contrary, the efficiency of individual state management approaches is strongly affected by both the characteristics of the incoming workload, and the scale of the system on which these mechanisms are deployed.

The complexity of this problem is therefore strongly exacerbated in Cloud Computing platforms due to the feature that is regarded as one of the key advantages of the cloud: its ability to alter dynamically the scale of the platform in real-time to meet the demands of varying workloads.

Goal. The Cloud-TM project aims at tackling precisely these problems. Its goal is to design, build, and evaluate a middleware platform for service implementation in Cloud Computing environments that will address the following key challenges:

- offering a simple and intuitive programming model for the implementation of services in Cloud computing platforms. Cloud-TM will integrate the familiar notion of atomic transaction as a first-class programming language construct, sparing programmers from the burden of implementing low level, error-prone mechanisms (e.g. locking, persistence and fault-tolerance) and permitting major reductions in the time and cost of the development;
- minimizing the monitoring and administration costs by automating the provisioning of resources from the cloud based on user specified target Quality of Service/operational costs criteria;
- maximizing the scalability and efficiency (i.e. the costs/benefits ratio in the Cloud Computing usage-based pricing model) of the user-level services via autonomic mechanisms, by self-tuning the internal mechanisms of the middleware platform to ensure optimal performances in face of fluctuations of the number of allocated resources and of the workload characteristics.
Project’s Information. Cloud-TM is funded by the European Commission under the FP7 program, which invested 1.7 Million Euro in the project. The Cloud-TM consortium brings together an international team that includes:

• INESC-ID, which is leading the consortium and can count on the collaboration of researchers from the GSD and ESW groups under the coordination of Dr. Paolo Romano;

• a team of researchers from Sapienza Rome University with decades long experience in the area of performability modelling and evaluation;

• Red Hat, one of the largest companies in the open-source software market, which will disseminate the results of the project by incorporating them in their industry leader middleware platforms;

• Algorithmica, an Italian start-up software company that will demonstrate the capability of the Cloud-TM platform by developing highly innovative pilot applications such as a Massively Multiplayer Online Game and a Location-based Mobile Social Network.

8.2 REFLECT

Objectives This project will develop, implement and evaluate a novel compilation and synthesis system approach for FPGA-based platforms. REFLECT relies on Aspect-Oriented (AO) Specifications to convey critical domain knowledge to a mapping engine while preserving the advantages of a high-level imperative programming paradigm in early software development. REFLECT leverages AO specifications and a set of transformations to generate an intermediate representation using an extensible mapping language (LARA). LARA specifications will allow the exploration of alternative architectures and run-time adaptive strategies enabling the generation of flexible hardware cores that can be incorporated into larger multi-core designs. In this project we will evaluate the effectiveness of the approach using partner-provided codes from the domain of audio/video processing and real-time avionics. The results will be integrated in the hArtes tool chain and are expected to substantially leverage the tool chain’s functionality (www.hartes.org).

Key Techniques and Approach At the core of the compilation and synthesis approach (see enclosed figure) is a transformation engine that leverages the AO specification and a set of algorithmic techniques, such as term rewriting, successive refinement and refactoring to transform the input application code into a domain-specific language, named LARA (Language for Reconfigurable Architectures). LARA allows the description of advanced mapping strategies including the specification of dynamic behavior for the mapping process. This specification, which includes explicit elements for reconfiguration and hardware-oriented directives such as data mapping and streaming information, is then translated into VHDL-RTL using either parameterized hardware patterns or programmable hardware templates.

A fundamental driver for the proposed approach is the use of Aspect-Oriented specifications. Aspects allow the user to expose domain-specific or algorithm-specific knowledge to the compiler non-intrusively and without compromising the semantics of the original specification. The knowledge conveyed by the aspects specification is used by the compiler and the architectural synthesis tools towards the implementation of highly specialized and domain-specific architectures. In addition to pure performance, in its many facets, aspects also provide a handle into an extremely important and often neglected issue in hardware design and implementation – verification. As mandated for aerospace and automotive systems requiring safety and high reliability, verification requires that designs must correctly implement the functional behavior and timing implied by the application specification (in C or the corresponding data-flow models). We will leverage the
ability of aspect-oriented specifications to allow the compiler not only to generate designs that comply with specific timing and rate requirements but also to develop comprehensive test-generation schemes for code coverage and timing.

Another important feature is the inclusion of history-based, best-practices repository that will aid the tool in dealing with very large designs. By understanding which sets of transformations and parameters lead to the best designs for application codes with specific aspects, this repository will substantially reduce the size of the design-search-space the compiler needs to cover in the pursuit of efficient, and correct designs that meet specific constraints. This repository can be built either with the help of designers for specific hardware/software design patterns or using pattern extraction and matching techniques. When using a new architecture or a set of templates, the approach might be slow in deriving good designs and thus populating the space of best practices. With time, and with the use on many application codes and/or kernels, the system will use the knowledge of previous design mappings and deliver designs increasingly faster and of high quality.

**Expected Results.** The technology developed here is expected to be integrated by REFLECT industrial partners and members of its Industrial Advisory Board, in particular by ACE, a leading compilation tool supplier for reconfigurable systems and by Honeywell a worldwide solution supplier of embedded high-performance systems. The academic partners will promote human resources with technical excellence in the area of architectures and software development thus enabling the sustainability of a vibrant European information technology fabric in the domain of compilation and synthesis for multi-core architectures and systems.

**The REFLECT Team.** Honeywell Intl., s.r.o, (Czech republic) Zlatko Petrov (Project Coordinator); INESC-ID, (Portugal) Pedro C. Diniz (Scientific Co-coordinator); Faculdade de Engenharia da Univ. do Porto, (Portugal), João M.P. Cardoso (Scientific Co-coordinator); Technische Universiteit Delft, (The Netherlands), Koen Bertels; Karlsruhe Institute of Technology, (Germany), Jürgen Becker; Imperial College of Science Technology and Medicine, (UK), George A. Constantinides; Associated Compiler experts b.v., (The Netherlands), Bryan Olivier; Projectos de Circuitos e Sistemas Electrónicos s.a., (Portugal), Fernando Gonçalves.

### 8.3 eCUTE

The eCUTE project is working to develop an innovative technological application to aid cultural understanding and empathy in children and young adults. eCUTE uses a view of culture based on the 6 Cultural Dimensions defined by Geert Hofstede and Bennett’s developmental model of intercultural sensitivity.

The project will:
- Develop pedagogical approaches to education in cultural understanding grounded in psychological and educational theory;
- Create believable cultural learning scenarios based on theoretical approaches that connect with the experiences of the target learner groups;
- To establish an operational parameterisation of theoretically derived cultural behaviour and use it to create synthetic cultures and characters that behave as if they live within such cultures;
- Develop expressive behaviour for synthetic characters that is culturally appropriate;
Create two cultural Virtual Learning Environments (VLEs), one for late-primary children and the other for young adults based on virtual dramas using synthetic characters with culturally-specific interaction behavior;

Evaluate the created systems with stakeholder, teacher and learner groups, demonstrating the learning efficacy of the showcases with the intention of leveraging further funding and commercial opportunities.

**Beyond the State-of-the-art** eCUTE is an interdisciplinary project, and will advance beyond the state-of-the-art in a number of different disciplinary areas such as well as producing a novel synthesis across them (see Figure 1). It will deliver both new scientific results and new technology.

The main advances can be summarized as follows:

- Develop and extend the theory behind education in cultural awareness and understanding;
- Implementation of Contact Theory with virtual characters;
- Grounding of VLEs in intercultural sensitivity development models;
- Incorporation of explicit affective models within a VLE;
- Systematic exploration of how ICT can develop and enhance existing role-play and game-based simulation in education for cultural acceptance and understanding;
- Develop synthetic cultures based on the latest insights from comparative research on national cultures;
- Two novel VLE showcases, one on cultural conflicts aimed at late primary children and one on intercultural communication aimed at young adults;
- Dramatising the issues of culturally-specific expressive behaviour through intelligent virtual agents;
- Producing consistent and configurable expressive behaviour in virtual agents by linking it to an internal model;
- Producing an account of the interaction between cultural norms and personality via an innovative cultural-affective agent architecture;
- Parametrised culturally-specific characters that can be speedily configured to new synthetic cultures;
- Develop novel methods of assessing culture sensitivity using a multi-modal approach including self-report, behaviour, and physiological measures of empathy;
- Learning outcome evaluation seamlessly embedded within the learning experience adding value not burden to the 21st century learner.

MIXER (Moderating Interactions for Cross-Cultural Empathic Relationships) is the first application being developed in the eCUTE project and aims to support children in learning about cultural conflict. MIXER is being developed re-using existing technology (from FearNot!) applied to a different context and purpose with the aim of creating an educational and enjoyable experience for 9-11 year olds.

Currently, MIXER is still in the early stages of development, with the current focus (Spring 2011) on the development of lo-fi and mid-tech prototypes. The paper, entitled Games-based Learning for Exploring Cultural Conflict, work was presented at the AISB: AI & Games Symposium in April 2011.
**Results.** The impact should be to raise awareness of cultural sensitivity within the schools and communities engaging with ECUTE. Impact scenarios for user and stakeholder communities will focus at the regional level, seeking to engage with schools, colleges and communities to support user-centred design and to engage in evaluation. Viral awareness of ECUTE to be achieved through schools and youth and community networks. The desired impact with teachers and schools would be for the results of using the showcases to be sufficiently good that they would want to use the showcases to support their teaching and/or for this approach to have had a positive impact on their future teaching of cultural sensitivity.

**Team.** The partners are: Heriot-Watt University (UK), INESC-ID (PT), Universitaet Augsburg (DE), Wageningen Universiteit (NL), Jacobs University Bremen GGMBH (DE), University of Sunderland (UK), Gako Hojin Deikei Gakuen (JP), National University Corporation/Kyoto University (JP).

### 8.4 MIA-VITA

**Problem.** Volcanic eruptions and tremors pose a high risk for humans, especially for populations which inhabit near volcanoes. An adequate response to this threat requires continuous monitoring and forecasting, as well as an efficient response in case of a major event. Unfortunately, the resources necessary to prevent and deal with volcanic events, both in terms expert personnel and available equipment, are not always present in the countries which have the higher risk. Monitoring technology is very expensive and many locations are not properly monitored, if at all.

The MIA-VITA project (Mitigate and Assess risk from Volcanic Impact on Terrain and human Activities) aims at developing cost efficient monitoring tools designed for poorly monitored volcanoes. The retrieved data includes satellite, gas and volcano-seismology measurements.

This will enable the improvement of vulnerability assessment namely for people, buildings and biosphere. Results will be achieved with help from local scientists and stakeholders in Africa (Cameroon, Cape Verde), in Asia (Indonesia, Philippines) and will be validated on a European volcano (Montserrat). The objectives will be reached through sharing/transfer of know-how, through scientific and technological developments, and through dissemination/training.

**Goal.** This project has the chance to have a real impact on the lives of those who live near volcanoes. It will allow effective monitoring to be performed at more volcanoes, thus providing early warnings for evacuation. This might save lives and reduce the economical impact of the eruption. The improvement in the emergency communication procedures will also increase the efficiency of the evacuation and rescue efforts.

Inesc-ID’s team is responsible for the development of a low-cost monitoring platform, comprised of off-the-self embedded computers gathering data from 3-axis geophones. The low-cost of these equipments will allow for the deployment of arrays of sensor networks spanning a large area, thus increasing the accuracy and detail of the information available to scientists. These equipments will relay the data, in real-time, to off-site research centers and civil protection authorities. Such technology will allow for a fast response to volcanic events as well as making available the expertise of remote research centers.
Once a volcanic event is forecast or detected, civil protection agencies and other governmental organizations come into action, promoting evacuation efforts or providing relief to the affected population. This requires an effective coordination among the several agents involved in a context where the communication infrastructure is often compromised by the volcanic event itself. MIA-VITA also addresses the procedures and communication infrastructure available in such events, providing recommendations for their evolution and effective use.

MIA-VITA is supported by the European Commission through the 7th framework programme. Comprising a multidisciplinary group coordinated by the French institution Bureau de Recherches Géologiques et Minières, the project is being developed by several scientific research organizations, private commercial IT companies and different governmental civil protection agencies. The consortium gathers organizations from many countries, including France, Italy, Portugal, Norway, Germany, United Kingdom, Cape Verde, Cameroon, Indonesia and Philippines. The Portuguese participants are INESC-ID and IST. The INESC-ID team is part of the Communication Networks and Mobility group, being located at Taguspark.

### 8.5 SE2A

SE2A – Nanoelectronics for Safe, Fuel Efficient and Environment Friendly Automotive Solutions is an European project, integrated in the ENIAC program (call of 2008) and locally monitored in Portugal by FCT. Its objectives are related with the development of automotive vehicles with increased safety, low fuel consumption and reduced pollutant emissions, thereby having a significant socio-economic impact.

**Partners.** INESC-ID participates in this project, together with INOV and INESC-MN, through the involvement of several research groups of the Electronic Embedded Systems Research Unit, with an overall budget of about 300 k€. The research groups that participate cover a wide variety of areas, from micro Electronics to Control.

The Dynamic Systems and Control group contributed with an original algorithm to optimize fuel consumption in automotive cruise control. This was a major opportunity for the group to get involved in the problems of dynamic optimization of hybrid dynamic systems, an area that receives increasing attention from the scientific community of Control.

The Analog and Mixed Signal Circuits group is involved in the design and implementation of integrated circuits for the “Sensors design and Technology” and the “RF sub-system” subtasks. The group is working on several circuits: a power harvest (figure), a Wideband LNA, an Inductorless 2.4GHz receiver, and two UWB transmitters. The circuits were designed in AMS 0.35µm and UMC 130nm technologies, sent to fabrication and characterized. This project was included in the group strategic goal to achieve an autonomous self-powered sensor with communications capability.
09. RESEARCH UNITS
9.1 Spoken Language Systems

The long term goal of L²F is to bridge the gap between natural spoken language and the underlying semantic information. The group has targeted 5 broad lines of activity which combine multiple core technologies. The two first ones (chronologically speaking) were semantic processing of multimedia contents and spoken/multimodal dialog systems platforms. More recently, the group has extended its activity into two new directions: speech-to-speech machine translation (S2SMT), and computer assisted language learning (CALL). E-inclusion has also been the objective of our continued efforts, with a recent emphasis on speech therapy tools.

In the near future, the group targets are: personalization, spontaneous speech in real conditions, new machine learning paradigms applied to language processing, new challenges with borderline areas: language & robots, language & the brain, privacy preserving speech processing.

Main Achievements

A significant effort has been invested into bringing L²F au par with major research centers on speech / language worldwide, taking advantage of the strong interdisciplinary expertise of the team. This effort was reflected in several submissions to relevant journals, although their review process in most cases will only be complete during 2011.

Another important aspect was the participation in international evaluation campaigns, one of which led to an award.

One of the highlights of our activities in 2010 was the PhD thesis defense of J. Graça which led to invitations to give tutorials in two major conferences.

Very significant progress has been achieved in the two most recent areas of activity in the group – S2SMT and CALL, which started in the framework of the Carnegie Mellon - Portugal program. Both projects scored “excellent” in their first year review.

The cooperation with European research centers has also been of major importance, not only in the scope of the two projects that ended with very successful reviews during 2010 (VIDIVIDEO and I-DASH), but also in the framework of COST actions. The success of the two projects led to several initiatives in the same line, such as the new European project EUTV.
Conscious of the maturity of the area in terms of industrial exploitation, which is also reflected by our own spin-off VoiceInteraction, new research challenges have been sought, such as secure speech processing, robust speech recognition, educational games, and the integration of prosodic cues. Among the new application areas, one should emphasize aphasia recovery, and elderly assistance, the topics of two recent national projects (VITHEA, and ARIA). 2010 was marked by the consolidation of linguistic resources. This is also the topic of the recently started European project METANET4U.

Within the context of the LIREC project, a situated dialogue system was developed, which integrated a dialogue system and an intelligent agent’s mind and basic cognitive skills.

9.2 Information and Decision Support Systems

The “Information and Decision Support Systems” research line aims at designing novel processes, techniques, and technology for the analysis, design, development, integration, deployment, and operation of distributed information systems and enterprise architectures. It gathers the INESC-ID groups that perform research in the fundamental areas of knowledge required to assure efficient, intelligent, aligned, safe, reliable, secure, and trustworthy information systems to support the whole structure of the modern economic and social framework. In this context, INESC-ID gathers a body of competences that renders it a national and international reference. These competences include significant expertise in fundamental technology, techniques, algorithms, data structures, and programming techniques, as well as in more applied areas such as software engineering and web application development.
Main Achievements

One of the major achievements of the research line in 2010, often involving the collaboration of several groups, was the increasing participation on projects financed by the European Union, some of which are: the STORK project, one of the biggest large-scale IT research projects financed by the European Union, which aims to provide a pan-European authentication infrastructure to allow citizens to establish new e-relations across borders, just by presenting their national eID; the TIMBUS Integrated Project, where INESC-ID leads a national group of partners including a private company (Caixa Mágica) and two other national labs (LNEC and LIP); the EuDML project, which aims to build the European Digital Mathematics Library; and the Cloud-TM project, which aims to develop a new programming paradigm for the cloud.

The line has achieved also a significant amount of results, in terms of scientific publications, prototype development, and technology transfer activities. From those, we highlight the following:

• Prototypes: (i) The first implementation of a lock-free STM that is privatization-safe and satisfies opacity. (ii) Deployment of the first widely used molecular biology database developed in Portugal, the Yeastrace database, in cooperation with the biological sciences group of IST.
• Technology transfer activities with several industrial and public institutes such as Caixa Mágica, PT-INOV, Link Consulting, Ministry of Justice, EDP, SiQuant, BNP - National Digital Library, the Lisbon Municipal Archives, and Europeana, among others.
• Several dissemination activities, including the organization of International Conferences and Workshops, and the participation in the organization of international competitions in constraint solving.
• Researcher awards: Susana Vinga was awarded the 2010 UTL/CGD Young Researcher Award in the area of Informatics Engineering, and Sara Madeira received a “Menção Honrosa” at the same award.
9.3 Interactive Virtual Environments

Interactive virtual environments assume great strategic importance, given the foreseen evolution of interaction paradigms, either in supporting human-computer interaction or supporting remote computer-mediated interaction amongst people within Virtual Worlds. This research aims to:

- explore multimodal interaction models in virtual environments by using interfaces based on synergic recognition of multiple modalities;
- create intelligent agents and synthetic characters that can interact with users in a natural way, inspired in the way humans interact with each other;
- create and develop new architectures of cooperative virtual environments by using recognition algorithms and artificial intelligence techniques to create realistic synthetic characters;
- develop software architectures for virtual environments, with emphasis on image synthesis algorithms;
- develop innovative applications in areas such as games and learning environments where the techniques developed above get applied.

Main Achievements

- Consolidation: in 2010 more PhD researchers (12), new post-docs (2) and more PhD students (over two dozen) MsC (over 60) were working in IVE. Our ratios of graduate student to supervisor are the best among all action lines in INESC-ID.
- Technology transfer: We have been active in developing software for thematic musea in the Ciência Viva Network.
- Enhanced collaboration with external companies, including Ydreams, InEvo and WOW (in the context of industry-drive technology transfer projects)
- Prizes: Joaquim Jorge was elevated to Fellow of the Eurographics Association in 2010. Best INESC-ID Researcher and Young Researcher certificates were awarded to Joaquim Jorge (VIMMI) and Manuel Fonseca (VIMMI) respectively.
- Organization of scientific events: we have participated in the organization of key international events, including Eurographics Computational Aesthetics, Sketch-Based Interfaces and Modeling. Ana Paiva was elected to the Executive Board of IFAAMAS (the major organization for Intelligent Agents and Multi-agent Systems). Furthermore, we have been active in over thirty international scientific program committees, which attests to the international visibility of all groups in this area.
- Results dissemination: in 2010, our research work was published in relevant international scientific journals – 12 articles were published, international conferences (59 papers). Our publication rates are about one international journal and five conference papers per PhD/year. The research area also published over 11 papers in national conferences.

We have also been very active in promoting national conferences in HCI, Computer Graphics, Games and AI.
9.4 Embedded Electronic Systems

Embedded Electronic Systems (EES) are crucial in the development of new devices, products, and services. The two main objectives of the EES Line of Action are as follows. First, to perform world-class research on new algorithms, architectures, methodologies, tools and circuits for designing energy-efficient, highly dependable embedded electronic systems. Second, to promote the economic value of research, transforming creativity into innovation, performing advanced professional training and technology transfer. This enables to empower people and communities. With this purpose, the EES Line of Action performs research on EDA (Electronic Design Automation) and electronic circuit design and test for high scale integration, algorithms and tools for implementing programmable and reconfigurable embedded systems, and control and signal processing algorithms suitable for implementations in real-time, embedded systems. Starting with basic research for general applications, we target advanced applied research using emergent technologies and applications, in partnership with worldwide institutions (academia, R&D, and industry).

Main Achievements
- Consolidation: EES has new emerging areas, more PhD researchers, PhD students, and enhanced international partnership.
- Collaborative research: among research groups within EES (SE2A, MRAM, ICONS, SIDEWORKS projects), among INESC-ID Lines of Action (DYNAMO), and with other national key R&D Institutions in the scientific area (INESC-NM and INOV (SE2A), IT (SPEED), ISR (ARGUS and ScryBAM), UNL (IMPACT) and INL (through INESC-NM)), and with start-up companies (Coreworks, SiliconGate) has been consolidated.
- New markets, interdisciplinary cooperation: EES is now active in consumer electronics (REFLECT project), communications and multimedia (SIDEWORKS project), renewable energies (SFERA project), environment (AQUANET project), automotive (SE2A project), and bio-medicine and life sciences (magneto biosensors (BIOMAGCMOS project), medical diagnosis (BIOCHIP project), anesthesia automation (GALENO project), medical imaging (PET project), and immunology (HIVControl project)).
• Technology mastering: EES developed (with INESC-MN) an advanced technology for magnetic biochip platforms and know-how in implantable intracranial visual prosthesis. One prototype of a magnetic tunneling junction (MTJ)-based coarse-grained reconfigurable array device using MTJ memory cells has been successfully tested, another sent to fabrication.

• PET technology: image reconstruction results on clinical tests at IPO(Oporto), ICNAS(Coimbra) and Timone Hospital, Marseille (France) (PET and Ultrasound technologies), have been obtained.
9.5 Communication Networks and Mobility

The main objectives of the Communication Networks and Mobility Research Group are to carry research activities on communication network architecture and on the mobility aspects of communication. More precisely, the Group activities are focused into the following areas:

- Wireless Sensor and Ad-hoc Networking
- Delay Tolerant Networking
- Situation Management Systems
- Quality of Service for Real-time Applications in IP Networks

Within these areas of activity, the Group has the following objectives:

- To achieve high level research results documented through published research papers;
- To support the post-graduate work of research students for their thesis;
- To actively participate in cooperative international research projects;
- To foster technology transfer based on the achieved research results.

Main Achievements

The Research Line achieved the following main results in 2010:

- A novel reliable transport protocol (DTSN) for convergecast and unicast communications in wireless sensor networks, employing caching at intermediate nodes to minimize end-to-end retransmissions.
- Derivation of mathematical expressions for the average number of children of a node in a wireless sensor network data aggregation tree as function of the tree level of the node, for both 2-D and 3-D networks.
- Definition and development of Loba128, which is a pseudo-random number generator to be used as a key generator for a symmetrical encryption system in a one-time-pad like environment, particularly useful for wireless sensor networks as it requires about 40% less energy than AES for cyphering/deciphering.
- Conception, development and demonstration of a situation management system to increase safety in an aerodrome. GPS/EGNOS signal is used for vehicle localization purposes and Wi-Fi/WiMAX network is used for on-ground communications in the airside.
- Conception of a secure wireless sensor network architecture for protection (safety and security) of an electricity distribution network, including substation, medium voltage lines and power transformers. It interfaces with the SCADA system through a special purpose gateway.
- Conception of a delay tolerant networking architecture adapted to vehicular networks.
- Development of a video streaming protocol with a dynamic length FEC aiming at QoE maximization, trading-off data rate, FEC protection and delay.
- A distributed simulation platform to combine several simulations (based in different platforms) in order to simulate new handover mechanisms based in optimization of video QoE.
10. ANEXES
10.1 Research Projects

Title: **PET**
Financed by: AdI - Agência de Inovação
Coordinator from INESC-ID: Isabel Maria Silva Nobre Parreira Cacho Teixeira
Summary: Breast cancer early detection is recognized as a worldwide priority, since it constitutes the most effective way to deal with this illness. This project aims at the development of the Data Acquisition Electronic (DAE) system for a PEM (Positron Emission Mamography) equipment.

Title: **Vidi-Video – Interactive semantic video search with a large thesaurus of machine learned audio-visual concepts**
Financed by: European Comission – FP7
Coordinator from INESC-ID: Isabel Maria Martins Trancoso
Summary: VIDI-Video project takes on the challenge of creating a substantially enhanced semantic access to video, implemented in a search engine. The engine will boost the performance of video search by forming a 1000 element thesaurus detecting instances of audio, visual or mixed-media content.

Title: **GRITO - Uma Grid para Preservação**
Financed by: FCT
Coordinator from INESC-ID: José Luís Brinquete Borbinha
Summary: In this project we propose to build a data grid for digital preservation that can be used by any kind of organizations that need to provide data integrity on a large time scale.

Title: **PoliGrid - distributed policies for resource management in Grids**
Financed by: FCT
Coordinator from INESC-ID: Paulo Jorge Pires Ferreira
Summary: The main objectives of this project is to design a platform that supports the definition, deployment and enforcement of distributed history-based policies in a scalable and effective manner. In addition, we will provide a prototype implementation that proves the feasibility of the concept and evaluate its performance based on the simulation of selected grid usage scenarios. To achieve the above mentioned goal there are several challenges that must be addressed. As a matter of fact, in spite of being used for a number of applications, grid platforms still present a number of limitations in what concerns the enforcement of advanced usage models. In this project we will address the following challenges: large number of users and distributed resources, resource heterogeneity, autonomous administrative domains, high volatility and support for multi-level usage policies.

Title: **TARDE - Transimpedance Amplifiers for Radiation Detectors**
Financed by: FCT
Coordinator from INESC-ID: Manuel de Medeiros Silva
Summary: To obtain improved performance (low power, low voltage, minimum noise) transimpedance amplifiers to be used in the front-end of radiation detectors for medical imaging applications. An amplifier for aPET (Position Emission Tomography) scanner will be considered as a demonstrator.

Title: **IDeA - Integrated Design of Automation for Anaesthesia**
Financed by: FCT
Coordinator from INESC-ID: João Manuel Lage de Miranda Lemos
Summary: Development of an autonomous integrated system for the automation of anaesthesia.

Title: **Dynamo - Dynamical Modeling, Control and Optimization of Metabolic Networks**
Financed by: FCT
Coordinator from INESC-ID: Susana de Almeida Mendes Vinga Martins
Summary: The first objective of this project is to develop and validate mathematical models and computational tools for the analysis and simulation of the dynamical behavior of complex metabolic networks. The main goal is to produce interpretable models that accurately describe the metabolic system and have prediction and generalization capabilities. A second objective is to create control and optimization strategies to alter
the fluxes and concentrations of metabolites, both transiently and at steady-state, by proposing the manipulation of enzymes gene expression. A third objective is the creation of an integrative bioinformatics infrastructure to store the experimental data and to implement and deploy the algorithms developed, thus fostering model interchange between systems. A forth objective is the acquisition of experimental in vivo metabolite concentration time series data, the creation of mutant bacterial strains with desired metabolic behavior and the experimental validation of the models previously proposed.

Title: **LVDCDC - Integrated DC-DC voltage regulator implemented in standard CMOS technology**
Financed by: FCT
Coordinator from INESC-ID: Marcelino Bicho dos Santos
Summary: 1 - Development of circuit topologies, designed using a low-voltage standard CMOS process, to implement power management units suitable for integration in SoCs, specially targeting portable applications. New topologies will be studied for the power multiplexing among control modes (PWM; PFW; Power-Down, depending on the load) and between converter topologies (depending on the power supply voltage). 2 - Design and test of three complete prototypes of power management units for SoC integration with different input voltages, in the range of portable devices batteries and several output voltages, supplying power for each core of the SoC. 3 - Laboratorial characterization of the prototypes (efficiency, voltage operation range, load current limits, power-down consumption, ...). 4 - Target an actual and real problem of the semiconductor industry, bridging the gap between university research and leading edge industry demands.

Title: **ICONS - Intracortical Neuronal Stimulator**
Financed by: FCT
Coordinator from INESC-ID: Moisés Simões Piedade
Summary: The goal of this project is to design and prototype a microelectrode stimulation system for cortical neuroprosthesis. It includes the design and prototype of an integrated microelectrode stimulator for a intracortical neuroprosthesis. The implantable microelectrode stimulator uses flip-chip technology to be fully implantable without wiring, reducing the risk of infection and increasing robustness. It is small enough to be undetectable and has low power consumption obtained directly from the carrier, through an RF low-coupling transformer, discarding the need for batteries. The system architecture and circuit techniques which overcome some of the application issues identified in previous solutions and prototypes.

Title: **LEADER - Low-Energy Analog-to-Digital Converter with Enhanced Effective Resolution**
Financed by: FCT
Coordinator from INESC-ID: Jorge Manuel dos Santos Ribeiro Fernandes
Summary: To design and evaluate experimentally a calibration-free recycling pipeline ADC (multi-stage algorithmic) with 1.2 V supply, 14 bits, and 8.20 MHz clock frequency. The target is to obtain very low power, 0.4 pJ per conversion, and low area.

Title: **SPEED - Low-Power Ultra-High Speed Analog-to-Digital Converter for Ultra-Wideband Wireless Communications**
Financed by: FCT
Coordinator from INESC-ID: Jorge Manuel dos Santos Ribeiro Fernandes
To design and evaluate experimentally a 2-channel time interleaved pipelined ADC with 6 bits, 1G sample/s. A 90 nm CMOS technology will be used, and the target is to achieve 0.2-0.3 pJ per conversion step. An efficient solution will be used for built-in self testing.

Title: **FI-DRA - Analysis of the Distributed Resolution of Feature Interactions for Internet Applications**
Financed by: FCT
Coordinator from INESC-ID: Rui Gustavo Nunes Pereira Crespo
Summary: In this project we intend to enlarge and conclude the research of an innovative distributed system for FI resolution in Internet, whose first part was concluded in 2005. The proposed system represented a solution of FI of internet applications, which alone satisfy requirements but together reveal undesirable behaviours. The project focus on the fundamental properties of security use of the system, and on the resolution reach for any non-empty set of features candidates for execution. The properties are formally identified and the results will be used for a PhD thesis of one participant in this project. Furthermore, the project focus on the capacity enhancement that allows a single advisor to be used by all application nodes in a local area. This goal represents the major part
of a MsC thesis of one participant in this project. The project results are expected to provide a basis for its adoption in local area networks and Internet service providers.

Title: MRAM - Reconfigurable Hardware using Magnetic Tunneling Junction Memories
Financed by: FCT
Coordinator from INESC-ID: Horácio Claúdio Campos Neto
Summary: The objective of this project is to research new circuit structures for multi-context reconfigurable hardware devices using magnetic tunneling junction (MTJ) memory cells. The use of magnetic random-access memory (MRAM) technology in run-time reconfigurable hardware devices is a very promising technological solution. MRAM can provide non-volatility with cell areas and access speeds comparable to those of SRAM, and with lower process complexity than flash memory. Also, MTJ cells are not sensitive to single event upsets (SEU) caused by radiation effects, which is a well-known issue with SRAM-programmable devices.

Title: STOP-Fire - A Computational Intelligence Distributed System for Forest Fire Combat Aid
Financed by: FCT
Coordinator from INESC-ID: João Paulo Baptista de Carvalho
Summary: The main goal of this project is the development of a computational intelligence based distributed system prototype that can produce contingency plans to control and combat forest fires based on available resources (water, equipment, aerial and terrestrial vehicles, firemen, etc.) and geographical, topological and meteorological restrictions. The prototype will be composed of several modules: an intelligent graphical forest fire propagation simulator; an expanded fuzzy GIS (Geographical Information System) associated to a Data Mining system that extracts geographical and topologic relevant data; an Intelligent Data Mining system to extract relevant available forest fire combat resource data; an Expert system that provides contingency plans based on meteorological data, real time constraints and information provided by the previous modules. All modules are components of a web based distributed system that should provided good performance and remote accessibility.

Title: A-CSCW - Attentive CSCW
Financed by: FCT
Coordinator from INESC-ID: Manuel João Caneira Monteiro da Fonseca
Summary: The main objective of this project is to study how technology may positively influence group attention in the collaborative context. This objective will be accomplished by researching the following questions: - How collaborating individuals divide their attention between the group and the individual tasks? - How can technology positively influence the attention to the group? - Which computer devices improve group attention? - What are the guidelines to incorporate such devices in future CSCW systems? - What are the expected performance improvements? - Answers to these questions will be supplied to the research community via: - A theoretical framework for group attention - A collection of attentive devices that can be integrated in CSCW systems and tools - Results from laboratory experiments with attentive devices - A group performance model based on attention - A collection of best practices for designing attentive CSCW.

Title: UWBR - UWB Receiver: baseband processing using reconfigurable hardware
Financed by: FCT
Coordinator from INESC-ID: Maria Helena da Costa Matos Sarmento
Summary: The project focus is on the electronic design of high data rate wireless communications systems. This project will explore - the use of UWB as an emerging technology for indoor applications - the performance of new FPGAs to implement high demanding baseband processing functions for wireless communications - the potentialities of serial-communication in new FPGAs - and design methodologies, integrating the use of Simulink and CAD environments.

Title: VECTOR - Matlab Compilation and Hardware Synthesis of Custom-Vector Processing for Image and Signal Processing Algorithms
Financed by: FCT
Coordinator from INESC-ID: Horácio Claúdio Campos Neto
Summary: This project aims to develop and evaluate methods for the automatic mapping of image processing algorithms to FPGA-based hardware platforms. These methods must take into account the limited resources on each FPGA and the required input/output bandwidth to cope with the
real-time requirements of the input applications. We will extend the PI’s experience in the development of a compilation and synthesis system for FPGAs to include a front-end capable of handling restricted forms of Matlab specifications. The system will use well known data dependence analyses techniques to analyze the opportunities for data reuse and vectorization. We will develop novel compiler analyses and mapping algorithms to exploit compiler-controlled caching of data and the development of custom vector pipelines in FPGAs. Another novel aspect will be the inclusion of bandwidth and real-time constraints in the design space exploration of alternative designs enabled by the extreme flexibility of contemporary FPGAs.

Title: PCL Noise – Noise Reduction in Power Line Communications Channels
Financed by: FCT
Coordinator from INESC-ID: Paulo Alexandre Crisóstomo Lopes
Summary: To develop new signal processing techniques and algorithms for noise reduction in the power line channel, and increase the achievable bit rate. Only this way it can be competitive with other technologies.

Power line signals are mostly limited by electrical compatibility issues, namely by the radiation levels created by common mode currents in the lines, it follows that it is important to minimize injected currents, and not necessarily the voltage levels in the line. This can be done by taking into account the differences in impedances between the noise sources and the emitter, and requires the power line to be modelled as a two port network. Another means for noise reduction if to use the correlation between noises signals in adjacent carriers. Still, another means of noise reduction, that may be suitable for impulse, non-gaussian noise, is the use non linear filters at the reception to filter impulse noise. This can be done throw voltera filters, neural network, or any kind of non-linear filter.

Title: PRIVATO – Privacy Aware Trusted Computing
Financed by: FCT
Coordinator from INESC-ID: Carlos Nuno da Cruz Ribeiro
Summary: In this project we propose a platform which uses TC, but does not have the privacy and ownership problems of standard TC. The platform uses a simple monitor running in a hardware-protected environment which mediates every communication between protected applications and the outside world and verifies the safety properties of such applications using a data flow model.

We plan to test our TC platform with an e-voting system, specifically with the e-voting client of an e-voting system, which is currently the weakest link of e-voting systems. We will identify the relevant properties of an e-voting client, and build a TC monitor which verifies and attests those properties to a number of e-voting services participating on an election. The e-voting services will return this attestation to the voter by way of an out-of-band channel or a covert in-band channel to be defined. We also plan to evaluate the changes, in terms of ISA and micro-architecture, on a RISC processor which are needed to implement the TC features, namely the curtain memory, secure I/O, attestation and sealing.

Title: SHAMAN - Sustaining Heritage Access through Multivalent ArchiviNg
Financed by: FCT
Coordinator from INESC-ID: José Luís Brinquete Borbinha
Summary: The aim of the SHAMAN Integrated Project is to develop a next generation digital preservation (DP) framework. It is furthermore developing corresponding preservation tools for analyzing, ingesting, managing, accessing and reusing information objects and data across libraries and archives. Three prototypical applications will support trialling and validating of the result in scientific publishing, parliamentary archival, industrial design and engineering and finally experimentally also in scientific application domains. To achieve these goals SHAMAN is applying grid-based multivalent, linguistic, semantic, and peer-to-peer methods for supporting DP within its core infrastructure. To archive this, the core functions are organized within the SHAMAN reference architecture. The core services of the SHAMAN framework are constructed by integrating Data Grid, Digital Library, Persistent Archive, Context Representation, Annotation, and Preservation as well as Deep Linguistic Analysis and corresponding Semantic Representation and Annotation technologies for simple and connected data types establishing, document, media, CAD, and scientific data, knowledge, and information collections.
Title: DYABLO - Models for the Dynamic Behavior of Biological Networks
Financed by: FCT
Coordinator from INESC-ID: Arlindo Manuel Limede de Oliveira
Summary: The objectives of this project are the development of new techniques and models for accurate simulation of biochemical networks. Coupled with higher abstraction models, these techniques can be used to study the properties of the state spaces of complex biological systems, using model checking algorithms. Finally, these techniques and models will be applied to actual biological systems, with emphasis on the regulation mechanisms of the FLR1 stress response network of Yeast.

Title: SHIPs - Sat-based Haplotype Inference by Pure Parsimony
Financed by: FCT
Coordinator from INESC-ID: Maria Inês Camarate de Campos Lynce de Faria
Summary: One of the main topics of research in genomics is determining the relevance of mutations, described in haplotype data, as causes of some genetic diseases. The haplotype inference problem consists in inferring haplotypes from genotypes. For solving this problem, different approaches can be followed. For example, following the pure parsimony criterion the main goal is to minimize the number of required haplotypes. The main goal of this project is to develop efficient algorithms for solving the haplotype inference problem, mainly based on a parsimonious approach, and to apply these algorithms to real data, in order to identify genetic deseases.

Title: ARN - Algorithms for the identification of genetic Regulatory Networks
Financed by: FCT
Coordinator from INESC-ID: Ana Teresa Correia de Freitas
Summary: The objectives of this project are:
- The development of new methods and models to search and extract evidence of regulatory mechanisms in biological data and literature. This includes the improvement of the models used to represent complex regulatory signals and small functional RNA motifs and the development of algorithms to explore the cooperative characteristic of all these signals; the development of algorithms for the identification of local patterns in expression data; and the development of text-mining methods for extracting gene regulations from BioLiterature and from gene annotations.
- The design of new algorithms to derive effective models for gene regulatory networks. This includes the development of methods to piece together information from different sources. The project will use the YEASTRACT platform (www.yeastract.com) as a launching pad for a much more ambitious system.

Title: BSOLO - Satisfação e optimização com restrições Booleanas
Financed by: FCT
Coordinator from INESC-ID: Vasco Miguel Gomes Nunes Manquinho
Summary: The development of a new pseudo-Boolean core framework and the integration of the proposed techniques is fundamental, not only for supporting research work in related topics (e.g. model counting), but also to increase the competitiveness of the software package already developed. Without it, the visibility of our research work will decrease, as well as the excellent performance obtained in the pseudo-Boolean solver evaluations (results available at http://www.cril.univ-artois.fr/PB07/). With a more competitive solver, the BSOLO project will also pursue the objective of being able to integrate the new solver into real-world applications, namely in international companies from Operations Research (OR) to Electronic Design Automation (EDA).

Title: Byzantium – Efficient Byzantine fault-tolerant database replication
Financed by: FCT
Coordinator from INESC-ID: Rodrigo Seromenho Miragaia Rodrigues
Summary: This project aims at developing novel techniques for improving the performance of Byzantine fault tolerant replicated databases.

Title: FLR1-NET - Characterization and modeling of a specific transcriptional regulatory network required for multidrug resistance in yeast
Financed by: FCT
Coordinator from INESC-ID: Arlindo Manuel Limede de Oliveira
Summary: The main objectives of this project are to unveil the hierarchy and synergy that lies behind the combined action of the transcription factors involved in yeast response to drugs and other chemical aggressions and to develop computational tools for modeling the dynamic of these transcription regulatory networks.
Title: REDICO - Dynamic Reconfiguration of Communication Protocols  
Financed by: FCT  
Coordinator from INESC-ID: Luís Eduardo Teixeira Rodrigues  
Summary: The Redico projects intends to build a new protocol composition and execution framework tailored to support dynamic reconfiguration. There are multiple challenges in addressing the problem, including:  
- The new framework should support the seamless reconfiguration in run time. In particular, it should allow for different participants to run with different protocol configurations as long as these configurations are compatible.  
- The framework should provide strong support to ensure the consistency of the system configuration (at each site and among multiple sites). These consistency checks should be based on protocol dependencies and should be able to be checked in an efficient manner, to prevent the performance degradation of the system.

Title: ERA-PG - Genome-wide analysis of short RNAs as modulators in dehydration stress tolerance using tolerant and genetic model systems  
Financed by: IBET  
Coordinator from INESC-ID: Ana Teresa Correia de Freitas  
Summary: Drought stress is a common adverse environmental condition that seriously affects crop productivity worldwide. Due to the complexity of drought as a stress signal and the fact that drought stress is difficult to manipulate, deciphering dehydration tolerance mechanisms is a major challenge.  
The objective of this project is to explore potential roles of regulatory small 21-25nt RNAs (sRNAs) in dehydration stress tolerance. We propose to construct libraries of sRNAs from the desiccation tolerant model plant Craterostigma plantagineum, the dehydration tolerant legume Medicago truncatula and the genetic model plant Arabidopsis thaliana at different stages of dehydration. We aim to identify new families of sRNAs using genomics tools and test the expression profile of selected sRNAs. Our results will have important implications for gene regulation under dehydration stress and also contribute significantly to the long-term goal of having a comprehensive profile of sRNAs in plants.

Title: FolkPeers - Folksonomies in P2P systems  
Financed by: FCT  
Coordinator from INESC-ID: Helena Sofia Andrade Nunes Pereira Pinto  
Summary: The new developments on the Semantic Web and in particular the new trend on Web 2.0 applications have a strong emphasis on user-driven publishing and managing content platforms. Examples of such systems are Flickr (to store, search, sort and share photos), del.icio.us (to keep, share and discover favorite links), digg (to keep, classify, and share favorite news), etc. All of them are user-driven social content websites that have a huge number of users sharing resources. Classification of shared resources is user-driven and lead to a new topic: Folksonomies. The goal of this project is to develop an application for user-driven social content management in the ontology area. In particular we aim at developing an ontology library based in P2P technology, that allows users to store, search, sort, share, discover and classify ontologies.

Title: GINGER - A Flexible Peer-to-Peer Grid Infrastructure  
Financed by: FCT  
Coordinator from INESC-ID: Luís Manuel Antunes Veiga  
Summary: To build a fully decentralized, peer-to-peer Grid infrastructure that meets several goals that are not met by current Grid infrastructures, such as ease of deployment and use, lack of centralized components, or the ability to run in an environment where nodes may not be willing to cooperate, and where failure is the norm, and not the exception.

Title: Mercury - improving consistency of replicated data in resource-constrained devices  
Financed by: FCT  
Coordinator from INESC-ID: Paulo Jorge Pires Ferreira  
Summary: The high-level overall goal of this project is to improve users’ productivity by supporting data access with high availability and performance. Optimistic replication is a well known technique
to attain such goal but its usefulness strongly depends on the underlying consistency protocol to ensure fast and reliable replica consistency. This project will develop new algorithms, protocols, and system architectures running in prototypes that will ensure conflict minimization and rapid update convergence appropriate for resource-constrained devices.

Title: Pastramy - Persistent and highly Available Software Transactional Memory
Financed by: FCT
Coordinator from INESC-ID: João Manuel Pinheiro Cachopo
Summary: The project has three complementary goals:
- To design and implement an optimized persistence store to Software Transactional Memory (STM) that supports the durability property of software transactions and provides efficient read access to objects. We plan to support several persistent store structures that allow optimized access from STM and readable access from final users.
- To design and implement a collection of replication strategies tailored to build a reliable and distributed STMs. Such algorithms are fundamental to increase the scalability and availability of STMs based systems. We plan to leverage on the partner experience in building replication algorithms for relational database models, to build novel algorithms, adapted to the unique characteristics of STMs.
- To deploy and evaluate the solutions above in a realistic setting, using a open-source university management system that is currently used at the IST to incorporate all on-line campus activities and related management services.

Title: POSTPORT - POrting Speech Technologies to other varieties of PORTuguese
Financed by: FCT
Coordinator from INESC-ID: Isabel Maria Martins Trancoso
Summary: The goal of this project is porting spoken language technologies originally developed for European Portuguese to other varieties of Portuguese, namely those spoken in South-American and African countries. The two main technologies to be investigated are speech synthesis and recognition. Instead of porting complete systems, we shall concentrate on the linguistically relevant modules. Prior to this main work, the project will involve two tasks: corpora collection and characterization of the main differences between the studied varieties. The last task concerns the automatic identification of spoken varieties of Portuguese, which will be used as a pre-processing stage for switching among recognition systems developed for specific varieties.

Title: Eucalyptus - Scanning for candidates genes underlying a pulp yield QTL in Eucalyptus globulus
Financed by: FCT
Coordinator from INESC-ID: Ana Teresa Correia de Freitas
Summary: The main objective is to identify and characterize the genomic region that underlies strong effect pulp yield QTL in E. globulus, combining map-based cloning and transcriptomic approaches. Knowledge of the genomic loci responsible for quantitative variation of wood traits of interest (pulp yield), is of major interest in molecular assisted breeding. This will allow identifying genes responsible for that variation, and gathering new knowledge about the molecular mechanisms of gene expression and regulation in wood forming tissues.

Title: VIZIR - Visualizing Massive 3D Data Sets Interactively on Commodity Clusters
Financed by: FCT
Coordinator from INESC-ID: João António Madeiras Pereira
Summary: This project aims at developing efficient parallel algorithms to make it possible to interactively visualize and navigate massive data sets in commodity clusters for high resolution screen devices such as large tiled displays.

Title: MANCOOSI - Managing the Complexity of the Open Source Infrastructure
Financed by: European Comission – FP7
Coordinator from INESC-ID: Maria Inês Camarate de Campos Lynce de Faria
Summary: The main objective of the Mancoosi project is to develop the scientific knowledge and build the tools necessary to manage the complexity of the open source infrastructure. This infrastructure is one of the essential building blocks of tomorrow’s software architectures: the success of LAMP (Linux, Apache, MySQL, Php) inside as well as outside the data centers is clear evidence of this.
Title: EuroNF - Anticipating the Network of the Future - From Theory to Design
Financed by: European Comission – FP7
Coordinator from INESC-ID: Augusto Julio Domingues Casaca
Summary: Future networks became a central topic with a major debate concerning whether moving towards the new networked society will be evolutionary or disruptive. In the future networked society, the physical and digital worlds will merge based on the massive usage of wireless sensor networks. Objects will be able to identify and locate themselves and to communicate through radio interfaces. Self-organized edge networks will become more and more common. Virtualization and programmability will allow for providing different networking environments over the same infrastructure. Autonomic networking will deal with the increasing complexity of I&C systems. End-user empowerment will increase with their capacity of providing services and content. Euro-NF will therefore cover the integration of a widerange of European research capacities, including researchers and research and dissemination activities. As such Euro-NF will continue to develop as a prominent European center of excellence in Future networks design and engineering, acting as a “Collective Intelligence Think Tank”, representing a major support for the European Society leading towards a European leadership in this area.

Title: LIREC - Living with Robots and Interactive Companions
Financed by: European Comission – FP7
Coordinator from INESC-ID: Ana Maria Severino de Almeida e Paiva
Summary: LIREC aims to establish a multi-faceted theory of artificial long-term companions (including memory, emotions, cognition, communication, learning, etc.), embody this theory in robust and innovative technology and experimentally verify both the theory and technology in real social environments. Whether as robots, social toys or graphical and mobile synthetic characters, interactive and sociable technology is advancing rapidly. However, the social, psychological and cognitive foundations and consequences of such technological artefacts entering our daily lives - at work, or in the home - are less well understood. Successful technology can only be delivered on the basis of strong scientific foundations, and with partners in psychology, ethology, human-computer interaction, human-robot interaction, robotics and graphical characters, LIREC will advance understanding of the concepts of embodiment, autobiographic memory and social interactions in the context of companions where the ‘mind’ might migrate to differently embodied ‘bodies’.

Title: MAXIMUS - MAXimum fidelity Interactive Multi User display Systems
Financed by: European Comission – FP7
Coordinator from INESC-ID: João António Madeiras Pereira
Summary: MAXIMUS is a FP7 European research project which aims at improving the design review for automotive and architecture design «dramatically improved rendering and interaction technologies. The main contribution of INESC-ID in the consortium is to develop natural multi-user interaction techniques for use in retro-projection display systems.

Title: LocON - Platform for an inter-working of embedded localisation and communication systems
Financed by: European Comission – FP7
Coordinator from INESC-ID: Augusto Julio Domingues Casaca
Summary: The project aims at a seamless connectivity and interworking of embedded localisation and communication systems through a new platform - the LocON platform. The platform will be demonstrated at the Faro airport.

Title: MIA-VITTA - Mitigate and assess risk from volcanic impact on terrain and human activities
Financed by: European Comission – FP7
Coordinator from INESC-ID: Teresa Maria Sá Ferreira Vazão Vasques
Summary: The MIAVITTA project aims at developing tools and integrated cost effective methodologies to mitigate risks from various hazards on active volcanoes (prevention, crisis management and recovering). Such methodology will be designed for ICPCs contexts but will be helpful for European stakeholders to improve their experience in volcanic risk management. The project multidisciplinary team gathers civil defence agencies, scientific teams (earthsciences, social sciences, building, soil, agriculture, Information Technologies and telecommunications) and an IT private company.
Title: FleetMod - Modelling and Simulation of the Behaviour of Fishing Fleets
Financed by: FCT
Coordinator from INESC-ID: João Paulo Baptista de Carvalho
Summary: Fishermen are the most important predators in marine ecosystems, with a high impact on the mortality on marine populations and destruction of marine habitats. In this project we aim a qualitative model of this predatory behaviour, that will allow to simulate and predict the responses of the skippers of fishing vessels to a wide range of relevant factors, whether of natural or human origin. This model will then be connected to existing models of the population dynamics of different fish stocks, and will provide a framework to test the effectiveness of different management measures, such as catch restrictions, marine closed areas, seasonal fishing bans, etc. The project will focus on the bottom-trawl, purse-seine and deep sea longline fishing fleets, and will combine recent advances in qualitative modelling techniques (rule-based fuzzy cognitive maps) with a privileged source of real-time information on the behaviour of skippers taken onboard during fishing trips.

Title: Sidework Biocores - Hardware accelerator for biological sequences alignment
Financed by: QREN
Coordinator from INESC-ID: Paulo Ferreira Godinho Flores
Summary: The main objectives of this project/task is the hardware implementation of an algorithm for biological sequence alignment (DNA, RNA or amino acids). A dedicate architecture based on the SideWorks template should be developed. This architecture should be special tailored to the most intensive tasks of the select alignment algorithm. The remaining and less intensive tasks of the sequence alignment algorithm should be executed on the FireWorks embedded processor.

Title: SE2A - Nanoelectronics for Safe, Fuel Efficient and Environment Friendly Automotive Solutions
Financed by: European Comission/FCT
Coordinator from INESC-ID: Leonel Augusto Pires Seabra de Sousa
Summary: The main objective of this project, in what respects the participation of INESC-ID SiPS group in SE2A, is to design and implement an instrument electronics unit able to simultaneously acquire signals from a set of sensors required to implement an Inertial Navigation System (INS). The instrument electronics unit contains the dedicated electronics needed to operate the inertial sensors. It includes power supplies, read-out electronics to provide signal in the form needed by the navigation processor and possible computer. Example of sensors to be used are accelerometers, gyroscopes and a digital compass. The precise requirements vary in accordance with the types of instruments used and the level of performance which is needed. The information extracted from the signals permits the INS to produce the movements (position, velocity) and attitudes of the unit.

Title: SCryBAM - Sistemas Criptografia Baseada em Aritmética Modular
Financed by: FCT
Coordinator from INESC-ID: Leonel Augusto Pires Seabra de Sousa
Summary: The main goal of this project is the research of efficient systems of modular Arithmetic, namely Residue Number Systems (RNS), for the development of safe embedded based on the use of cryptographic algorithms. For a given security level, the cryptographic algorithms based on elliptical curves are computational more efficient than the anti-symmetrical algorithms currently in use (e.g. RSA, ElGamal). This project also researches and develops efficient dedicated computational structures for cryptographic systems based on elliptical curves, exploring the properties of the RNS. It is intended, also, to integrate these computational algorithms and structures in embedded systems for different types of applications, in particularly sensible areas as they are the systems of personal identification and (bio)medicine.

Title: MULTICON - Architectural Optimization of DSP Systems with Multiple Constants Multiplications
Financed by: FCT
Coordinator from INESC-ID: Paulo Ferreira Godinho Flores
Summary: The main goal of this research project is the development of new models and algorithms for optimization of Multiple Constant Multiplications (MCM) architectures. Most of existing algorithms simply minimize the number of adders and subtractors used in MCM blocks. However, the total delay of MCM blocks is also an important requirement that has been ignored in most optimization models. The developed algorithms should incor-
porate area and delay in a common optimization model for MCM blocks and be tuned for each MCM instance in order to reduce the total problem search space.

Moreover, in this project new architectures targeting different requirements will be proposed and evaluated. Dedicated architectures for low-power consumption that trade-off computation speed (throughput) with power consumption will be studied. The propose architectures should have the capability to activate only the hardware elements of the MCM that are required for computation of a given constant multiplication. By reducing the global switching activity in the MCM, major saving in power consumption are expected.

As an outcome of the research project, a set of tools, adequate for integration in a typical design flow and incorporating the developed optimization algorithms for specific architectures, will be made available as open software in a public webpage of the project.

Title: **Sideworks-Security - Hardware accelerator for cryptographic applications**

*Financed by: QREN*

*Coordinator from INESC-ID: Ricardo Jorge Fernandes Chaves*

*Summary: The main objectives of this project/task is the development of efficient implementations of ciphering algorithms, considering the hardware reconfiguration capabilities.*

Title: **LabChip - Integrated Lab On Chip Platforms for Medical Diagnostics**

*Financed by: FCT*

*Coordinator from INESC-ID: Leonel Augusto Pires Seabra de Sousa*

*Summary: Lab on chip diagnostic systems are being introduced for a variety of point of care applications ranging from medical diagnosis (gene expression, protein, and cell chips), to environmental and food control applications. This project will form an interdisciplinary network of Portuguese and Spanish laboratories, strengthening current collaborations and initiating new ones. Workshop organization, student and researcher visits, and project meetings are planned to achieve convergence. The project will cover three types of lab on chip platforms: a) magnetoresistive (MR) biosensor platforms, where both a general purpose MR lab on chip platform and a lateral flow MR based or inductive based platform will be analyzed b) MEMS and NEMS based biosensors, where devices made at the collaborating groups will be compared c) Integrated semiconductor biosensors, where devices made in the different groups using electronic, or optoelectronic based detection will be compared and improved.*

Title: **TARGET - Transformative, Adaptive, Responsive and enGaging EnvironmenT**

*Financed by: European Comission – FP7*

*Coordinator from INESC-ID: João António Madeiras Pereira*

*Summary: TARGET aims to revolutionize competence development for project and innovation managers by providing technological support for rapidly developing and improving their competencies. The serious games approach will be exploited to provide real-life like learning experiences for project managers to enhance their competences. TARGET focuses on providing support for competence development, where learners will be able to experience complex and challenging project management experiences that characterize the real world. TARGET aims to address this challenge by providing realistic game scenarios for the project managers, to augment whatever they are familiar with from their work experience, or from communities of practice, or from courses on the formalized body of knowledge of project management. TARGET aims to capitalize on the experience and knowledge of relevant communities (e.g. communities of project managers, communities of TARGET users) by obtaining their experiences to enrich the game scenarios as well as supporting contributions and knowledge sharing among the community members through social tools.*

Title: **WSAN4CIP - Wireless Sensor and Actuator Networks for the Protection of Critical Infrastructures**

*Financed by: European Comission – FP7*

*Coordinator from INESC-ID: Augusto Julio Domingues Casaca*

*Summary: The project will apply wireless sensor and actuator networks to the protection of critical infrastructures, namely for the distribution of water and energy.*
Title: Sideworks-Arithmetic - Scientific Computing and BaseBand Processing on the SideWorks Reconfigurable platform
Financed by: QREN
Coordinator from INESC-ID: Horácio Cláudio Campos Neto
Summary: This project will explore the use of SideWorks, a reconfigurable platform, to compute applications in two specific domains: high performance computing and baseband processing. In the high performance computing domain, a set of double and single precision floating-point operations will be considered, namely, sum, subtraction, multiplication and division. A set of arithmetic cores will be developed and implemented on SideWorks to accelerate the execution of matrix computations. In the baseband processing domain, a set of algorithms used in the design of a OFDM receiver will be implemented on SideWorks. In particular, the project considers the design of blocks for data synchronization, OFDM, demodulation and Viterbi decoder.

Title: REAP.PT – Computer Aided Language Learning - Reading Practice
Financed by: FCT/CMU
Coordinator from INESC-ID: Nuno João Neves Mamede
Summary: In order to enable students to learn to read another language, a good tutoring system should give them much opportunity for practice and make the experience as engaging and personalized as possible. The REAP.PT system is being designed to complement teacher time by giving the student documents to read and questions about new words they have seen in the documents. It will personalize the work by choosing texts in Portuguese that are at the reading level of the individual student, presenting words that that student needs to learn and having documents on subjects that the student is interested in. Questions will be automatically generated about the meaning of the words that the student saw in a document and reports will be given to the student and to their teacher.

Title: EDLocal – Making local and regional content accessible through the European Digital Library
Financed by: European Comission
Coordinator from INESC-ID: José Luís Brinquete Borbinha
Summary: EDLocal is a European project funded by the eContentPlus Program and represented in Portugal by the Fundação Museu Nacional Ferroviário (FMNF). The purpose is to establish a Best Practice Network to improve the interoperability of the digital content held by regional and local institutions and make it accessible through the Europeana (http://europeana.eu). There is a pressing need to involve Europe’s network of local and regional libraries, museums and archives more extensively in making the enormous amount of digital content that they hold available through Europeana, INESC-ID will assist the FNF to establish efficient and sustainable processes through which Portuguese institutions can easily make their content available to Europeana during and after the project, adopting and promoting the use of infrastructures, tools and standards, as specifications emerge, especially OAI-PMH repositories and Europeana Metadata Applications Profiles.

Title: PT-STAR – Speech Translation Advanced Research to and from Portuguese
Financed by: FCT/CMU
Coordinator from INESC-ID: Maria Luísa Torres Ribeiro Marques da Silva Coheur
Summary: Each year, more than a billion Euros is spent translating documents and interpreting speeches by European institutions. Also, about half of the Europeans speak only its own language. Just these two facts per se are a strong motivation for the fostering of Speech-to-Speech Machine Translation (S2SMT) technologies, which aim at enabling natural language communication between people that do not share the same language. Within this project, several problems are envisaged, such as spontaneous speech translation – for which the performance of the automatic speech recognizer component seriously degrades – and voice conversion – which allows the synthesized speech to retain the characteristics of the original voice. Moreover, several major problems in statistical machine translation are addressed, as for instance the study of different methods to automatically extract bilingual lexicon from non-aligned parallel corpora and to update the translation model. Finally, PT-STAR targets the implementation of a proof of concept prototype.
Title: BIOHYPO - Confronting the clinical relevance of biocide induced antibiotic resistance
Financed by: European Commission – FP7
Coordinator from INESC-ID: Ana Teresa Correia de Freitas
Summary: Biocides have been in use for hundreds of years for antisepsis, disinfection and preservation. Despite this widespread and ever increasing use most bacterial and fungal species remain susceptible to biocides. The dramatic increase and spread of resistance to antibiotics linked to reports of co- and cross-resistance between antibiotics and biocides raised speculations on potential hazard of biocide use. The overarching question which BIOHYPO is aimed to address is: has the use of biocides contributed to the development and spread of clinically significant antibiotic resistance in human pathogens? Core of BIOHYPO are a high throughput screening approach on collections of thousands of well characterized microorganisms and an interactive web based data analysis platform. Phenotypic screening for reduced susceptibility to biocides, detection of novel resistance genes and mobile elements, and screening for their molecular epidemiology and metagenomics will be accompanied by methodological innovation for testing, risk evaluation and registration of biocides. Altogether BIOHYPO aims to provide solid data and analysis to direct future issuing of guidelines for safe environmental, medical and industrial use of biocides.

Title: SFERA - Solar Facilities for the European Research Area
Financed by: European Commission – FP7
Coordinator from INESC-ID: João Manuel Lage de Miranda Lemos
Summary: The purpose of this project is to integrate, coordinate and further focus scientific collaboration among the leading European research institutions in solar concentrating Systems. To define and validate new methodologies for comparative durability tests by accelerated aging of selected CSP components. Improve the capacities of the installations to allow for: - tunable levels of flux by adaptive control of shutters - flexible temperature control of test bed to create thermal gradients at samples - transient heating and cooling to adjust for thermal cycles - quick flux cycles for thermal shock investigations.

Title: ColaDI - Gestão documental Colaborativa para Design Industrial
Financed by: QREN
Coordinator from INESC-ID: Manuel João Caneira Monteiro da Fonseca
Summary: ColaDI goal is the development of solutions for a simple and transparent management of documents produced by industrial design. We plan to research new approaches for multiuser collaboration, to enable an easier and more direct discussion over documents, 2D and 3D. New calligraphic and gesture based interfaces will be developed thus increasing usability, ease of use and user conversation. At the end, we want to build a platform to allow the integration of new research results in the areas of document collaboration, classification and retrieval, taking into account the solution’s usability and use of new interaction techniques. ColaDI will be a bridge for future cooperation between its partners and will provide a commercial and real life use of research results.

Title: Cloud-TM - A Novel Programming Paradigm for Cloud Computing
Financed by: European Commission – FP7
Coordinator from INESC-ID: Paolo Romano
Summary: This project aims at designing, building, and evaluating an innovative middleware platform for service implementation of Cloud based services: Cloud-TM (Cloud-Transactional Memory) Cloud-TM offers a simple and intuitive programming model for large scale distributed applications that integrates the familiar notion of atomic transaction as a first-class programming language construct, sparing programmers from the burden of implementing low level, error-prone mechanisms (e.g locking, persistence and fault-tolerance) and permitting major reductions in the time and costs of the development process. Cloud-TM will embed a set of atomic mechanisms to simplify service monitoring and administration, a major source of costs in dynamic and elastic environments such as the cloud. These mechanisms aim at ensuring the achievement of user defined Quality of Service levels at minimum operational costs by automating the provisioning of resources from the cloud and self-tuning the middleware platform to achieve optimal efficiency in the utilization of resources.
ARGUS – Activity recognition and object tracking based on multiple models
Financed by: FCT
Coordinator from INESC-ID: João Manuel Lage de Miranda Lemos
Summary: Development and test of algorithms for activity recognition and object tracking based on multiple models.

ARIA - Ambient-assisted Reading Interfaces for the Ageing-society
Financed by: FCT
Coordinator from INESC-ID: António Joaquim dos Santos Romão Serralheiro
Summary: The ARIA project aims at defining a framework for assisted reading, particularly targeted for elderly communities. It envisages a broad and active perspective of reading, where annotation and group communication tasks complement and build upon the main reading activity, taking advantage of a digital proactive medium. It addresses elderly individuals through the adoption of an assisted and adaptive stance that adapts document content navigation, presentation and interaction.

TILECAL - Collaboration in the upgrade of the Tilecal/ATLAS/LHC back end electronic systems to the specifications of the SLHC
Financed by: FCT
Coordinator from INESC-ID: José António Soares Augusto
Summary: To collaborate on the ongoing efforts for upgrading the Tilecal detector electronics systems, belonging to the ATLAS CERN/LHC experiment. The Tilecal will have to meet the requirements in data transfer bandwidth, radiation tolerance and processing speed, which are predicted for the SLHC (Super Large Hadron Collider). Broadly speaking, as the SLHC will afford a tenfold increase in luminosity, those system characteristics will have to engage also in a tenfold improvement. Besides the institutions signing the project proposal, the Un. of Valencia (through the IFIC-Instituto de Física Corpuscular) and one CERN Department responsible for electronics development are cooperating in the project.

HIVCONTROL - Control based on dynamic modeling of HIV-1 infection for therapy design
Financed by: FCT
Coordinator from INESC-ID: Susana de Almeida Mendes Vinga Martins
Summary: Immunology is increasingly recognized as a major field in the area of Biomedicine. Establishing efficient therapeutics for infectious diseases is a major problem of the human society. In particular, this is illustrated by the emergence of the Acquired Immune Deficiency Syndrome (AIDS), which raised new problems and concerns worldwide. Controlling this type of diseases has thus a significant socio-economic impact. Furthermore it also raises challenging problems that only an interdisciplinary approach can tackle. In this respect a systems’ approach is attracting more and more attention in recent years and forms a global framework for this proposal. The aim of this project consists of designing personalized therapy strategies to control HIV-1 infection using model based nonlinear control and estimation techniques.

AQUANET - Decentralised and reconfigurable control for water delivery multipurpose canal systems
Financed by: FCT
Coordinator from INESC-ID: João Manuel Lage de Miranda Lemos
Summary: Design and test of algorithms for decentralised and reconfigurable control for water delivery multipurpose canal systems.

GIAU2 - Gestão Integrada de Apoio ao Utilizador
Financed by: Instituto do Turismo de Portugal
Coordinator from INESC-ID: Miguel Leitão Bignolas Mira da Silva
Summary: To implement new processes for managing IT support (including the software) in particular for change management and service level management.

MIVIS - Modelação Procedimental de Superfícies Implicítas para Visualização
Financed by: FCT
Coordinator from INESC-ID: Joaquim Armando Pires Jorge
Summary: The main objective of this project is to improve on current sketch-based modelling research to create more complex and detailed models than is currently possible. The project will use a combination of implicit sur-
faces and polygonal representations with real time direct manipulation for free form procedural modeling and rendering operations. Much of sketch based modelling results in cartoon type figures (models and renderings). Tools sets require improvement and expansion to provide usable techniques for creating more complex real world objects. Current sketch-based modeling systems/tools do not provide the complexity of operations and speed to create common scientific illustrations, which frequently contain lots of detail. The project will be driven by the requirements of scientific illustrators to ensure the tools created are useful and usable.

Title: REFLECT - Rendering FPGAs to Multi-Core Embedded Computing

Financed by: European Comission – FP7
Coordinator from INESC-ID: Pedro Nuno Ferreira da Rosa da Cruz Diniz
Summary: This project will develop, implement and evaluate a novel compilation and synthesis system approach for FPGA-based platforms. We rely on Aspect-Oriented (AO) Specifications to cover critical domain knowledge to a mapping engine while preserving the advantages of a high-level imperative programming paradigm in early software development and portability. We leverage AO specifications and a set of transformations to generate an intermediate representation using an extensible mapping language (LARA). LARA specifications will allow the exploration of alternative architectures and run-time adaptive strategies enabling the generation of flexible hardware cores that can be easily incorporated into larger multi-core designs. We will evaluate the effectiveness of the proposed approach using partner-provided codes from the domain of audio/video processing and real-time avionics.

Title: Alberti-Digital - Tradição e inovação na teoria e prática da arquitectura em Portugal

Financed by: FCT
Coordinator from INESC-ID: Joaquim Armando Pires Jorge
Summary: This research project is both, a celebration and innovation. A celebration in order to celebrate the order given by D João III, in XVI mid-century, to André de Resende to translate into Portuguese the - de re aedificatoria- Leon Battista Alberti. An innovation in order to produce for the first time, an intelligent computing environment to understand the cultural impact of this treatise on classical architecture. This project has therefore the following stages in order to achieve those objectives:
- Decoding the treaty;
- Stroke the influence of the treaty in the Portuguese architecture;
- Stroke impacts on theory, practice and teaching of architecture, assembly and organization of an exhibition of an international conference.
As final products will be an itinerant exhibition, an educational software will be available and will be also published a book in order to record the results, which should show the implications of the theory of Quattrocento architecture in the practice of architecture in Portugal, particularly during the counter-reform period (Saudação XVI-XVII).

Title: GALENO - Modeling and Control for personalized drug administration

Financed by: FCT
Coordinator from INESC-ID: João Manuel Lage de Miranda Lemos
Summary: This project aims at designing personalized drug administration system using Modeling, Estimation, Control and Advisory methods. The approach proposed in this project consists on the
online estimation of the parameter models start- 
ing from a tailored a priori distribution developed 
also within this project by novel methodology and 
refining these estimates using effect measure- 
ments, in the presence of perturbations and sen- 
sor noise. A bayesian framework is therefore a 
natural setting, in particular because the system 
at hand is highly stochastic. The individualized PK/ 
PD parameter profile obtained for each patient is 
used to provide the ideal drug dosage adjusted by a 
control algorithm for which several possibilities will 
be considered, regardless a reliable sensor for the 
measurement of the effect is available.

Title: MPSat - Multi-Packet Detection Techniques for Satellite
Financed by: FCT
Coordinator from INESC-ID: Augusto Julio Domingues Casaca
Summary: Development Multi-Packet Detection Techniques for Satellite Networks

Title: 3DORUS: 3D Object Retrieval using Sketches
Financed by: FCT
Coordinator from INESC-ID: Manuel João Caneira Monteiro da Fonseca
Summary: The main goal of this project is to develop novel multimedia information retrieval mechanisms, to replace the current non-natural and ill-suited methods for retrieving 3D objects. We will do this by developing novel algorithms to simplify, analyze and describe the content of three-dimensional objects, based on new techniques for partial structure-driven matching of three-dimensional models. We will investigate also new techniques to specify queries using sketches.

Title: Pneumopath - A comprehensive dissection of pneumococcal-host interactions
Financed by: European Comission – FP7
Coordinator from INESC-ID: Susana de Almeida Mendes Vinga Martins
Summary: Transmission of Streptococcus pneumoniae to a new host can result in clearance, asymptomatic colonisation or progress to invasive disease. To date, study of infection has tended to be a reductionist approach, considering the contribution of each virulence factor or host factor in isolation. Consequently, in searching for targets for antimicrobial therapy or for enhancement of host defence, the contribution of individual factors may be inaccurately estimated. The aim of this project is, through a systems approach to host-pneumococcal interaction, identify the most important and consistently involved host and pneumococcal factors.

Title: CRUSh - Clip-art Retrieval using Sketches
Financed by: FCT
Coordinator from INESC-ID: Manuel João Caneira Monteiro da Fonseca
Summary: In this project we want to develop a new approach to retrieve clip-arts, independently of their format (raster images or vector drawings), that will combine the potentialities from image and drawing analysis techniques. Our solution will allow the search and retrieval of clip-arts using sketches as queries. It will use techniques from image processing and from vector drawing analysis, to describe clip-art contents. From the vectorial part, we will explore the spatial arrangement of visual components that constitute the drawing, as well as techniques used to describe their shapes. From the image processing side, we will take advantage of existing methods to visually simplify clip-arts, and to extract features related to color and texture to describe its content.

Title: DF-Protect - Data Fusion Protect
Financed by: OBlog
Coordinator from INESC-ID: Paulo Jorge Fernandes Carreira
Summary: This projects aims at providing a copy protection and license enforcement mechanism to the Data Fusion data migration tool suite. The goal is to protect the tool from being abusively copied. This project is particularly interesting for the Oblog Consulting, the company that develops Data Fusion, since in a typical scenario the tool is installed in many workstations.

Title: MicroEGo - Did you ask for something small? The microRNAs power in a Eucalyptus tension world!
Financed by: FCT
Coordinator from INESC-ID: Ana Teresa Correia de Freitas
Summary: In this project we will identify and characterize E. globulus miRNA’s involved in the regulation mechanisms of wood formation and their target genes, using as a model the tension wood forming tissues. The long term aims is to use this information to devise new ways to control the quality of wood produced by E. globulus and to provide
the breeding programs with tools to direct their work to the selection/production of genotypes with desired wood qualities.

Title: **PROSOPON - Partilha de Ciclos de CPU para Identificação e Indexação Facial em Multimédia**
Financed by: FCT
Coordinator from INESC-ID: Luis Manuel Antunes Veiga
Summary: We will design a peer-to-peer cycle sharing infra-structure to support video analysis and indexing. Video processing, extraction, face detection and identification will all be scheduled as embarrassingly parallel Bag-of-Tasks (i.e., no coordination needed among concurrent activities) by reducing the footage resolution, splitting video into smaller sequences, and scattering them among the nodes of the peer-to-peer overlay for processing. Intermediate and final results are stored and indexed leveraging layers and dimensions of the overlay.

PROSOPON will also support users’ contributions to guide the process of face classification. The peer-to-peer infra-structure will be used with an additional overlay for distributed fault-tolerant storage of the video library and the index that results from the face indexing process. This additional overlay index will have a multidimensional structure according to the parameters used in the face identification phase (e.g. eigenfaces/eigen-features) and will be used to efficiently execute queries on the indexed library.

Title: **RepComp - Replicação de Componentes para Melhoria de Desempenho ou Fiabilidade em Sistemas Multicore**
Financed by: FCT
Coordinator from INESC-ID: Luis Manuel Antunes Veiga
Summary: In this project, we propose a complementary approach that can be used by both applications that include multiple threads and by applications that include a single thread. The main insight for our approach is that applications almost always resort on a set of components with standard interfaces - e.g. data structures, algorithms, etc. For these components, several implementations are available, which have different performance for different inputs or for different operations - e.g. for a set data structure, an implementation based on hashtables is faster for inclusion checking while a tree-based implementation is faster for ordered listing. Thus, we propose to locally replicate each component and use different implementations for each replica. As programs usually rely heavily on these standard components, by using this approach, we can transparently improve the performance of the overall program even when programmers structure them as a single thread application.

Title: **Pneumosys - A systems biology approach to the role of pneumococcal carbon metabolism in colonization and invasive disease**
Financed by: FCT
Coordinator from INESC-ID: Susana de Almeida Mendes Vinga Martins
Summary: The ultimate GOAL of this project is to develop a multi-level mathematical model that can predict factors in sugar assimilation essential to thrive in the different host niches. However, a systematic, systems biology approach towards determining the factors governing sugar metabolism is far from trivial. The specific AIMS of this project are to obtain the response of S. pneumoniae to changing carbon sources by a variety of global technologies including metabolomics (Task 2), transcriptomics, and proteomics (Task 3), with the goal of fueling the mathematical representation (Task 4). To verify the model, deletion mutants of predicted essential factors will be constructed and tested for the ability to colonize and cause invasive disease (pneumonia and bacteraemia) in vivo (Task 5).

Title: **iExplain - Reasoning About Unsatisfiability**
Financed by: FCT
Coordinator from INESC-ID: Vasco Miguel Gomes Nunes Manquinho
Summary: In this project, a new formalism named Weighted Boolean Optimization (WBO) is proposed that extends the Maximum Satisfiability (MaxSAT) problem by introducing the use of pseudo-Boolean constraints as soft or hard constraints. Furthermore, several algorithms to solve WBO will result from this project. These new software packages are expected to have an important impact in the research community by allowing a common framework and integration of MaxSAT and Pseudo-Boolean formalisms. It will also be proposed the generalization of algorithms for MaxSAT based in identifying unsatisfiable subformulas. The use of such approach will be an important contribution to the research community, since no algorithm has been devised based on the identification of unsatisfiable subsets of pseudo-Boolean constraints.
Moreover, this approach will also be extended for solving the Constraint Satisfaction Problem (CSP) and MaxCSP and variants. Finally, it is also an objective of the iExplain project to use the developed algorithms in several real-world problems from formal verification to bioinformatics.

Title: ParSat - Parallel Satisfiability Algorithms and its Applications
Financed by: FCT
Coordinator from INESC-ID: Paulo Ferreira Godinho Flores
Summary: The Boolean Satisfiability Problem (SAT) is a fundamental problem in computer science. It is not only of theoretical interest but also of practical relevance for several industries. For instance, in EDA area, SAT has been successfully used for automatic test pattern generation, combinational equivalence checking, symbolic model checking, timing analysis and FPGA routing. Our goal in this project, is to research and develop techniques to speedup the solution of SAT problems. Distributed SAT algorithms, using parallel computing environments (such as multicores, GPU’s, etc...) are promising approaches to reach this goal. Using these new computing platforms, we plan to explore techniques both at the algorithmic level and at the implementation level. In the former we will consider how SAT algorithms can be modified to explore the search space in parallel, and in the latter we will identify code sections that can be efficiently executed in parallel. Moreover, the different characteristics of the parallel computational platforms, MIMD versus SIMD, will allow us to explore different approaches to the exploration of the various algorithmic levels of parallelism.

Title: HPC over the Large-Scale Internet - High-Performance Computing over the Large-Scale Internet
Financed by: FCT
Coordinator from INESC-ID: Luís Eduardo Teixeira Rodrigues
Summary: This project advances the current state of the art in platforms for Internet-wide computation, by designing, implementing and evaluating new mechanisms that move beyond the traditional client-server architecture of these platforms to support, for the first time, scalable decentralized cooperation among clients. This proposal addresses the key challenge of transitioning from the centralized architecture to one that is distributed and scalable. By adding communication between clients, we may remove the central server from the communication loop, for the sake of economy and speed. Whenever possible, direct (or delayed) exchange of data among clients may save precious bandwidth resources from the project’s owner. Additionally, for applications with controlled IO requirements, inter-client communication may speedup execution. To support this goal, most of our work will focus on two aspects: one is to prepare the BOINC middleware for the change, the other is to build on P2P computation to achieve some guarantees in such a hostile environment.

Title: EnviGP - Improving Genetic Programming for the Environment and Other Applications
Financed by: FCT
Coordinator from INESC-ID: Sara Guilherme Oliveira da Silva
Summary: Genetic Programming (GP) is the youngest paradigm inside the artificial intelligence research area called evolutionary computation, and consists on the automated learning of computer programs. GP often yields results that are not merely academically interesting, but competitive with the work developed by humans. However, because it is a young and complex paradigm, the practical use of GP still poses a few challenges. In this project we will develop and test new approaches to the bloat and overfitting problems in GP, while studying the relationship between the two, and adapt GP for improved efficiency in multiclass classification problems. The achievement of these goals will ultimately produce a powerful general-purpose tool that can be used by practitioners of many diverse areas of research.

Title: Cloud-TM - A Novel Programming Paradigm for Cloud Computing Acronym: Cloud-TM
Financed by: European Commission – FP7
Coordinator from INESC-ID: Paolo Romano
Summary: This project aims at designing, building, and evaluating an innovative middleware platform for service implementation of Cloud-based services: Cloud-TM (Cloud-Transactional Memory). Cloud-TM offers a simple and intuitive programming model for large scale distributed applications that integrates the familiar notion of atomic transaction as a first-class programming language construct, sparing programmers from the burden of implementing low level, error-prone mechanisms (e.g. locking, persistence and fault-tolerance) and permitting major reductions in the time and cost of the development process. Cloud-TM will embed
a set of autonomic mechanisms to simplify service monitoring and administration, a major source of costs in dynamic and elastic environments such as the cloud. These mechanisms aim at ensuring the achievement of user defined Quality of Service levels at minimum operational costs by automating the provisioning of resources from the cloud and self-tuning the middleware platform to achieve optimal efficiency in the utilization of resources.

Title: FastFix – Monitoring Control for Remote Software Maintenance
Financed by: European Commission – FP7
Coordinator from INESC-ID: Luís Eduardo Teixeira Rodrigues
Summary: FastFix results will include a platform and a set of open source tools to on-line monitoring of execution environments, gathering semantic information on application and user behaviour. This information is sent in real time to a support centre, taking special care on privacy and security issues. Using event correlation techniques, FastFix identifies failure symptoms, performance degradation or changes in user behaviour and allows for failure replication, patch generation and patch deployment, resulting in a self-healing software application.

Main objectives are to develop (1) tools to gather context information on user and application, (2) a run-time with minimum impact on application performance, (3) a secure method to send this information to a centralized fault analysis platform, (4) a tool to detect software failures, undesirable execution trends and performance degradation, (5) a platform to replicate failure conditions within a virtual machine and (6) a tool to generate change strategies and necessary patches.

Title: DINASTI – Distributed Infrastructure for Simulations
Financed by: IST - FP7
Coordinator from INESC-ID: Mário Serafim dos Santos Nunes
Summary: The future leads towards an ambient environment where wireless communications will exist in every scenario of life to provide the end user the "flexibility and choice", to enhance the quality of life of the individual, such as the ABC (Always Best Connected) philosophy. An important architectural issue is that of defining a next-generation wireless system, which acts as a "network-of-wireless-networks" accommodating a variety of radio technologies and mobile service requirements in a seamless manner. The achievement of this vision raises the need for a heterogeneous system evaluation platform. While nothing replaces real life experiments, the development of physical test-beds is highly expensive with reduced flexibility. While simulators have been around and used by the wireless R&D community for years, no integrated tool that considers all the aspects relevant for the analysis and dimensioning of a wireless network still exists either in the commercial or research arena. Therefore, the development of an infrastructure covering the radio access network layers will be a very powerful tool for researchers to design and evaluate next generation wireless networks.

Title: Reaction – Retrieval, Extraction, and Aggregation Computing Technology for Integrating and Organizing News
Financed by: FCT
Coordinator from INESC-ID: Mário Jorge Costa Gaspar da Silva
Summary: We research new tools for providing greater automation in news gathering, analysis, and delivery, while respecting practical constraints of news producers and consumers. We emphasize decomposition of stories into finer-grained elements and discovery of implicit relations between them. We also emphasize the relationship between news and social networks, both explicit and implicit, which underlie the news and significantly shape its content, quality, and authority. Hands-on experience in the newsroom will enable practitioners to
Innovate current practice of news production and identify important avenues for future research in computational Journalism.

Title: eCUTE – Education in Cultural Understanding, Technologically-Enhanced Acronym: eCUTE Coordinator from INESC-ID: Ana Maria Severino de Almeida e Paiva Summary: The eCUTE project aims to develop innovative technologically-enhanced learning approaches in cultural awareness and understanding that will help overcome cultural, ethnic and religious differences that can lead to social stresses and sometimes outright conflict. The technologies to be developed in eCUTE include virtual world simulations with intelligent interactive graphical characters embodying models of culturally-specific behavior and interaction in scenarios developed via a user-centered design process.

Title: MAIS-S – Multiagent Intelligent Surveillance System Financed by: FCT Coordinator from INESC-ID: Francisco António Chaves Saraiva de Melo Summary: With the generalized use of intelligent technology, the interaction between multiple smart devices poses interesting challenges both in terms of engineering and research. In this project, we model such complex networks as multiagent systems where each node corresponds to an agent. We propose the use of decision-theoretic models - Dec-POMDPs and specializations thereof - that naturally capture the decentralized nature of these networks in terms of local perception, interaction/communication and local actuation. We are interested in heterogeneous surveillance networks that include different kinds of nodes, with different perceptual and actuation capabilities, as well as different processing power. The work will follow along two main lines. We formalize several fundamental problems typically found in most surveillance systems as optimal decision-making problems (Tasks 1-2) and tackle these problems in a principled way, proposing solutions that offer some theoretical guarantees of performance. On the other hand, we investigate several practical problems faced in deploying such a heterogeneous network (Tasks 3 and 4) and bring the results from Tasks 1-2 into practical use.

Title: SIREN - Social games for conflict Resolution based on natural Interaction Financed by: European Commission – FP7 Coordinator from INESC-ID: Ana Maria Severino de Almeida e Paiva Summary: The Siren project aims to create a new type of educational game, the conflict resolution game, which takes advantage of recent advances in serious games, social networks, computational intelligence and emotional modelling to create uniquely motivating and educating games that can help shape how children think about and handle conflict. The software developed by the project will be able to automatically generate conflict scenarios that fit the teaching needs of particular groups of children with varying cultural background, maturity, and technical expertise, and the desired learning outcomes as specified by a teacher. This will enable the system to be used by school teachers all over Europe, without specific technical training. To realize this vision, a number of advances to the state of the art will be made throughout the various disciplines that members of our thoroughly multi-disciplinary consortium specialize in.

Title: PMU – Power Management Units (PMU) design with Silicongate Financed by: Silicongate, Lda Coordinator from INESC-ID: Carlos Francisco Beltran Tavares de Almeida Summary: According to the contract signed between INESC-ID and Silicongate on September 6, 2010, clause 2) the design of power units managem-net b) technical specification

Title: ATTEST – AlgoriThms and Tolls for reasoning about dEpendable SysTem Financed by: FCT Coordinator from INESC-ID: João Paulo Marques da Silva Summary: Given the ever increasing importance of verified software, namely in safety-critical applications, the development of provably correct verification tools is a relevant and strategic research topic. This issue has been addressed in earlier work [22], but existing software verification tools are currently unable to certify their results. Essentially, although software verification tools are known to be extremely reliable, it is also true that these tools have not been proved correct. For many applications, the use of uncertified software verification tool may represent an acceptable compromise. However, in applications where safety
is a primary concern [e.g., human transportation, including avionics, automotive, railways and shipping], certified software verification solutions will bring added confidence to deployed software systems. The ATTEST project will develop a new generation of software verification tools built on top of formally certified components. The resulting software verification tools will provide a much higher degree of confidence in verified software systems.

Title: FalaComigo - Enhance the Cultural Tourism through the Interaction with Virtual Characters
Financed by: QREN
Coordinator from INESC-ID: Maria Luísa Torres Ribeiro Marques da Silva Coheur
FalaComigo aims to develop a solution to Enhance the Cultural Tourism through the Interaction with Virtual Character, by providing a set of applications, that will be settled in various places of touristic interest.

The goal of FalaComigo is, therefore, to develop a solution that helps tourists to take a different view of the monument or place of cultural interest that they are visiting, allowing them to interact with a set of virtual characters through questions and answers, specific for each location. Through these solutions, FalaComigo team will provide new and compelling ways of interacting with visitors, supplying a remarkable sensory experience. On the basis of development of these solutions we find a spoken dialogue system with speech recognition and synthesis, 3D facial animation, spoken dialogue management systems and question/answer technologies.

Title: GaLA—Game and Learning Alliance
Financed by: European Commission – FP7
Coordinator from INESC-ID: Ana Maria Severino de Almeida e Paiva
Summary: The GaLA motivation stems from the acknowledgment of the potentiality of Serious Games (SGs) for education and training need to address the challenges of the main stakeholders of the SGs European landscape (users, researchers, developers/industry, educators). A foundational fault issue in this context is the fragmentation that affects the SG landscape. GALA aims to shape the scientific community and build a European Virtual Research Centre (VRC) aimed at gathering, integrating, harmonizing and coordinating research on SGs and disseminating knowledge, best practices and tools as a reference point at an international level. The other two key focuses of the project are (1) the support to deployment in the actual educational and training settings and (2) the fostering of innovation and knowledge transfer through research-business dialogue. The NoE organizations aim to integrate their activities and resources in a long-term view structuring the activities along 3 major axes: research integration and harmonization; joint research activities; spreading of excellence.

Title: INVITE - Social Identity and partNership in VrTual Environments
Financed by: FCT
Coordinator from INESC-ID: Rui Filipe Fernandes Prada
Summary: The focus of the project will be around the notion of partnership of a human with another human or a virtual agent in a virtual environment: the project will study how partnership is created, maintained or broken during an interaction supporting the realization of a particular task in a virtual environment.

The hypothesis we propose is that inclusion of AI models that incorporate social intelligence, inspired by human behavior, in a virtual environment will foster believability in virtual agents within the context of partnership.

Title: EUTV - Adaptive Channels in Europe
Financed by: European Commission – FP7
Coordinator from INESC-ID: Isabel Maria Martins Trancoso
Summary: EUTV plans to perform research and develop and deploy the best-of-class extractors for indexing and analysing the individual information modalities (text, speech, audio, image, video) perform research on multimodal feature fusion of the individual extractors exploiting structural characteristics of the multimedia streams and the content domains (le news, sport, documentaries) and descriptions about concepts modelled into ontologies. The EUTV framework will be based on service-oriented architecture so to be able to easily update extractors when better versions are available.
Title: ADAAS – Assuring Dependability in Architecture-based Adaptive Systems
Financed by: FCT
Coordinator from INESC-ID: Luís Eduardo Teixeira Rodrigues
Summary: As software systems become increasingly central to support everyday activities, there is a critical need to improve their dependability and optimize their performance, while reducing their development and operational costs. This project will focus on the provision of self-adaptability as a means for achieving dependability in the context of the other requirements. In particular, focusing on the use of architectural models at run-time, it will develop new languages, techniques and tools for creating dynamic adaptation strategies that allow a system to automatically respond to change and improve its behaviour as it executes. Relative to current research in this area, key innovative qualities of these adaptation strategies will be their analyzability and their flexibility. The former is necessary to establish the correctness of adaptation strategies and ensure that they will achieve the desired outcomes. The latter is necessary to accommodate uncertainty in the operating environments and changes that may occur.

10.2 Publications

10.2.1 Books


10.2.2 International Journal Articles

Ginevra Castellano and Iolanda Margarete dos Santos Carvalho Leite and André Tiago Abelho Pereira and Carlos António Roque Martinho and


C. Patrikakis and A. Pnevmatikakis and P. Chippendale and Mário Serafim Nunes and Rui Cruz, *Direct your personal coverage of large athletic events*, IEEE.


Gabriel César Ferreira Pestana and Andrea Kurz and AnteroKuvonen and AugustoCasaca, *Location-based services to improve aircraft ground handling and safety procedures*, European Journal of Navigation, 8(3), pp. 16-21, Dec. 2010, Druck Center Meckenheim GmbH.


Fernando Sequeira Sousa and Fábio O. Teixeira and Alex E. Falcão and Anderson D. Hummel and Thiago M. Costa and Pável Calado and Luciano V. Araújo and Ivan T. Pisa, *Use of Medical Subject Headings (MeSH) in Portuguese for Categorizing Web-based Healthcare Content*, Journal of Biomedical Informatics.


João Delgado and Inês Lynce and Vasco Manquinho, *Computing the Summed Adjacency Disruption Number between Two Genomes with Duplicate Genes*, Journal of Computational Biology, 17(9), pp. 1243-1265, Sep. 2010, Mary Ann Liebert, Inc.


Levent Aksoy and Ece Olcay Gunes and Paulo Flores, Search algorithms for the multiple constant multiplications problem: Exact and approximate, Microprocessors and Microsystems, Embedded Hardware Design (MICPRO), 34(5), pp. 151-162, Mar. 2010, Elsevier B.V.


10.2.3 National Journal Articles


10.2.4 Book Chapters


Ana Sofia Graça and Joao Marques Silva and Inês Lynce, Mathematical Approaches to Polymer Sequence Analysis and Related Problems, Chapter Haplotype Inference using Propositional Satisfiability, Oct 2010, Springer.


**10.2.5 International Conferences**


A. P. Francisco and Sophie Schbath and Ana T. Freitas and Arlindo L. Oliveira, Using Graph Modularity Analysis to Identify Transcription Factor Binding Sites, International Workshop on Graph Theoretic Analysis of Biological Networks at IEEE International Conference on Bioinformatics and Biomedicine (BIBM10), Dec. 2010.


Panita Yongyuth and Rui Prada and Arturo Nakasone and Asanee Kawtrakul and Helmut Prendinger, *3D Multi-language Internet Game For Fostering Agriculture Environmental Awareness*, ACM MEDES 2010, Oct. 2010, ACM.


François Daoust and Philipp Hoschka and C. Patrikakis and Rui Cruz and Mário Serafim Nunes and David Osborne, Towards Video on the Web with HTML5, NEM Summit, Oct. 2010, NEM.


Gonçalo José Branquinho Antunes and José Barateiro and José Borbinha, *A Reference Architecture for Digital Preservation*, 7th International Conference on Preservation of Digital Objects (iPRES 2010), Sep. 2010, APCA.


L. P. Perera and Joao P. Carvalho and C. Guedes Soares, Bayesian Network based sequential collision avoidance action execution for an Ocean Navigational System, 8th IFAC Conference on Control Applications in Marine Systems, Rostock, Germany, Sep. 2010, pp. 301-306.

Sylvain Brohéé and Joana P. Gonçalves and Daniela Nitsch and Yves Moreau, Beegle - a new search engine for discovering novel genes, Ninth European Conference on Computational Biology (ECCB 2010), Sep. 2010.


Alberto Abad and Thomas Pellegrini and Isabel Trancoso and João Paulo da Silva Neto, Context Dependent Modelling Approaches for Hybrid Speech Recognizers, Interspeech 2010, Sep. 2010, ISCA.


Tiago Doce and João Miguel de Sousa de Assis Dias and Rui Prada and Ana Paiva, Creating Individual Agents through Personality Traits, 10th International Conference on Intelligent Virtual Agents, Sep. 2010, pp. 257-264, Springer.


Martijn Kuipers and Ricardo Vaz and Mário Serafim Nunes, Robust Video Calls for Emergency Services over IP based Networks, 6th International Mobile Multimedia Communications Conference (Mobimedia2010), Sep. 2010, ICST.

Ivo Anjo and João Cachopo, RuLAM Project: Speculative Parallelization for Java using Software Transactional Memory, 8th International Conference on the Principles and Practice of Programming in Java (PPPJ 2010), Sep. 2010.


R. Chipana, L. Bolzani and Fabian Vargas and Jorge Filipe Leal Costa Semião and J. Rodríguez-Andina and Isabel Maria Silva Nobre Parreira Cacho Teixeira and João Paulo Cacho Teixeira, *Investigating the Use of BICS to Detect Resistive-Open Defects in SRAMs*, IEEE International On-Line Test Symposium (IOLTS), Jul. 2010, IEEE.


Francisco Melo and Manuela Veloso, *Approximate planning for decentralized MDPs with sparse interactions*, AAMAS 2010, May 2010, pp. 1389-1390, IFAAMAS.


Carlos António Roque Martinho, I Mean It, Detecting user’s intentions to create believable behaviour for virtual agents in games, AAMAS 2010, May 2010, pp. 83-90, IFAAMAS.


Josep Argelich and Alba Cabiscol and Inês Lynce and Felip Manyà, New Insights into Encodings from MaxCSP into Partial MaxSAT, 40th IEEE International Symposium on Multiple-Valued Logic (ISMVL10), May 2010, pp. 46-52, IEEE.


Helena Moniz and Fernando Batista and Hugo Meinedo and Alberto Abad and Isabel Trancoso and Ana Isabel Mata da Silva and Nuno J. Mamede, Prosodically-based automatic segmentation and punctuation, Speech Prosody 2010, May 2010, ISCA.


Mário Guimarães and António Rito Silva, Towards Real-Time Integration, 3rd International Workshop on Cooperative and Human Aspects of Software Engineering (CHASE10), May 2010, pp. 56-63, ACM.


Sérgio Miguel Fernandes and João Cachopo, A scalable and efficient commit algorithm for the JVSTM, 5th ACM SIGPLAN Workshop on Transactional Computing, Apr. 2010.


Cristina Mota, Journalistic corpus similarity over time, Corpus linguistic applications: Current studies, new directions, Mar. 2010, pp. 67-83, Rodopi.


Mário Pereira Véstias and Horácio C. Neto, Parallel Decimal Multipliers Using Binary Multipliers, IEEE VI Southern Programmable Logic Conference (SPL 2010), Mar. 2010, pp. 73-78.


Frederico Pratas and Ricardo Mata and Leonel Sousa, Iterative induced dipoles computation for Molecular Mechanics on GPUs, 3rd Workshop on General Purpose Processing on Graphics Processing Units (co-located with ASPLOS), Feb. 2010, ACM.

Bruno Martins and Pável Calado, Learning to Rank for Geographic Information Retrieval, 6th Workshop on Geographic Information Retrieval, Feb. 2010, ACM.


Ivo Miguel da Quinta Anastácio and Bruno Martins and Pável Calado, Using the Geographic Scopes of Web Documents for Contextual Advertising, 6th Workshop on Geographic Information Retrieval, Feb. 2010, ACM.


10.2.6 National Conferences


José Borbinha and Nuno Miguel Antunes Freire, *Da “The European Library” à “Europeana” – Um percurso com impulsos nacionais*, 10º congresso nacional de bibliotecários, arquivistas e documentalistas, Apr. 2010.

M. Lopes and Nuno Miguel Antunes Freire and Hugo Miguel Álvaro Manguinhas and Gilberto Filipe Santos Pedrosa and M. Teixeira and José Borbinha, *O Modelo FRBR e a descoberta de informação: a experiência do projecto TELplus*, 10º congresso nacional de bibliotecários, arquivistas e documentalistas, Apr. 2010.


10.2.7 Patents


10.2.8 Technical Reports


10.2.9 Special Issues of Journals


António Menezes Leitão Ed., Lisp: Research and Experience, Lisp: Research and Experience, 16(2), Jan. 2010, Graz University of Technology.

10.2.10 Edited Proceedings


10.3 Dissertations

10.3.1 PhD Theses


**10.3.2 MSc Theses**


Sérgio Carvalho, Modeling and Simulation of Artificial Communities Behavior, MSc Thesis, Instituto Superior Técnico, Nov 2010.


Artur Ventura, Spoken Interaction with Synthetic Entities, MSc Thesis, Instituto Superior Técnico, Nov 2010.


André Calvinho, Identificação de Interacções de Serviços de Email por Verificação de Modelos, MSc Thesis, Instituto Superior Técnico, Oct 2010.


Pedro Miranda, SaaS (Software as a Service) - Infrastructures and Application in Real Scenarios, MSc Thesis, Instituto Superior Técnico, Oct 2010.


Clemente Raposo, Data-aware connectivity in mobile replicated systems, MSc Thesis, Instituto Superior Técnico, Sep 2010.


10.4 Seminars

22-Dec-2010
*Seminar do grupo DMIR: Processpedia*
António Rito Silva, INESC-ID Lisboa and IST

13-Dec-2010
*In-silico strategies in drug design*
Nuno Palma, BIAL, Departamento de Investigação e Desenvolvimento

10-Dec-2010
*Real-time link extraction and classification*
Bruno Pedro, TarPipe

03-Dec-2010
*Vernáculo de Angola – Estado actual de conhecimento e perspectivas de investigação futura*
Liliana Inverno, Universidade de Coimbra

23-Nov-2010
*Research in Kochi University of Technology, Japan*
Shinichi Yamagiwa, Kochi University of Technology

12-Nov-2010
*Pulsar Navigation*
Chris Verhoeven, Technical University of Delft

11-Nov-2010
*On the Origin of Satellite Swarms*
Chris Verhoeven, Technical University of Delft

03-Nov-2010
*Next Generation Search*
Ricardo Baexa Yates, Yahoo! Research Labs

22-Oct-2010
*Pesquisas em PLN no Núcleo de Linguística Computacional (NILC)*
Maria das Graças Volpe Nunes, USP/São Carlos & NILC, Brasil

22-Oct-2010
*Fully generalized graph cores and applications*
A. P. Francisco, INESC-ID Lisboa and IST

15-Oct-2010
*Dynamic model identification of Lactococcus lactis metabolism time-series*
Andras Hartmann, INESC-ID
08-Oct-2010
Detecting mis-recognitions in ASR output
Thomas Pellegrini, INESC-ID

01-Oct-2010
Using Excel as user interface on a semantic information system
Pedro Reis, INESC-ID

29-Sep-2010
Distributed and Predictable Software Model Checking
Nuno Claudino Pereira Lopes, Inesc-ID

22-Sep-2010
Distributed Compensations with Interruption in Long-Running Transactions
Roberto Bruni, Università di Pisa

17-Sep-2010
Multiplication Algorithms for Monge Matrices
Luís M. S. Russo, INESC-ID Lisboa and IST

10-Sep-2010
Characterful Speech Synthesis
Matthew Aylett, CereProc

03-Sep-2010
Modeling the F0 curve for Speech Synthesis
Gopala K. Anumanchipalli, Carnegie-Mellon

20-Jul-2010
Hierarchical Phrase-based Translation with Weighted Finite-State Transducers
Adrià de Gispert, University of Cambridge

19-Jul-2010
Meaning Propagation
Fernando Pereira, Google

19-Jul-2010
Structured Prediction Cascades
Ben Taskar, University of Pennsylvania (Upenn)

13-Jul-2010
Efeitos de Radiação em Circuitos Integrados
Jader Alves de Lima Filho, Centro de Tecnologia da Informação Renato Archer

07-Jul-2010
Research Overview on intelligent transportation systems
Pietro Manzoni, Universidade Politecnica de Valencia

02-Jul-2010
Predicting Cloze Task Quality for Vocabulary Training
Adam Skory, Carnegie-Mellon

02-Jul-2010
Computational Methods for the characterization and detection of protein binding sequences through information theory
Joan Maynou, Universitat Politècnica de Catalunya

24-Jun-2010
Dynamics of CD4+ T cells in HIV-1 Infection
Ruy M. Ribeiro, Los Alamos National Laboratory

08-Jun-2010
Learning words and speech units through natural interactions
Jonas Hörmstein, Institute for Systems and Robotics (ISR)

02-Jun-2010
Challenges and Directions in the Multicore Era
Cliff Click, Azul Systems

01-Jun-2010
Mining the Web 2.0 to Improve Search
Ricardo Baeza-Yates, Yahoo Research and University Pompeu Fabra

31-May-2010
Towards a Coding Style for Scalable Nonblocking Data Structures
Cliff Click, Azul Systems

28-May-2010
Controlling Complexity in Part-of-Speech Induction
João Graça, INESC-ID Lisboa

28-May-2010
Speedpath Analysis Under Parametric Timing Models
Luís Guerra e Silva, INESC-ID Lisboa

21-May-2010
SITIU: The Portuguese Version of Let’s Go!
José Lopes, INESC-ID Lisboa

21-May-2010
Global Tolerance of Biochemical Systems and its Design Implications
Pedro Coelho, University of California at Davis
17-May-2010
**On-the-Fly Model Checking for Regular Alternation-Free Mu-Calculus** and **One Interface to Serve Them All**
Radu Mateescu and Jaco van de Pol, INRIA Rhône-Alpes / University of Twente

14-May-2010
**Voltage-mode Quaternary FPGAs: An Evaluation of Interconnections**
Cristiano Lazzari, INESC-ID

07-May-2010
**Analysis of interrogatives in different domains**
Helena Moniz, INESC-ID

30-Apr-2010
**Computer Architecture: an experience on performance and power**
Filipa Duarte, PhD, IMEC

26-Apr-2010
**From Assembling Short DNA Reads to Protein Sequencing by Assembling Mass Spectra**
Pavel Pevzner, University of California at San Diego (UCSD)

09-Apr-2010
**A Data Mining Approach for the detection of High-Risk Breast Cancer Groups**
Orlando Anunciação, Inesc-ID

26-Mar-2010
**Recent improvements in the PT-STAR Project**
Tiago Luís, Wang Lin, INESC-ID Lisboa

26-Mar-2010
**Human Immunodeficiency Virus (HIV) Dynamic Modeling and Antiretroviral Treatment Analysis**
Ana Calhau, Constança Roquette, Teresa Cordeiro, IST

19-Mar-2010
**Avaliação de Usabilidade**
Alfredo Manuel dos Santos Ferreira Júnior, INESC-ID

12-Mar-2010
**In silico Metabolic Engineering**
Miguel Rocha, Universidade do Minho

03-Mar-2010
**Fail-aware untrusted storage (FAUST)**
Christian Cachin, IBM Research - Zurich

26-Feb-2010
**Speaker Verification Experiments on the NIST SRE Database**
Jordi Luque, L2F and TALP

26-Feb-2010
**CHE - Evolutionary Algorithms for Cluster Geometry Optimization**
Francisco B. Pereira, Universidade de Coimbra

23-Feb-2010
**Winter Workshop of the Distributed Systems Group**
An informal event of the Distributed Systems Group to present the I&D activities of this specific group.

19-Feb-2010
**A Music Classification Method Based on Timbral Features**
Thibault Langlois, Gonçalo Marques, LASIGE/FCUL

19-Feb-2010
**Novelty and Evolution in Biological, Chemical and Random Reaction Networks**
Pietro Speroni di Fenizio, CISUC, Department of Informatics Engineering, University of Coimbra

19-Feb-2010
**Phone Recognition and Language Modeling for Variety Identification**
Oscar Koller, INESC-ID

12-Feb-2010
**Formal verification techniques: model checking in systems biology**
Pedro T. Monteiro, INESC-ID

08-Feb-2010
**Lexicon extraction from bilingual comparable corpora**
Luís Carvalho, INESC-ID

08-Feb-2010
**PT-STAR: speech translation**
Nuno Grazina, INESC-ID
29-Jan-2010

Recent advances in language and speaker recognition: Compensation methods, the Joint Factor Analysis
Jordi Luque, L2F and TALP

29-Jan-2010

Project “EnviGP - Improving Genetic Programming for the Environment and Other Applications”
Sara Silva, INESC-ID

22-Jan-2010

Recent advances in language and speaker recognition: Gaussian Super Vectors and compensation methods
Alberto Abad, Jordi Luque, L2F and TALP

22-Jan-2010

Wideband CMOS Receivers Exploiting Noise and Distortion Cancelling
Eric A. M. Klumperink, University of Twente

15-Jan-2010

How to Complete an Interactive Configuration Process?
Mikoláž Janota, University College Dublin

08-Jan-2010

Concise Integer Linear Programming Formulations for Dependency Parsing
André Martins, IST/Carnegie-Mellon

08-Jan-2010

Motif representation and discovery
Alexandra M. Carvalho, Inesc-ID