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01 \ INTRODUCTION
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 in 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 2009.

A list of the most significant research projects undertaken in 2009 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 and also the participation in two start-up companies launched by researchers and students from INESC-ID.
02 \ GENERAL INFORMATION
2.1 Institutional Information


INESC-ID is owned by Instituto Superior Técnico (51%) and INESC – Instituto de Engenharia de Sistemas e Computadores (49%).

INESC-ID operates in two locations, near (or inside) the two campuses of IST, namely:

**Campus I**

**Alameda**
Rua Alves Redol, 9
1000-029 Lisboa
Telef.: +351 213100300
Fax: +351 213145843

**Campus II**

**TagusPark**
Avenida Professor Cavaco Silva
2780-990 Porto Salvo
Telef: +351 214233508
Fax: +351 214233290

2.2 General Description of INESC-ID

INESC-ID is a research institute that integrates a body of highly qualified researchers, approximately 100 of which with a PhD degree, as well as post-graduate students. The majority of the PhD researchers are professors, mostly from Instituto Superior Técnico. This body of researchers, unique at national level in its scientific area, enables INESC-ID to act, in the different phases of the R&D process. The intense activity developed by INESC-ID since its inception in 2000 resulted, up to now, in more than 2000 scientific papers published in specialized journals and international conferences, dozens of industrial prototypes based on state-of-art technologies, and in a number of patents and awards.
2.3 Main Institutional 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.

2.4 Funding Agencies

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 Commission. 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 partners institutions.
2.5 Human Resources

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>18</td>
</tr>
<tr>
<td>PhD Degree</td>
<td>78</td>
</tr>
<tr>
<td>MSc Degree</td>
<td>66</td>
</tr>
<tr>
<td>1st Degree</td>
<td>70</td>
</tr>
<tr>
<td>Undergraduate Students</td>
<td>42</td>
</tr>
<tr>
<td>High School</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>281</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.

2.6 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.

2.6.1 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. The Board was composed, until May 2009, by Arlindo Oliveira (chairman), Luís Caldas de Oliveira and José Carlos Monteiro. From June 2009 until the end of the year the Board of Directors was composed by Leonel Sousa (chairman), Luís Caldas de Oliveira and José Carlos Monteiro.
Fig. 1 – INESC-ID Organization Chart
2.6.2 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 2009 the General Council was composed, until May 2009, by Carlos Matos Ferreira, Afonso Barbosa, Pedro Girão, José Tribolet, Abílio Ançã Henriques and João M. Lemos. The board of directors of IST has changed in June 2009, and since them the three representatives of IST are António Cruz Serra, Arlindo Oliveira and Paulo Martins.

2.6.3 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 2009 the Fiscal Council was composed by Hermínio Ribeiro, Dr. João Catarino and Dr. Vitor Franco.

2.6.4 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.

2.6.5 Board of the Scientific Council

The Scientific Council has a managing board composed of a chairman and two other members. In 2009 the Board of the Scientific Council was composed by Prof. Luís Silveira, Prof. Inês Lynce, and Prof. João Miranda Lemos (chairman).

2.6.6 Scientific Council Coordinating Committee

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

2.6.7 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 Princípe (Univ. Flórida, USA).

2.6.8 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.
2.6.9 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.

2.6.10 Administrative Support

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

2.6.11 Financial Control Department

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

2.6.12 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.

2.6.13 Legal Support Department

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

2.6.14 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.

2.6.15 Network Support Department

The Network Support Department is responsible for the maintenance of the computer network and servers.
2.7 Research Units

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 2009:

**Spoken Language Systems:**
Coordinator Isabel Trancoso
Individual groups do not exist within this research unit.

**Information and Decision Support Systems:**
Coordinators Profª Helena Sofia Pinto, Prof. Pável Calado
SW Algorithms and Tools for Constraint Solving – Prof. Inês Lynce
Knowledge Discovery and Bioinformatics – Profª 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. João Madeiras Pereira
Intelligent Agents and Synthetic Characters – Prof. Ana Paiva
Intelligent Multimodal Interfaces – Prof. Joaquim Jorge

**Embedded Electronic Systems:**
Coordinators Prof. Carlos Beltran Almeida, 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 Silva

**Communication Networks and Mobility:**
Coordinator Prof. Augusto Casaca
Individual groups do not exist within this research unit.
In 2009 INESC-ID has continued to improve the quality of the research and development performed. The present report gives the main indicators, lists the most significant activities developed during the year, and highlights some of the most significant projects, with the objective of illustrating the quality and variety of the research developed by the institution.

### 3.1 Main Results

The following set of tables summarizes the activities carried out in 2009 and the results achieved.

**Projects**

<table>
<thead>
<tr>
<th>Type of Project</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Programs</td>
<td>13</td>
</tr>
<tr>
<td>National Programs</td>
<td>42</td>
</tr>
<tr>
<td>Contracts with companies</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>66</strong></td>
</tr>
</tbody>
</table>

**Publications**

<table>
<thead>
<tr>
<th>Publication Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Books</td>
<td>4</td>
</tr>
<tr>
<td>International Journals</td>
<td>63</td>
</tr>
<tr>
<td>National Journals</td>
<td>1</td>
</tr>
<tr>
<td>Serials</td>
<td>15</td>
</tr>
<tr>
<td>Edited Books</td>
<td>3</td>
</tr>
<tr>
<td>Book Chapters</td>
<td>21</td>
</tr>
<tr>
<td>International Conferences</td>
<td>199</td>
</tr>
<tr>
<td>National Conferences</td>
<td>50</td>
</tr>
<tr>
<td>Patents</td>
<td>1</td>
</tr>
<tr>
<td>Technical Reports</td>
<td>65</td>
</tr>
<tr>
<td>Special Issues of Journals (editor)</td>
<td>1</td>
</tr>
<tr>
<td>Conference Proceedings</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>427</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>134</td>
<td>11</td>
<td>145</td>
</tr>
<tr>
<td>MSc Theses</td>
<td>223</td>
<td>132</td>
<td>355</td>
</tr>
<tr>
<td>Graduation Theses</td>
<td>25</td>
<td>-</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>382</strong></td>
<td><strong>143</strong></td>
<td><strong>525</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>10</td>
</tr>
<tr>
<td>Committee Chair</td>
<td>13</td>
</tr>
<tr>
<td>Committee Member</td>
<td>106</td>
</tr>
<tr>
<td>General Chair</td>
<td>5</td>
</tr>
<tr>
<td>Invited Speaker</td>
<td>6</td>
</tr>
<tr>
<td>Reviewer</td>
<td>94</td>
</tr>
</tbody>
</table>

### 3.2 Special events and Opportunities

During 2009 INESC-ID continued to improve the quality of its research, by developing initiatives that aim at fostering excellence in research.

#### 3.2.1 Program CMU-Portugal

INESC-ID participates in the joint PhD Program Carnegie Mellon University-Portugal in the area of Language and Information Technologies. This PhD program is part of the activities of the recently created Information and Communication Technologies Institute (ICTI), resulting from the Portugal-CMU Partnership.

The Language Technologies Institute (LTI) of the School of Computer Science at Carnegie Mellon University (CMU) offers a dual degree Ph.D. Program in Language and Information Technologies in cooperation with Portuguese Universities. The LTI, formed 20 years ago, is a world leader in the areas of speech processing, language processing, information retrieval, machine translation, machine learning, and bio-informatics. The breadth of expertise at LTI enables new research in combinations of the core subjects, for example, speech-to-speech translation, spoken dialog systems, language-based tutoring systems, and question/answering systems.

The Portuguese consortium that participates in the program includes the Spoken Language Systems Lab (L2F) of INESC-ID, the Center of Linguistics of the University of Lisbon (CLUL), the Centre for Human Language Technology and Bioinformatics at the University of Beira Interior (HULTIG) and the linguistics group at the University of Algarve (UALG). These four research centers have expertise in the same language technologies as LTI, but with a strong focus on processing the Portuguese language.
3.2.2 Program MIT-Portugal

The Knowledge Discovery and BioInformatics group participated in the MIT-Portugal program, in the Biotechnology Systems area. Professor Arlindo Oliveira taught modules in the areas of computational biology and bioinformatics, in close coordination with professors from MIT, IST, and other Portuguese universities.

3.2.3 Annual General Meeting

The INESC-ID Annual General Meeting took place in October 2009. Senior Researchers met in Aldeia dos Capuchos to discuss issues related with the strategic development of the institution, with special emphasis on the organization and CMU and MIT programs. Prof. Paulo Ferrão, as director of the MIT-Portugal program and Prof. João Barros as director of the CMU Portugal program were the invited speakers of this general annual meeting.

3.2.4 Admission of New Senior Research Staff

INESC-ID is continuously seeking highly qualified candidates with a PhD degree and with a track record showing their ability to perform independent research in their scientific areas.

These openings were announced in national and international journals and websites. From the large number of applicants, six were admitted during 2009, and are now full members of the research staff: Paulo Fonseca, Berend Kuipers, Francisco Melo, Sara Silva, Hector Roldan, and Levent Aksoy.

3.2.5 Internal Assessment and Evaluation

The activities developed in 2007-2008 were the object of an internal assessment by a committee appointed by the Scientific Council, composed of Profs. Arlindo Oliveira, João Miranda Lemos, Luís Silveira and Luís Rodrigues.

The results of the assessment, as well as the remarks and recommendations made to the internal units were presented to the Scientific Council.
3.3 **Prizes and International Recognition**

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

- Mário Serafim Nunes received the *Best Paper Award* for The Fifth International Conference on Networking and Services (ICNS2009)*, IARIA / IEEE Computer Society, Valencia, Spain, April 2009;

- Fernando Baptista received *Best Paper Award* for the article "Fernando Batista, Isabel Trancoso and Nuno J. Mamede, Automatic Recovery of Punctuation Marks and Capitalization Information for Iberian Languages, Proceedings of the I Joint SIG-IL/Microsoft Workshop on Speech and Language Technologies for Iberian Languages. Porto Salvo, Portugal, September 2009;"

- Helena Sarmento received the *Best Paper Award* for the article "Indoor Location System Using ZigBee Technology, Sensorcomm";

- Leonel Sousa was Distinguished by the Technical University of Lisbon (UTL) with an *Honorable Mention* for the number and the impact of the publications in international scientific journals in the period 2004-2008 (award UTL/Santander Totta);

- Leonel Sousa received the HiPEAC *Paper Award* for “Compact and Flexible Microcoded Elliptic Curve Processor for Reconfigurable Devices”, by Samuel Antão, Ricardo Chaves and Leonel Sousa, presented at the IEEE Symposium on FCCM, March 2009;

- Jorge Fernandes and R. Duarte received the *Outstanding Paper Award* at IEEE Int. Conf. on Mixed Design of Integrated Circuits and Systems, (MIXDES’09) in June 2009 with paper R. Duarte and J. Fernandes, “A Comparative Study on Transformer and Inductor Based LC Tanks for VCOs”;

- Arlindo Oliveira was awarded with the prize UTL/Santader for the quality and impact of the scientific publications;

- Inês Lynce was awarded with the prize APPIA PremelA Award, given by the Associação Portuguesa para a Inteligência Artificial;

- Samuel Antão was awarded with the prize Prof. Luís Vidigal 2008-09 for the dissertation “Efficient Units for Data Processing and Cryptography.

In 2009 new internal prizes were launched. The commission nominated to this purpose is the INESC-ID AdvisoryBoard, composed by Profs. Franco Maloberti (Univ. Pavia, Italy), Srinivas Devadas (MIT, USA), Morris Sloman (Imperial College, London, UK), and Carlos Príncipe (Univ. Flórida, USA).

The commission selected for the Best PhD Student Award Tiago Guerreiro, for the Best Young Researcher Prof. Inês Lynce, and, for the Best Senior Researcher Prof. Leonel Sousa. These awards were given by the chairman of the Scientific Council Prof. João Miranda Lemos.
3.4 Visibility and External Image of the Institution

In 2009 the effort to improve the external image of the institution continued. INESC-ID has been invited to participate in several events of high visibility, such as:

- Workshop UQ, organized by the Instituto Superior Técnico at Taguspark campus in April 2009;
- Ciência 2009 – 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 2009;
- Mostra 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 October 2009;
- 4as Jornadas de Inovação, an exhibition organized by Agência de Inovação in June 2009, with the objective of stimulating cooperation between R&D institutions and enterprises.

Besides the exhibitions, INESC-ID also promoted and stimulated external visits, mostly from other institutions and groups of external researchers or students from abroad. Some examples are the external visits like Aerospace Mission.

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. 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, and cover a wide range of research areas. Besides promoting collaboration across disciplines, these activities allow that the general public, mainly students and researchers from other institutions/universities, have an interesting approach of the work developed at INESC-ID. These seminars also promote an exchange of contacts and useful links for future cooperation.

INESC-ID also gives an extreme importance to its general outlook as a research institution for the world. Our web page is daily updated, either with new scheduled seminars, news or open calls for funding. This allows our researchers to be updated with new opportunities and also publish fellowship calls, for example.

The INESC-ID newsletter was restructured, with a new look and contents. In 2009, a better an informal approach was improved in order to attract general public. Interviews with senior and young researchers and the promotion of some of our research projects are the basis of the News-ID, which also covers corporate/market Inesc-ID relationships, besides publishing information about our start-ups.
A close connection with the media world was also strongly promoted in the year of 2009. Due to that close relationship, we were able to publish and disclose results of research projects in high impact public journals and TV programs, showing abroad the technology and innovation improvements that our institution has been given on a worldwide level.

### 3.5 Cooperation and Mobility

INESC-ID promotes cooperation with other institutes and universities, and also with foreign students. In 2009 took place several activities in cooperation with Euroyouth, 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 Euroyouth.

Among the referred cooperation there were also organized some external visits to INESC-ID research groups and activities. Greece students, teachers and researchers visited institution campuses at Alameda and Taguspark, learning methods and sharing research and academic experiences.
4.1 Mancoosi

Mancoosi (www.mancoosi.org) is a European research project in the 7th Research Framework Programme (FP7) of the European Commission. The project is situated in the FP7 theme Information & Communication Technologies (ICT), Challenge 1: Pervasive and Trusted Network and Service Infrastructures, Objective 2007.1.2 Service and Software Architectures, Infrastructures and Engineering. The project has started February 1st, 2008, and will finish by the end of May 2011.

Mancoosi addresses the problem of system upgrades in the context of free and open software distributions. It is common to install an upgrade in a PC just to find out afterwards that something very important is not working anymore. The problem is that, especially when you think about large, complex software packages, there is no general way to know if a software package, with all its dependencies and obscure libraries, configuration files, hardware components or security setup, will work properly on a specific computer. That is, there is no way to know it before actually installing a package, and before finding out the hard way that it has destroyed something else.

Mancoosi pursues two main avenues:

- **Rollback solutions**: develop mechanisms that provide for rollbacks of failed upgrade attempts, allowing the system administrator to revert the system to the state before the upgrade. The expected outcomes are tools and techniques to safely and selectively undo package installation.
- **Better upgrades**: develop better algorithms and tools to plan upgrade paths based on various information sources about software packages and on optimization criteria. The expected outcomes are safer, more flexible package installers and better reporting for failed upgrades.

**Better upgrades**

Installing a software component can be a puzzle: if there are several possibilities on how to satisfy its dependencies, the system may ask the user obscure questions, and finally choose one solution using its own blind algorithm, which may lead to remove other useful packages, and leave the user in the dark. Mancoosi aims at developing sophisticated optimization algorithms to find efficient upgrade paths and high level request languages which will make software upgrading a simpler process for any user, not only for experienced computer wizards.

**Rollback solutions**

No matter how significant the advances in theory, we know there will always be the possibility that the installation process fails or is not what the user really wanted. Mancoosi is also building a transactional layer into end-user package management tools, which will allow bringing your system back to a previous state ("rollback") without further problems, working at the level of individual components, and not on file-system checkpoints.

Rollback solutions will be found through the following steps:

- **Report failure**: end users are equipped with tools that allow to report rollback failures to distribution editors;
- **Check reports**: distribution editors receive and check these error reports and pass them on to researchers who refine their models describing the effect of package installation and removal;
- **Improved tools**: distribution editors then incorporate improved rollback algorithms in the next generation of tools.

![Mancoosi Screen Shot](image)
Better upgrades will be achieved through the following steps:

- Report failure: end users are equipped with tools that allow to report upgrade and installation failures to distribution editors;
- Verify reports: distribution editors receive and check these error reports;
- Submit problems: distribution editors pass them along to Mancoosi in a unified, distribution-independent format;
- Interesting problems: a selection of interesting problems is offered to researchers through an international competition;
- Improved algorithms: improved, efficient algorithms coming from research;
- Improved tools: the algorithms are incorporated by distribution editors in the next generation of tools.

### 4.2 Maximus

MAXIMUS is a FP7 European research project which aims at improving the design review for automotive and architecture design through dramatically improved rendering and interaction technologies. This project, lead by the Fraunhofer Institute (Germany), focuses on developing a system which not only complements the way designers work and collaborate through multi-modal interaction techniques, but also takes advantage of high dynamic range rendering.

As a result of the know-how and experience, the main contribution of INESC-ID in the MAXIMUS project is to devise natural multi-user interaction techniques for use in retroprojection display systems. For that end, we developed innovative prototypes, such as the SqueezyBall or Large Tabletop Interaction Surface.

The Squeezy-Ball is a wireless input device with six degrees of freedom for interaction on large scale environments. This interaction device is targeted for user freedom. It allows the user to walk around freely while interacting with the system, offering natural interaction in a 3D environment using both gestures and direct manipulation. The six degrees of freedom are provided through gyroscopes and accelerometers, while position in space is determined using a tracking system. Additionally to a standard physical button, pressure sensitive sensors allow the user to squeeze the ball to control the system.

The Large Tabletop Interaction Surface was developed to be used together with a large screen display, proving a natural way for architects to perform design reviews on their projects. The tabletop device we developed has an unusually large (greater than A0) interaction surface and is capable of receiving multiple finger and pen inputs. There, the architects’ plans could be seen in a 1:1 scale to their paper version. Within this context, we are researching pervasive multitouch interaction that aim at creating low-cost devices with 3D stereo. We also explore multimodal interfaces combining speech, tracked devices and two-hand interaction to create new tools for architects. Above all, our solution will provide a unique way for architects to work collaboratively in a computer system, similar to what they currently do with-out computers, around a table with paper plans. With the prototype we are developing, architects will be able to review the design on the tabletop and visualize the results on a real-time in a large screen.

Besides the natural multimodal interaction techniques, the MAXIMUS project aims on providing high dynamic range real-time light simulation and rendering pipeline and finally displaying maximum fidelity...
image quality. To attain this goal, the consortium is composed by partners with distinct expertise. The partner BARCO is developing novel projection technology in terms of high dynamic range contrast and extended color gamut, while Spheron is devising high dynamic range acquisition technology for materials. Fraunhofer IGD is developing novel light simulation techniques given the new possibilities introduced by high dynamic material models provided by Spheron and the new display possibilities developed by BARCO. Representing the real end users, Giugiaro and Page\Park contribute in the automotive industry and architects context, respectively. Finally, Glasgow Caledonian University is leading the assessment and evaluation of project prototypes.

4.3 BIOHypo

BIOHYPO aims to provide solid data and analysis to direct future issuing of guidelines for safe environmental, medical and industrial use of biocides.

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? The core of BIOHYPO is 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.

The INESC-ID team is responsible for the workpackage 2, entitled: Integrated bioinformatics and data management. The integrative bioinformatics workpackage consists of two parallel efforts by the INESC-ID team members. Firstly, a semantic web infrastructure will be developed to provide a flexible web-based data management resource for all participants, where both the raw data and the results of its processing can be hosted, shared and selectively disseminated. The web based repository will have its application programming interface (API) exposed through REST web-services (REpresentation State Transfer is an approach where the API is invoked through regular HTTP calls). Secondly, the data analysis will be designed to address the scale and complexity of molecular epidemiology data. This will be achieved by a meta-analysis approach where the distinct sources of data and the distinct risk modeling targets are integrated. The first step of the analysis will be aimed at finding the statistical significant associations between the biocide use and the appearance of antibiotic or biocide resistance, using traditional uni- and multivariate statistical methodologies. The second step will focus on the quantification of association that also detects the sort of transient, non-linear correlation that characterizes Biological Signals. Finally, the integrated analysis of data will
be object of a meta-analysis approach that includes results from other sources in order to determine the real clinical relevance of any antibiotic/biocide co- and cross-resistance found. If co- or cross-resistances are found, they will be analyzed by creating mathematical models of risk. These models will be developed with the specific purpose of accessing the impact of the biocides real clinical settings as quantified by increased costs of treatment or hospitalization, which in turn will allow for an objective cost/benefit assessment of the use of biocides and antibiotics in the society.

4.4 PT-Star

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 their 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.

S2SMT can be seen as a cascade of three major components: Automatic Speech Recognition (ASR), Machine Translation (MT) and Text-to-Speech Synthesis (TTS). One of the main problems of this multidisciplinary area, however, is the still weak integration between the three components. The main goal of PT-STAR (funded by FCT, within the Carnegie Mellon | Portugal Research Projects Program) is to improve speech translation systems for Portuguese by strengthening this integration.

S2SMT faces several current research challenges. First, the performance of all modules significantly degrades in the presence of spontaneous speech. This significant degradation is mostly due to the fact that the modules (namely the ASR and MT modules) are typically trained with read speech, and have serious difficulties in processing the hesitations, repetitions, filled pauses and non-grammatical utterances that are so frequent in spontaneous speech. Second, the current state of the art in S2SMT shows a relatively weak integration between the three modules, not exploring the synergies between the AST and MT modules, on one hand, and the MT and TTS modules, on the other. For instance, the synthesizer typically assumes fluent text as input, which is not often the case in the output of the MT module. Hence the synthesis strategy has to be modified in order to avoid producing non-understandable speech in these cases. Being able to transfer the main focus (or emphasis) of the incoming speech from the source to the target language is another extremely challenging task.

PT-STAR is being applied to three different scenarios: Broadcast News, Ted Talks and Classroom Lectures. Each one of these scenarios has its own specificities resulting in a broad test-bed: in S2SMT of Broadcast News we can move from controlled to spontaneous speech; in Ted Talks, domain adaptation and voice conversion are major challenges, and we also have to deal with occasional applause and laughs from the audience; in what concerns classroom lectures, the envisaged system has to deal mainly with spontaneous speech, and very specific technical topics. In this first year of project, we have put our efforts in the speech-to-text translation of Broadcast News from PT to EN and in the S2SMT of Ted Talks. Improvements can be observed in these different application scenarios.

PT-STAR involves a consortium of universities and research centers: the Spoken Language Systems Lab (L2F) of INESC-ID Lisboa, the Center of Linguistics of the University of Lisbon (CLUL), and the University of Beira Interior (UBI) and, on the CMU side the Language Technologies Institute (LTI). S2SMT is a multilingual, multidisciplinary topic where LTI’s research is undoubtedly one of the best at world-wide level, and where the language specific expertise of the Portuguese research teams greatly complements this know-how.
4.5 Target

The TARGET project is a collaborative project partially funded by the European Community under the Seventh Framework Programme.

It is well-known that there is global competition for highly skilled people. This has led to increasing acceptance by organizations as a key business strategy, of the need to retain and re-train their existing staff through some kind of tailored competence development that reduces the lead-time for a learner to achieve target productivity: the “time-to-competence” (TTC). Today, the main route to short TTC is a bespoke (hand-crafted) face-to-face or blended course, which tends to be resource-intensive (expensive to create and deliver). What is needed are methods and tools to effectively and economically address dynamic competence development rapidly, with flexible learning contexts of varying complexity and longevity. One challenge is that each learner is a unique individual, with different cognitive abilities, emotional intelligence, personality, knowledge and experience. Thus, it is not feasible to develop a single solution tailored to all learners, but rather it is necessary to support mass-individualization.

Taking this into account, the main aim of TARGET is to research, analyse and develop a new genre of responsive Technology Enhanced Learning (TEL) environment that supports rapid competence development of individuals, namely knowledge workers. Additionally, TARGET can respond dynamically to the ever-changing business needs of an organization and the evolving personal goals of individuals.

One of the key elements of the TARGET integrative framework will be the Serious Games which are digital games that are driven by learning objectives. In fact, serious games can be deployed as testbeds for experience management that are highly motivating and emotionally engaging, causing high and long knowledge retention. In TARGET, a serious game is combined with digital storytelling techniques, thus enabling the community to store and share experiences reflecting complex situations.

The mix and sequence of those elements changes dynamically and synergistically in TARGET to maximize responsiveness to learner needs.

The serious game is the foundational component of the TARGET platform. As the TARGET learning process involves both the social and individual dimensions of learning, the Serious Game component needs to support both dimensions by means of:

**Lounge.** This corresponds to a shared virtual space where users (e.g.: learners and mentors) gather together and may have discussions with one another.

The focal point of the Lounge is a visual representation of the Knowledge Ecology, which can be accessed via the Knowledge Ecology Navigator (KEN) in either single or shared mode. The latter implies that two or more users share the same perspective of the Knowledge Ecology.

**Game Scenario.** In this case, the user is presented with a briefing of the Story to be engaged with. In addition to the background information, the user may browse the existing roles and choose one, although in most cases the true benefit of the Story is only experienced from a particular role. Once the user chooses their role, the Story starts where reality is defined by a simulation and the other roles are assumed by Non-Player Character (NPCs) controlled by agents. Once the game scenario is finished, the user has completed their experience and is presented with a debriefing that states if the user was successful in achieving the story objectives. From the debriefing, the user may trigger the Competence Performance Analyzer (CPA) to check how they performed in terms of particular competences within the context of the story.

The Heads-Up Display (HUD) provides the 3D perspective on the environment, both in the Lounge and when engaged with a story. In addition, the user has access to: **Personal Organizer.** This is a visual component located on the lower left-hand corner. It aggregates together all the tools and services that the user has available to engage with the environment. Some of the tools are generic, like the inventory and the mini-map that not only provides location aware-
ness. In other cases, the tools correspond triggers to TARGET platform components such as the competence performance analyzer.

**Navigation and the social communication tools.**

This is the visual component located on the lower right hand corner, such as the dialogue system.

INESC-ID, through its VIMMI (Visualization and intelligent Multimodal Interfaces) research group will be involved in a crucial work package that will develop the TARGET platform, integrating the services/tools that other work packages/tasks have developed. In particular, VIMMI will design and develop the serious game along with the technology for artificial stakeholders that have a knowledge domain, a decision process that allows them to be goal oriented and to emotions that make them more engaging with the human stakeholders. That technology will be provided and developed by the GAIPS research group, also from INESC-ID.

### 4.6 Pastramy

The goal of the Pastramy project is to develop, design, and implement a persistent and highly available Software Transactional Memory (STM) that may be used as a reliable platform for the development of enterprise applications.

The presence of enterprise applications in our society has grown to the point where they support most of the services that we depend upon. Therefore, their reliability and availability is of paramount importance, as is our ability to develop and to evolve such applications quickly.

To address these problems, the Software Engineering group of INESC-ID developed an innovative software architecture based on an STM that provides a simpler programming model for developing enterprise applications. This approach was applied with success in the development of a real-world large application, the FénixEDU project, and is recognized internationally as the first real-world production use of an STM, being in daily use since 2005.

As STMs are primarily a mechanism for synchronization in concurrent shared-memory computations, they typically have no means to support data persistence, nor distributed environments, two crucial requirements of an enterprise application. Thus, whereas the STM used in the FénixEDU project had support for these two aspects, that support was based on very simple approaches that limited the scalability and the availability of the system. The Pastramy project proposes to solve these problems by researching new persistence and distribution mechanisms that are specially tailored to an STM.

The Pastramy project started in 2008 as a three year project funded by the Portuguese Fundação para a Ciência e a Tecnologia, and is a joint effort of the Software Engineering and Distributed Systems groups of INESC-ID, the Group of Software Systems of University of Lisbon, and the Distributed Systems group of University of Minho.

During the first two years of the project (until the end of 2009), the project’s team developed several innovative results, producing in that period 21 publications and 9 Masters thesis. Moreover, another product of the Pastramy project was the development of an open-source framework, the Fénix Framework that implements our STM-based solution for the development of enterprise applications. This framework is being used by several Portuguese software companies that are working in the FénixEDU project, and has been adopted also by a French software company that is developing a large online game. The Fénix Framework is, thus, the vehicle for the dissemination of the project’s results to the industry of software development.

During the last year of the project, the project will concentrate in the integration of the several results developed until now into the Fénix Framework, as well as in the refinement of some of the solutions proposed so far. At the end, we expect not only to have advanced the state-of-the-art in the area of persistent and distributed STMs, but also to have a production-ready framework that may be used to develop reliable enterprise applications.
The SFERA project is a EU-funded through FP7 project started in 2009 that aims to increase scientific collaboration among leading European research institutions in solar concentrating systems.

This project congregates the main european research institutes in solar energy to create a virtual laboratory, offering the access to the industry to the best research and test infrastructures on concentrated solar power (CSP).

Solar energy research can be classified by the concentration ratio of solar energy. Research on low concentration (1 to 10 “suns”) has applications such as water desalination, disinfection or detoxification and solar heating and cooling. Research on moderate concentration (10 to 1500 “suns”) has the main applications on solar thermal electricity generation, materials processing or chemical production. High concentration (1500 to over 15000 “suns”) focus on domains such as energy storage cycles, production of environmentally benign chemical energy carriers (H2, ‘Syngas’, etc.), high-flux photochemistry, high-value-added materials synthesis and knowledge of behaviour of multifunctional materials under extreme conditions.

The SFERA project is coordinated by CIMEAT from Spain, and has the following partners: DLR-Germany, CNRS-France, PSI-Switzerland, ETHZ-Switzerland, WIS-Israel, ENEA-Italy, DIN-Germany, IRIT-France, AUNERGY-Spain, CEA-France and INESC-ID.

INESC-ID partecipates in the project through the researchers Prof. João Miranda Lemos and Prof. Bertinho Andrade Costa from the Control of Dynamic System Group – Embedded Electronic Systems Research Unit. The aim of the participation is to develop and to test advanced automatic control techniques to be applied on the control of solar furnaces at PROMES-CNRS-France and at PSA at south of Spain. This work plays an important role in the characterization and in the research of high temperature materials where temperature profiles must followed with precision. Additional information about the SFERA project can be obtained at the web address http://sfera.sollab.eu/.
5.1 Spoken Language Systems

Spoken Language Systems is a strongly interdisciplinary area, requiring expertise in very distinct topics, such as signal processing, machine learning, artificial intelligence or linguistics. The Spoken Language Systems lab was created in 2001, although the earlier work dates from the late eighties, to bring together researchers from all these areas with the mission of bridging the gap between natural spoken language and the underlying semantic information, with a special emphasis on Portuguese. This joint expertise allows research efforts in collaborative areas such as semantic multimedia processing, spoken/multimodal dialog systems, speech-to-speech translation, computer-aided language learning, and e-inclusion.

Semantic processing of multimedia documents entails a complex pipeline of blocks in which the group invests strong research efforts: audio segmentation, including partitioning into blocks from the same speaker, speech recognition, enrichment of the automatically produced transcription with punctuation and capitalization, dealing with the disfluencies that characterize spontaneous speech, segmentation into stories, topic classification, language identification, and summarization.

Dialog platforms also combine multiple core technologies such as speech recognition, speech synthesis, animated face processing, text processing, and dialog management. Our goal has been to develop a generic platform that can be accessed via microphone, telephone, GSM, PDA and web, thus requiring the creation of a domain-independent level to the dialog manager.

The next two research directions are much more recent in our group: speech-to-speech machine translation (S2SMT) and computer aided language learning (CALL). Both are two strongly multilingual, multidisciplinary areas with an enormous application potential. Setting Portuguese as the source or the target language for S2SMT and the target language for CALL is a very ambitious goal. The complexity of S2SMT systems is well justified by the integration of several modules: speech recognition, machine translation and speech synthesis.

In CALL, virtually all text processing technologies can be integrated, as well as several speech processing ones (phone recognition, pitch analysis and speech-to-text alignment).

The last application area which has been the objective of our continued efforts is e-inclusion, namely the development of alternative and augmentative communication tools for people with special needs.
5.1.1 Activities

2009 has been a year of important changes for this research line, the most relevant one being learning how to do innovative research work and simultaneously interact with our recently created spin-off company VoiceInteraction, which took a significant percentage of young researchers.

The group has consolidated its efforts in the previous areas of research and expanded to new ones, currently encompassing virtually all areas of spoken and written language processing, and achieving the level of performance that brings Portuguese up to par with most European languages, in terms of automatic processing.

The participation in the international evaluation campaigns on language and speaker recognition (LRE 2009 and SRE 2010, the latter in cooperation with researchers from UPC, Spain), were one of the landmarks of our internationalization efforts, together with our representation in the boards of international organizations (ISCA and IEEE), and visits from five top-level researchers.

Three of these visitors were from Carnegie Mellon University. The cooperation with this University had a great impact, namely in terms of speech-to-speech machine translation (S2SMT) and computer-assisted language learning (CALL), in the scope of the recently started projects PT-STAR and REAPPT. These projects encompass many core technologies, providing an umbrella for merging and enriching several ongoing PhD and MSc theses on machine translation, topic detection and tracking, speech recognition, speech synthesis, voice morphing, capitalization and punctuation, text simplification, summarization, question-answering, text recommendation, etc.

Relevant progress was also achieved in terms of our multilingual, and multi-accent efforts, covering English and Spanish on one hand (VIDIVIDEO project), and Brazilian and African varieties of Portuguese, on the other hand (POSTPORT project).

The cooperation with the GAIPS group has grown in scope, not being restricted to the current joint participation in the LIREC project, but also covering new proposals in areas such as education. The LIREC project provided the framework for new experiments with autonomous embodied dialogue systems (robots). Spoken and multimodal dialogue applications have also been developed for several domains, with a special emphasis on museum guides.

We have obtained interesting results in the VIDIVIDEO project in terms of fusion of audio and video modalities for audio segmentation, audio event detection, and speech recognition. Our gender classification module is now able to cover also children voices, thus allowing its application for child abuse detection on the web, in the international project.

Two application areas raise very interesting research challenges in new domains: assistance to elderly people, and therapy of patients recovering from aphasia. These are the topic of the two recently approved national projects ARIAS and VITHEA, respectively, which will start in 2010.

The efforts in promoting research among very young students are also worth mentioning. Four young researcher scholarships have been successfully completed in 2009, particularly in the areas of interaction with robots and music recommendation, using machine learning techniques.
5.1.2 Future Plans

As in the previous year, we intend to continue investing in moving into multimodal, multilingual systems, developing prototypes of spoken language systems for Portuguese speaking countries, and strengthening our technology transfer through our spin-off company.

The new project proposals have been made in areas that reflect our recent interests. The projects that will start in 2010 (ARIA and VITHEA) denote our keen interest in application areas related to aids for the elderly and sick. The topics of the pending proposals reflect our growing involvement in the translation and education areas, which are relatively more recent in the group, and our continuous strengthening of the areas of multimedia semantic processing and multimodal dialog systems.

It is worth mentioning our growing interest in areas such as recommendation systems, sentiment analysis, genre classification, and personalized adaptive multimodal interfaces that learn with usage. The study of language acquisition is also essential to our progress on education areas. It is also worth mentioning the continuous extension of our technologies to other media, with a special relevance to social networks.

Processing of spontaneous speech remains a great challenge, not only for Portuguese, but for all languages in general.

The LIREC project presents great challenges, namely in terms of embodied dialog systems, and the integration of the memory of the agent with the language models of the speech recognizer.

In the S2SMT area, our hardest challenges are automatic domain adaptation in machine translation, and strengthening the interface between this module and the recognition and synthesis modules.

In the CALL area, the research challenges we are facing are the automatic selection of distractors for close questions, and text simplification. Building a multimedia REAP PT prototype is also a current goal.

An interesting topic of research would be to explore common web-based platforms for both tutoring and therapy.
5.2 Information and Decision Support Systems

Our society is heavily dependent on information systems which support the whole structure of the economic and social framework. Therefore, the domain of the processes, techniques and technology for the analysis, design, development and integration of information systems represents actual and fundamental areas of knowledge, required to assure aligned, safe, reliable and trustworthy solutions.

On the other hand, the generalized use of devices and techniques for data acquisition, transport and storage raises endless new social problems and challenges, especially to privacy, requiring techniques for data security and controlled use of sophisticated analysis methods for the detection of fraud, abnormalities and tendencies.

INESC-ID gathers a body of competences in these areas that renders it a national and international reference. In particular, it incorporates researchers who are internationally recognized in the areas of:

• Information systems analysis, design, development, integration and management;
• Architectures and technology for the Internet;
• Methods for data analysis and data mining;
• Algorithms for efficient manipulation of large volumes of data;
• Security in distributed systems (e.g. for grids);
• Mechanisms for privacy preservation;
• Architectures and technology for mobility;
• Requirements and model-driven engineering;
• Ontology engineering and application;
• Algorithms and tools for constraint solving;
• Computational intelligence;
• Systems and algorithms for biological data analysis;
• Geographic information systems;
• Digital libraries;
• Information system’s interoperability and metadata;
• Digital preservation.

The integration of these competences leads INESC-ID to position itself clearly as a reference, on a national level, for providing specialized services to public and private entities requiring specialists with unquestionable reputation within their areas of work.

5.2.1 Activities

Researchers from the Information and Decision Support Systems line are amongst the most visible and well known in their respective areas. The line has achieved 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 Fénix Framework, a framework that simplifies the development of enterprise applications, used in the FenixEDU project developed and deployed at Instituto Superior Técnico and at several other universities and software companies in Portugal. (ii) Deployment of the first widely used molecular biology database (source: Galperin, NAR-2006) developed in Portugal, the Yeastract database, in cooperation with the bio-
logical sciences group of IST. (iii) The LOP/BOA platform to support the Portuguese community, where teachers, students, and parents can share and reuse their own learning objects through a common repository;

• Technology transfer activities with several industrial and public institutes such as IST, PT-INOV, Link Consulting, Ministry of Justice, EDP, SIQuant, BNP;

• National Digital Library, Mimesis Republic, among others;

• Several dissemination activities, including: (i) Participation in the organization of international competitions in computer science. (ii) The organization of International Conferences and Workshops (e.g., RECOMB’2010 or IWODE’2009);

• Researcher awards: (i) Arlindo Oliveira was awarded with the 2009 UTL/Santander Award for outstanding contributions to the field of Computer Science. (ii) Inês Lynce received the 2009 APPIA Award and the 2009 INESC-ID Young Researcher Award.

5.2.2 Future Plans

Overall, the research line has been very successful in pursuing training, research, development, and technology transfers activities. We would like to strengthen this activity by addressing new themes and increasing the number of cooperative activities among different research groups not only of the same line, but also of other lines in INESC-ID. In particular, we highlight the following activities aiming at opening new research themes and foster intra-research line and inter-research line collaborations:

• Give continuity to the work on transactional programming, persistence, replication, and distribution, and expand it to address the new topics of autonomic adaptation and Cloud Computing environments, a joint effort between the Distributed Systems group and the Software Engineering group.

• Work on adaptive optimistic data replication algorithms with different consistency criteria, with emphasis on mobile systems, an activity that will benefit from the collaboration among Distributed Systems, Soft Computing and Management, and Information Retrieval groups.

• Develop Satisfiability Modulo Theory (SMT) solvers, extending the expertise of the LA in the fields related to constraint solving and optimization to support the construction of better tools.

• Develop further work in the area of Systems Biology, with the objective of developing the area of dynamical modeling of metabolic networks.

• Continue the research in the area of MDE and RE, in particular applied in the design of social software and collaborative web applications. Research new approaches of IT projects management aligned with the software development processes, particularly agile processes.

• Work on information systems middleware, namely in information and processes interoperability and in information life-cycle management, with a special focus on document management, digital archives and digital libraries.
5.3 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. INESC-ID has a large number of researchers who develop their activity in a set of disciplines highly relevant to interactive virtual environments.

Specifically two groups, VIMMI and GAIPS feature core competences in:

- Devising multimodal interaction models within virtual environments by using interfaces based on synergistic recognition of multiple interaction modalities;
- Architectures for cooperative virtual environments by using algorithms for gesture recognition and artificial intelligence techniques for creating realistic synthetic characters;
- Affective computing applied to the generation of believable synthetic characters and human-computer interaction;
- Software architectures for virtual environments, with emphasis on image synthesis algorithms, intelligent agents programming and effectively using component based design and development patterns.

For the reasons mentioned above, the institution is regarded as an excellence centre in this area, with internationally recognized competences and the ability to provide a set of services of great relevance to our strategic focus areas.

5.3.1 Activities

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

- Consolidation: in 2009 more PhD researchers, new post-docs 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. Major new international projects such as TARGET started in 2009. Also half a dozen nationally funded projects allow us to face the future with optimism;
- Technology transfer: In 2009 we concluded several technology transfer projects such as EUROTOOLING and were active in two. We have been active in developing software for thematic musea in the Ciência Viva Network. Besides our involvement in Lousal, a new contract was started with WOW systems an SME in Madeira to transfer technology for another thematic museum;
- Enhanced collaboration with external companies, including Ydreams, InEvo and WOW (in the context of industry-drive technology transfer projects);
- Prizes: best INESC-ID Doctoral Student, awarded to Tiago Guerreiro (VIMMI) as well as two nominations for Best Researcher (Joaquim Jorge) and best young Researcher (Daniel Goncalves);
- Organization of scientific events: we have participated in the organization of key international events, including Eurographics, GRAPP, AAMAS, AIED, IEEE VR, IEEE SMI, CASA, SocialCom.
Furthermore, we have been active in over thirty international scientific program committees, which attest to the international visibility of all groups in this area;

• Results dissemination: in 2009, our research work done was published in relevant international scientific journals – 15 articles were published, a sizable increment over the previous year – international conferences (36 papers) and four books in the area, one PhD and 38 MSc students finished their theses, over six software prototypes were developed as well as several patent applications filed. Our publication rates exceed one international journal and three conference papers per PhD/year. The research area also published over twenty papers in national conferences. We have also been very active in promoting national conferences in HCI, Computer Graphics, Games and AI.

5.3.2 Future Plans

This research line is composed of two small-medium research groups (VIMMI and GAIPS) including a total of twelve PhDs. Yet, in spite of its dimension, this research line has shown that it is able to acquire significant funding (with over a dozen of European and National Research grants). The scientific output is of high quality appearing both in respect international journals and conferences as well as books. Additionally, there have been a number of collaborations with industrial partners. We have undertaken several projects with mould industry companies, notably CENTIMFE which came to a successful conclusion in 2009. Also, we have connections, among others, to BRISA (responsible for the management of most of the national highway network); Plux, a company that explores with us the use of custom-made sensors for accessibility and multimodal interaction; INEVO, a small consulting firm that commercially disseminates our results in sketch-based interaction and multimedia information retrieval and YDreams a wellknown company in the area of media and interactivity. The research groups in the area are very well known internationally which is attested by their involvement in the organization of several major conferences, including Eurographics, GRAPP, AAMAS, AIED, IEEE VR, IEEE SMI, CASA, SocialCom, to name a few.

We plan to increase research funding: there are many initiatives under way to launch new projects within IVE. Specifically, over a dozen new proposals have been submitted to FCT in the latest call. Several new proposals for AdI-sponsored industry-led technology transfer programs (QREN) as well as +Conhecimento (Madeira) are currently being written as well. Several new FP7 proposals are under preparation, for submission to the regular IST as well as FET programs.

We also plan to increase human resources: To achieve its aims, IVE will strive to strengthen collaborative research within the different R&D groups. In order to enhance such collaboration, the hiring of future post-doctoral researchers will consider their being directly instrumental to make such collaborations happen in the future. We aim at furthering individual professional careers by encouraging increased involvement in professional societies, such as Eurographics, ACM and IEEE.
5.4 Embedded Electronic Systems

The main goals of this research unit are: to perform advanced research in fundamental areas that support the design of Embedded Electronic Systems; to train human resources at M.Sc. and Ph.D. levels; to provide advanced courses and technology transfer to industry and to support the creation of start-up companies from our researchers and students.

The Embedded Electronic Systems research unit is organized in four scientific areas: Electronics and EDA, Signal Processing, Control and Computer Engineering.

Information and Communications Technologies (ICT) are a fundamental part of the new information and knowledge society. The electronics industry is one of the key driving forces supporting the sustained growth of ICT potential in Europe. Besides production manufacturing areas, there is a vast set of manufacturing opportunities connected to the development of new products and associated services.

These opportunities are highly dependent on research and human resources trained in highly specialized project methodologies and tools. Among these systems, special emphasis goes to embedded electronic systems, programmable, not only in terms of software, but also in hardware.

The implementation of embedded systems (digital, analogue, or mixed signal) as components or cores (embedded cores) of integrated systems (SoC, Systems on a Chip) adds value, not only to large companies, but also to SMEs operating at national level, as long as specialized human resources exist in sufficient number and quality. Currently, in the SIP (Semiconductor Intellectual Property) market, there are successful SMEs with a business based on the design of IP (Intellectual Property), which are marked under the form of either material or virtual cores (hard or soft cores). Even large companies are already relying on outsourcing of project activities in this area which require multi-disciplinary know-how ranging from algorithms and architectures to telecommunications, image processing, biomedical applications, modelling, monitoring, supervision and control of industrial processes.

INESC-ID has available highly qualified human resources in the supporting technologies of digital electronics, analogue electronics, microelectronics, radio frequency electronics, instrumentation and test, adaptive control, predictive control, fault tolerant control and reconfigurable systems, computer systems architecture, programmable electronic systems, scientific computing, electronic design automation, and sensor networking. Its researchers also master the design, manufacturing, test, and debug techniques, necessary for new product development and follow-up of this area of crucial industrial and social importance. The use of these technologies in the areas of telecommunications, energy systems, industrial automation, automotive, and aero-spatial applications and in the emerging areas of electro-medicine and bio-engineering will require the collaboration of institutions with deep knowledge of system conception and implementation with semiconductor technologies.
INESC-ID possesses internationally recognized key competences in this scientific area and has a strong drive to provide services in this area, as a result of its experience in European and national projects.

2.4.1 Activities

The most relevant activities and achievements for this research line are:

- Consolidation: new emerging areas, more PhD researchers and more PhD students working in EES, and enhanced international partnership and networking.
- Technology mastering: EES is now proprietary (with INESC-MN) of one of the most advanced technologies for magnetic biochip platforms and a strong know how in the area of implantable intracranial visual prosthesis.
- New markets, collaborative research: the automotive SE2A ENIAC Project helped EES to enter the automotive market, and to exploit the synergies among 4 EES groups, and with key EU players, such as NXP and VOLVO.
- PET technology: In 2009, image reconstruction results on clinical tests at Inst. Português de Oncologia (IPO) Porto, have been obtained. Improved prototype versions of Data Acquisition Electronics (DAE) system for PET Mammography have been developed.
- Partnership with Cadence Design Systems (EDA): The research affiliation exists since 1996, through its participation in the Cadence Research Laboratories network.
- Prizes: best INESC-ID researcher, for Leonel Sousa, SIPS Group.
- Honorable Mention: L. Sousa, Distinguished by UTL/Santander Totta for the number and impact of the publications in international scientific journals in the period 2004-2008.
- Awards:
  - MIXDES Outstanding Paper Award for "A Comparative Study on Transformer and Inductor Based LC Tanks for VCOs", by R. Duarte and J. Fernandes.
  - IEEE Int. Conf. on Mixed Design of Int. Circuits and Systems, June 2009.
- Organization of scientific events: Int. Workshop on Multi-Domain Simulation, co-located with ICCAD, USA, PATMOS’09, ISPDC’09, Lisboa, IOLTS’09, ETS’09, Seville, Euro-Par’09 and HeteroPar’09, and ARC’09, Karlsruhe (committee chair).
2.4.2 Future Plans

The EES line of action is strongly committed to internationalize activities, by connecting people and researchers with top labs and universities worldwide, working in the area of embedded electronic systems. Moreover, we work to attract more international good PhD students, which are now about 20% of the total.

Many initiatives are already in place to launch new projects. For instance, proposals for new FCT projects are numerous, and under evaluation (e.g., 7 proposals made by ALGOS, 3 by GCAM, 6 by QTHS and 3 by SIPS, several of them in partnership). One of these FCT proposals is under the auspices of the Portugal-CMU program. A project proposal for ESA, with Critical Software, is also under evaluation. A new proposal for a new AdI-sponsored program with PETSys, in the context of the PET project, is under evaluation. New FP7 proposals are under negotiation, namely involving European and Brazilian partners.

EES is pursuing the following strategic objectives:

- To perform advanced research, development, innovation, technology transfer and professional training on algorithms, methodologies and tools for the analysis, specification, design, verification, test and diagnosis of complex energy-efficient systems, using electronics, magnetic, mechanical and optical technologies, eventually interfacing with biological systems;
- To pursue, through research, leading-edge knowledge and skills in these areas;
- To push research economic value, either by actively seeking customers for our research in global industry, or by promoting start-up companies;
- To promote international networking among partners (people and institutions) with complementary core competences;
- To attract local and foreign talents for post-graduate studies in the scientific area;
- To develop scientific and engineering know-how that may be used to serve the community, by supporting public authorities in decision-making processes.

Hence, collaborative research will be enhanced among the different R&D groups of EES, with other research lines within INESC-ID (e.g., EES has been cooperating with the Knowledge Discovery and Bioinformatics (KDBIO) R&D group of the Information Systems line in the modeling and control of biological systems, namely in the scope of the FCT DYNAMO project), also with local partners (such as INESC-NM, INOV, INL (Int. Iberian Nanotechnology Lab), Bithium, CoreWorks, PETSys, SiliconGate, TecMic, IT, LIP, Critical Software, etc), and finally with global partners (world-class academia, industry, professional societies, standardization institutions).

Moreover, the multidisciplinary knowledge and technology mastering, which is one of the most valuable assets of INESC-ID EES research line, will be further applied by strengthening our activity in emerging scientific and economical areas, such as energy harvesting, green computing, security, and info-inclusion.

Networking and internationalization will also be pursued. Two groups in the EES line have been actively involved in the Reconfigurable Computing Cluster of the European Network of Excellence on High Performance and Embedded Architecture and Compilation (HPEC). This network also involved some of the most important companies in the area of EES, namely NXP, ARM, IBM and STMicroelectronics. EES is also participating in ComplexHPC - Open European Network for High Performance Computing on Complex Environments.

We also plan to continue strengthening the use of key physical technologies (nanoelectronics, biotechnology, magnetic, optical, and mechanical) to design and operate energy-efficient, highly dependable embedded systems for emerging markets.
2.5 Communication Networks and Mobility

The concept of mobility is increasingly more important in the development of products and services for the information society. In effect, it is fundamental for the information to be available from any location, at any time and using any type of terminal. Integration of different networks (mobile, fixed, local and wide area) is not only an emerging reality but a real need felt by the general public.

Fixed and mobile communication networks and the mobility they provide, have a strategic importance, given the fact that they represent an important infrastructure. Within this area we gather the competences existing in the area of network architectures (fixed and mobile) which enable the integration of classic technologies, traditionally separating networks into two different domains: telecommunications and computer systems. Given the recent developments, it is clearly crucial to integrate both domains, both at network infrastructure level and at the level of services and applications.

A special important area for the increasing mobility of citizens is related to ad-hoc networks, which, due to the fact that they do not possess high requisites in terms of planning and installation, may become extremely relevant in specific domains of society, namely military and civilian protection.

INESC-ID competences in this area cover different aspects which are key to the use of communications networks. Emphasis goes to the work developed at the levels of quality of service, network management, security and robustness of wireless networks, besides other types of challenges imposed by mobility. INESC-ID is particularly well positioned to develop research in this field, both in areas related to fixed network infrastructure, and the mobile and wireless network infrastructure. We capitalize not only the knowledge acquired in state-of-the-art scientific research, but also the experience gained in the practical implementation of the virtual campus concept, with the institute currently integrated, in a transparent way, with Instituto Superior Técnico’s fixed and mobile networks, sharing its resources and infrastructures.

Research and development work performed in the networking area, both in the context of national and international projects, and the context of post-graduation theses, led to the development of competences recognized through the awarding of various prizes and the participation, as representatives of national operators, in several standardization bodies, namely ITU and ETSI, and research coordination in international projects and bodies.
2.5.1 Activities

The Communication Networks and Mobility line achieved the following main activities within the projects in which their researchers have been involved:

• Development of a Wireless Sensor Network architecture for Homeland Security applications: a multi-tier hardware and software architecture was developed taking into account the requirements of a specific WSN application: intruder detection in target areas and buildings. QoS, reliability and energy-efficiency requirements were taken into account in protocol and middleware design;

• Development of a Wireless Sensor Network architecture for Seismic monitoring applications: a reliable and real-time seismic monitoring network has been developed, aiming to gather information on volcanic tremor. Routing and efficient clock synchronization algorithms are the main issues that were taken into account;

• Development and simulation of LEMMA, an energy-efficient MAC protocol for Wireless Sensor Networks developed at INESC-ID: The LEMMA protocol is mainly suitable for alarm-driven WSN applications, offering a good trade-off between latency and energy consumption. It also allows the existence of multiple sink nodes. Unlike previous protocols, the decentralized time-slot allocation mechanism of LEMMA selects non-interfering timeslots based on actual link quality instead of relying on traditional rules-of-thumb such as the 2-hop interference model;

• Simulation and evaluation of time-slot allocation techniques for TDMA-based WSN MAC protocols: Several time-slot allocation scheduling techniques were comparatively evaluated in tree WSN topologies;

• Departing from the most efficient centralized allocation policies, decentralized policies were developed that try to present a similar behavior;

• Simulation and evaluation of a routing algorithm for mobile ad-hoc networks inspired in biological models, which has been developed with the aim of reducing the routing overhead;

• Development and evaluation of a multicast protocol for Delay-Tolerant networks. The protocol developed builds a pseudo-multicast tree based on a heuristic that uses estimates of the probability of nodes meeting based on previous encounters between nodes and mobility information;

• Development of an algorithm for Dynamic Adaptation of Quality of Service in VoIP Communications. The algorithm developed allows an adaptive solution to provide quality of service in Voice over IP communications. The solution is based on three components that interact in order to achieve higher quality in voice communication. The first two consist in changing the codec and the transport protocol in real-time during a conversation; the third consists in using a Forward Error Correction mechanism to recover from loss packets;

• Architectures for IPTV and WebTV with dynamic Quality of Service (QoS) adaptation. The developed architecture allows scalable converged networks, like flexible multimedia delivery of personalized streams over a variety of channels and networking infrastructures, including mobile networks. A new QoS adaptation method allows dynamic updates of session parameters, in order to maximize the Quality of Experience and turning the solution suitable for live multimedia streaming, independently of the cast mode;

• Simulation and evaluation of an algorithm for dynamic resource management aimed to improve the Quality of Experience of multimedia users.
2.5.2 Future Plans

The research line will continue fully active research on the four lines of research already indicated:
- Architecture of Cyber-Physical Systems and Mobile Ad-Hoc Networks
- Communication Protocols for Delay-Tolerant Networks
- Quality of Service of Real-Time Services in IP Networks
- Real-time localization techniques.

The researchers are working in a number of research activities. One of them is the research on the architecture of secure wireless sensor and actuator networks and application of the developed concepts to Critical Infrastructure Protection (electricity distribution and water distribution). Another activity is the Vehicular Delay-Tolerant Network project running within the Network of Excellence Euro-NF. Here, research is done on the new DTN protocols for vehicular applications.

Work in Architectures for IPTV and WebTV with dynamic QoS adaptation will continue. Finally, work is proceeding in precise localization techniques based on EGNOS, Wi-Fi and UWB and the respective fusion techniques, having in view the localization of people and vehicles in airport installations (terminal and air side).
6.1 Research Projects

Title: Cadence - Cadence Research Laboratories
Financed by: Cadence Design Systems
Coordinator from INESC-ID: Luis Miguel Teixeira D Avila Pinto da Silveira
Short summary: This contract is an open-ended research contract, under which Cadence Design Systems is funding a functional research unit, the Lisbon Center of the Cadence Laboratories. The long term objectives are the development of advanced research on the area of CAD tools for VLSI.

Title: PET
Financed by: AdI - Agência de Inovação
Coordinator from INESC-ID: Isabel Maria Silva Nobre Parreira Cacho Teixeira
Short 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: Emonic - Electromagnetics on Integrated Circuits
Financed by: Philips Research Laboratories
Coordinator from INESC-ID: Luis Miguel Teixeira D Avila Pinto da Silveira
Short summary: Development of a prototype extraction/modeling tool for RF-ICs, which includes all essential EM effects and can be used to verify/simulate circuits (preferably using standard RF circuit simulation tools) at macro/block level against their RF performance.

Title: eCircus - Education through Characters with Emotional Intelligence and Role-playing Capabilities that Understand Social Interaction
Financed by: European Commission – FP6
Coordinator from INESC-ID: Ana Maria Severino de Almeida e Paiva
Short summary: eCIRCUS will investigate the efficiency of role-play, narrative engagement and empathy on cognitive and emotional learning processes in complex social situations. eCIRCUS will develop a new approach in the use of ICT to support social and emotional learning. This will be achieved through virtual role-play with synthetic characters that establish credible and empathic relations with the learners.

Title: SATIN - Sound And Tangible Interfaces for Novel product shaping
Financed by: European Commission – FP7
Coordinator from INESC-ID: Joaquim Armando Pires Jorge
Short summary: The basic idea of the SATIN Project is to develop, evaluate and exploit as a new commercial product a novel user interfaced based on the fusion of haptic, video and sound modalities. The result of the project is expected to be an important step towards the development where familiar and intuitive modalities will hide complex technologies (related to mathematical representations of surfaces), and will improve easy of use and accessibility of interactive shape modelling applications, by supporting diverse user communities which are not necessarily expert and knowledgeable about the mathematical aspects of surface and geometric modelling, such as designers, creative people, physicians.

Title: Vidi-Video - Interactive semantic video search with a large thesaurus of machine learned audio-visual concepts
Financed by: European Commission – FP7
Coordinator from INESC-ID: Isabel Maria Martins Trancoso
Short 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
Short 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  
Short 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  
Short 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 a PET (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  
Short 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  
Short 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: **LVDCC - Integrated DC-DC voltage regulator implemented in standard CMOS technology**  
Financed by: FCT  
Coordinator from INESC-ID: Marcelino Bicho dos Santos  
Short summary: 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).

Title: **ICONS - Intracortical Neuronal Stimulator**  
Financed by: FCT  
Coordinator from INESC-ID: Moises Simões Piedade  
Short 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  
**Short 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  
**Short summary:** 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  
**Short 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:** COBAYA - Closing the compilation gap between algorithms and coarse-grained reconfigurable array  
**Financed by:** FCT  
**Coordinator from INESC-ID:** João Cardoso  
**Short Summary:** The main objectives of this research project are: to define an intermediate representation format well suited to dynamic compilation to the reconfigurable processing unit (RPU); to research new compiler techniques and hardware schemes that can both aim efficient compilation of software programming languages to reconfigurable computing platforms, especially coarse-grained reconfigurable arrays connected to a microprocessor as an RPU; to research and evaluate novel array architectures for the RPU. Those architectures can be used to save energy or/and to increase performance. Their study will be done bearing in mind an easier way to map imperative programming languages to this kind of architectures.

**Title:** MRAM - Reconfigurable Hardware using Magnetic Tunneling Junction Memories  
**Financed by:** FCT  
**Coordinator from INESC-ID:** Horácio Cláudio Campos Neto  
**Short 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.
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  
Short 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.

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Title: **A-CSCW - Attentive CSCW**

Financed by: FCT  
Coordinator from INESC-ID: Manuel João Caneira Monteiro da Fonseca  
Short 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.

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Title: **UWB Receiver- Baseband processing using reconfigurable hardware**

Financed by: FCT  
Coordinator: Maria Helena da Costa Matos Sarmento  
Short 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.

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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 Cláudio Campos Neto  
Short 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.

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Title: **CLAW - Aprendizagem e Anotação Cíclicas da Web**

Financed by: FCT  
Coordinator from INESC-ID: Helena Sofia Andrade Nunes Pereira Pinto  
Short Summary: Berners-Lee and colleagues proposed the evolution of the current Web into the
Semantic Web. The crucial feature is the association of semantics to the information in the web, which will allow it to be treated as knowledge and dealt with in new and more powerful ways. Ontologies are a major piece of the puzzle: they are pieces of knowledge that define the meaning of concepts in a domain in terms of their relationships with other concepts and therefore they provide semantics.

**Title:** AMADEUS - Aspects and Compiler Optimizations for Matlab System Development  
**Financed by:** FCT  
**Coordinator from INESC-ID:** João Manuel Paiva Cardoso  
**Short Summary:** MATLAB is regarded as a high productivity language contributing to innovative achievements in different areas. However, in the presence of models requiring long simulations, the developer has to code specific portions of the models in less abstract languages (e.g., C). This hampers the high productivity promise, decreases progress, and is also visible when MATLAB specifications are targeted to embedded systems, increasing product development cycles. This project intends to address aspect-oriented extensions to MATLAB in order to help system modeling and exploration of certain features conceiving system implementation. Aspect mining will be used in order to acquire some aspects relevance from third party MATLAB code. We hope to identify aspects that will help optimization phases in order to generate performance and memory efficient implementation code. Code optimizations will be researched in order to inference types, array dimensions and sizes, and memory minimization. A prototype weaver will be developed in order to evaluate the ideas with complex MATLAB code.

**Title:** PCL Noise - Noise Reduction in Power Line Communications Channels  
**Financed by:** FCT  
**Coordinator from INESC-ID:** Paulo Alexandre Crisóstomo Lopes  
**Short 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  
**Short 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:** European Commission – FP7  
**Coordinator from INESC-ID:** José Luis Brinquete Borbinha  
**Short 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 sup-
port 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 pier-to-pier methods for supporting DP within its core infrastructure. To achieve 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
Short 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
Short Summary: 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 diseases.

Title: **ARN - Algorithms for the identification of genetic Regulatory Networks**
Financed by: FCT
Coordinator from INESC-ID: Ana Teresa Correia de Freitas
Short 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.yeastact.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
Short 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  
Short 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 Límede de Oliveira  
Short 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  
Short 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 addition to building a new protocol framework, the project aims at:
- Refactoring the existing group communication protocol suite to work on the new kernel.
- To design a new group communication protocol suite able to operate on hybrid networks, consisting of fixed (wired) nodes and mobile (wireless) nodes.

Title: FOLKPEERS - Folksonomies in P2P systems  
Financed by: FCT  
Coordinator from INESC-ID: Helena Sofia Andrade Nunes Pereira Pinto  
Short 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: 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  
Short 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: GINGER - A Flexible Peer-to-Peer Grid Infrastructure  
Financed by: FCT  
Coordinator from INESC-ID: Luis Manuel Antunes Veiga  
Short 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 environ-
ment 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  
**Short 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. The contributions will be in the area of consistency of replicated data. In particular: i) a consistency protocol that decouples consistency information from data propagation, thus minimizing network bandwidth, ii) voting-based update protocols allowing rapid commitment in the presence of failures or partitions, and iii) content-based indexing for structuring the data allowing the use of similarities between data, thus reducing memory usage.

**Title:** PASTRAMY - Persistent and highly Available Software TRansactional MemorY  
**Financed by:** FCT  
**Coordinator from INESC-ID:** João Manuel Pinheiro Cachopo  
**Short 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 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  
**Short 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  
**Short 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  
**Short summary:** This project aims at developing efficient parallel algorithms to make it possible to in-
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 Commission – FP7  
Coordinator from INESC-ID: Maria Inês Camarate de Campos Lynce de Faria  
Short 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. Yet, this infrastructure undergoes a fast-paced and distributed evolution that is too often maintained in ad-hoc ways using tools and processes that have clearly attained their limits today. There is a need for new and innovative technology, and this is what Mancoosi will provide. We explicitly target the difficult problems that arise when one wants to efficiently and safely upgrade a set of software components in complex software infrastructures, like those found in open source software distributions, which are among the most complex software systems known, made of tens of thousands of components that evolve over time without centralized design: this is a challenging endeavor. We have chosen the Free and Open Source infrastructure as our main target, as it provides today a real-world example of what tomorrow’s complex, quickly changing software systems will look like: the applicability of these models and algorithms goes far beyond Free and Open Source software, and technologies developed in Mancoosi will pave the way to the maintainability of the software systems of the future, especially for systems of systems, even when they are not Free or Open Source.

Title: EURO-NF - Anticipating the Network of the Future - From Theory to Design  
Financed by: IST - FP7  
Coordinator from INESC-ID: Augusto Julio Domingues Casaca  
Short 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 wide range 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 Commission - 7th Framework Programme (Other) - Brussels, Belgium  
Coordinator from INESC-ID: Ana Maria Severino de Almeida e Paiva  
Short 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 Commission – FP7
Coordinator from INESC-ID: João António Madeiras Pereira
Short 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 Commission – FP7
Coordinator from INESC-ID: Augusto Julio Domingues Casaca
Short 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: **PET-Iib - Development of PET Technologies**
Financed by: AdI
Coordinator from INESC-ID: Manuel de Medeiros Silva
Short summary: Development of advanced versions of PET systems for medical imaging. The overall project will extend the capabilities of the PET scanner for mammography that has been developed by the PET Consortium since 2003. The Group of Analog and Mixed-Signal Circuits at INESC-ID will develop an upgraded version of the front-end ASIC.

Title: **MIA-VITTA - Mitigate and assess risk from volcanic impact on terrain and human activities**
Financed by: European Commission – FP7
Coordinator from INESC-ID: Teresa Maria Sá Ferreira Vazão Vasques
Short 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
Short 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 simulating and predicting 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: **CleanDrive**
Financed by: Câmara Municipal de Vila Franca de Xira
Coordinator from INESC-ID: João António Madeiras Pereira
Short summary: Adapting, maintaining and monitoring an Eco-driving simulator.

Title: **Sideworks-Biocores - Hardware accelerator for biological sequences alignment**
Financed by: QREN
Coordinator from INESC-ID: Paula Ferreira Godinho Flores
Short summary: The main objective 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:** EC/FCT
**Coordinator from INESC-ID:** Leonel Augusto Pires Seabra de Sousa
**Short 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. Some examples 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 Aritimética Modular
**Financed by:** FCT
**Coordinator from INESC-ID:** Leonel Augusto Pires Seabra de Sousa
**Short 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
**Short 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 subtracters 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 incorporate 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 these 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
**Short summary:** The main objective 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
**Short 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) magnetorestive (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 Commission – FP7
Coordinator from INESC-ID: João António Madeiras Pereira
Short summary: TARGET aims to revolutionize competence development for project and innovation managers by providing technological support for rapidly developing and improving their competences. 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: VRFS - Development of Video Recording Software Component in Feedback System for Sports Training
Financed by: Japan Institute of Sports Sciences
Coordinator from INESC-ID: Shinichi Yamagiwa
Short summary: Research and Development for a video recording software component in a feedback system utilized in training field for sports athletes.

Title: RSWV - Recording Software from DV Camera Input on Windows Vista
Financed by: MIA Corporation
Coordinator from INESC-ID: Shinichi Yamagiwa
Short summary: Research and investigation for porting the developed versions of video recording software system utilized as sports training to Windows Vista environment revising a part of the software component to extend functionalities that utilize new functions in Windows Vista.

Title: Sideworks Arithmetic - Scientific Computing and BaseBand Processing on the SideWorks Reconfigurable platform
Financed by: QREN
Coordinator from INESC-ID: Horácio Cláudio Campos Neto
Short 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 an 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
Short 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 REAPPT 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 the 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 Commission – FP7  
**Coordinator from INESC-ID:** José Luís Brinquete Borbinha  
**Short 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 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:** PTSpeech Translation Advanced Research to and from Portuguese  
**Financed by:** FCT/CMU  
**Coordinator from INESC-ID:** Maria Luísa Torres Ribeiro Marques da Silva Coheur  
**Short summary:** The main goal of PT-STAR (Speech Translation Advanced Research to and from Portuguese) is to improve speech translation systems for Portuguese by strengthening this integration. 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.

**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  
**Short 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  
**Short 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 du-
rability 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 testbed 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
Short 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.
6.2 Publications

6.2.1 Books


José Alves Marques and Paulo Ferreira and Carlos Nuno da Cruz Ribeiro and Luis Veiga and Rodrigo Rodrigues, Sistemas Operativos, Mar. 2009, FCA, LIDEL.


6.2.2 International Journal Articles


Paolo Romano and Bruno Ciciani and Andrea Santoro and Francesco Quaglia, Accuracy vs Efficiency of Hyper-exponential Approximations of the Response Time Distribution of MMPP/M/1 queues, International Journal of Parallel, Emergent and Distributed Systems, Taylor and Francis.


Jânio Monteiro and Carlos Calafate and Mário Serafim Nunes, Robust Multipoint and Multi-layered Transmission of H.264/SVC with Raptor Codes, Telecommunication Systems, SPRINGER.


Marielba Zacarias and H. Sofia Pinto and Rodrigo Magalhães and José Tribolet, *A “context aware” and agent-centric perspective for the alignment between individuals and organizations*, Information Systems, Apr. 2009, Elsevier Science Publisher.


6.2.3 Serials


### 6.2.4 Edited Books


### 6.2.5 Book Chapters


Gabriel Falcão and Vitor Silva and José Marinho and Leonal Sousa, *WIMAX, New Developments*, Chapter LDPC Decoders for the WiMAX (IEEE 802.16e) based on Multicore Architectures, May 2009, IN-TECH.


### 6.2.6 National Journal Articles

6.2.7 International Conferences


Hugo Santos and Rui Cruz and Mário Serafim Nunes, *Rate Adaptation Techniques for WebTV*, First International Conference on User Centric Media (UCMedia 2009), Dec. 2009, ICST.


Cristiano Lazzari and Paulo Flores and J. Monteiro, Power and Delay Comparison of Binary and Quaternary Arithmetic Circuits, IEEE International Conference on Signals, Circuits and Systems (SCS’09), Nov. 2009.


A. P. Francisco and Joana P. Gonçalves and Sara C. Madeira and Arlindo L. Oliveira, Using personalized ranking to unravel relevant regulations in the Saccharomyces cerevisiae regulatory network (Extended Abstract), Jornadas de Bioinformatica, Nov. 2009.


Helena Moniz and Isabel Trancoso and Ana Silva, Classification of disfluent phenomena as fluent communicative devices in specific prosodic contexts, Interspeech 2009, Sep. 2009, pp. 1719-1722, ISCA.


Plínio Barbosa and Maria do Céu Ribeiro and Isabel Trancoso, Cross-variety Rhythm Typology in Portuguese, Interspeech 2009, Sep. 2009, ISCA.


Miguel Bugalho and José Portelo and Isabel Trancoso and Thomas Pellegrini and Alberto Abad, Detecting Audio Events for Semantic Video Search, Interspeech 2009, Sep. 2009, ISCA.


Ana Sofia Graça and Inês Lynce and João Marques Silva and Arlindo L. Oliveira, Haplotype Inference Combining Pedigrees and Unrelated Individuals, CP Workshop on Constraint Based Methods for Bioinformatics (WCB), Sep. 2009.


Gabriel Pestana and Augusto Casaca and Nuno Duarte and Tim Denis, Location Based Services to improve Airport Safety and Security, 4th International Workshop on Critical Information Infrastructures Security (Poster Session), Sep. 2009, pp. 233.


David Pereira and Inês Lynce and Steve Prestwich, On Improving Local Search for Unsatisfiability, CP Workshop on Local Search Techniques in Constraint Satisfaction (LSCS), Sep. 2009.


Luis Marujo and José Lopes and Nuno J. Mamede and Isabel Trancoso and Juan Pino and Maxine Eskenazi and Jorge Baptista and Céu Viana, Porting REAP to European Portuguese, ISCA International Workshop on Speech and Language Technology in Education (SLaTE 2009), Sep. 2009, ISCA.


José Rocha and Nuno Dias and Ângelo Monteiro and Alexandre Neves and Gabriel Santos and Marcelino Santos and João Paulo Cacho Teixeira, Controllability and Observability in Mixed Signal Cores, IEEE International On-Line Test Symposium (IOLTS), Jul. 2009, pp. 198-200, IEEE.


Svetislav Momcilovic and Leonel Sousa, Development and Evaluation of Scalable Video Motion Estimators on GPU, Workshop on Signal Processing Systems (SiPS), Jul. 2009, IEEE.


Augusto Casaca and Paulo Pereira and José Santiago, Multicast over the Delay Tolerant Networks Prophet Protocol, Joint EuroNF and ITG workshop on “Visions of Future Generation Networks” (EuroView2009), Jul. 2009.


Rui Duarte and Jorge Fernandes, A Comparative Study on Transformer and Inductor Based LC Tanks for VCOs, IEEE Int. Conf. on Mixed Design of Integrated Circuits and Systems, (MIXDES'09), Jun. 2009.


Isabel Trancoso and Thomas Pellegrini and José Portelo and Hugo Meinedo and Miguel Bugalho and Alberto Abad and João Neto, Audio contributions to semantic video search, 2009 IEEE International Conference on Multimedia and Expo (ICME 2009), Jun. 2009, IEEE.


João Barreto and João Coelho Garcia and Luis Veiga and Paulo Ferreira, Data-aware connectivity in mobile replicated systems, ACM International Workshop on Data Engineering for Wireless and Mobile Access (Mobide 2009), Jun. 2009, ACM.


José Borbinha and José Barateiro and Gonçalo Antunes and Filipe Bastos de Freitas, **Challenges on preserving scientific data with data grids**, DaGreS 2009 - 1st ACM Workshop on Data Grids for E-science, May 2009, ACM.


Nuno Dias and Ângelo Monteiro and Gabriel Santos and Marcelino Bicho dos Santos, **Design-for-Debug of Mixed Signal Cores**, IEEE European Test Symposium, May 2009.

Stefan Poslad and Aristodemos Pnevmatikakis and Mário Serafim Nunes, **Directing Your Own Live and Interactive Sports Channel**, 10th International Workshop on Image Analysis for Multimedia Interactive Services (WIAMIS 2009), May 2009.


Ana Paiva and João Dias and Ruth Aylett and Mei Yee Lim, **Intelligent NPCs for educational role play game**, Agents for Games and simulation Workshop - Autonomous Agents and Multiagent Systems - AAMAS 2009, May 2009.


Josep Argelich and Alba Cabiscol and Inês Lynce and Felip Manyà, **New Encodings from MAX-CSP into Partial MAX-SAT**, IEEE International Symposia on Multiple-Valued Logic (ISMVL), May 2009, IEEE.

Shinichi Yamagiwa and Koichi Wada, **Performance Study of Interference on Sharing GPU and CPU Resources with Multiple Applications**, the 11th Workshop on Advances on Parallel and Distributed Processing Symposium (APDCM09)/IPDPS09, May 2009, IEEE CS.


Luis Veiga and João Silva and João Coelho Garcia, COGITARE: A Cloud Infrastructure for Grid and Overlay Network Research (Work in Progress Session + Poster), ACM EuroSys 2009, Apr. 2009, ACM.


José Portelo and Miguel Bugalho and Isabel Trancoso and João Neto and Alberto Abad and António Serralheiro, Non-speech audio event detection, ICASSP 2009 - Int. Conf. on Acoustics, Speech, and Signal Processing, Apr. 2009, IEEE.


Gabriel Falcão and Vitor Silva and Leonel Sousa, How GPUs can outperform ASICs for fast LDPC decoding, 23rd ACM International Conference on Supercomputing (ICS 09), Mar. 2009, ACM.


Ricardo Aguiar and João Madeiras Pereira and José Pereira, *GADEVI-Game Development Integrating Tracking and Visualization Devices into Virtools*, Feb. 2009, pp. 313-321, INSTICC.


6.2.8 National Conferences


Stoyan Garbatov and João Cachopo and João Carlos Serrenho Dias Pereira, Data Access Pattern Analysis based on Bayesian Updating, Primeiro Simpósio de Informática (Inforum), Sep. 2009.


Ivo Anjo and João Cachopo, JaSPEx: Speculative Parallel Execution of Java Applications, Primeiro Simpósio de Informática (Inforum), Sep. 2009.


Joel Silva and Rui Caldeira and Luís Seabra and Tiago Dias and Filipe Martins and Luis Guirrana and José Silva and Agostinho Gomes and José Augusto and Amélia Maio, Um Controlador Digital de uma Experiência de Medicação do Tempo de Vida de Muçus Cósmicos, V Jornadas sobre Sistemas Reconfiguráveis - REC2009, Feb. 2009.


6.2.9 Technical Reports


6.2.10 National Patents


6.2.11 Edited Proceedings


6.2.12 Special Issues of Journals (editor)


6.2.13 Dissertations

PhD Theses


MSc Theses


Bruno Jesus Rodrigues Fernandes, Projecto, Validação e Concretização do Módulo MICTP do...


André Negrão, VFC large-scale: consistência de dados em redes de grande escala, MSc Thesis, Instituto Superior Técnico, Nov. 2009.


João Pedro Carlos Gomes da Silva, **Qa+ml@wikipedia&google**, MSc Thesis, Instituto Superior Técnico, Nov. 2009.


6.3 Seminars

11-Dec-2009
Fast Kullback-Leibler Optimization Algorithm: Software Library Implementation
Eugéne Suter, Universidade de Évora

10-Dec-2009
A Physiological model for human patients subject to anesthesia
Tiago Jorge, INESC-ID

09-Dec-2009
O Arquivo da Web Portuguesa
Daniel Coelho Gomes, FCCN

09-Dec-2009
H.264 video encoding tools and the development of efficient hardware architectures
Vagner Rosa, Universidade Federal do Rio Grande do Sul

04-Dec-2009
Management and analysis of heterogeneous biological data: how the web can help
Ana T. Freitas, INESC-ID

26-Nov-2009
A View On Adaptive and Dependable Distributed Systems
Raimundo Macêdo, Universidade Federal da Bahia (UFBA)

23-Nov-2009
BICS-Based March Test for Resistive-Open Defects Detection in SRAM

20-Nov-2009
Optimization and Control for Metabolic Networks
Alexandre Domingues, Inesc-ID

17-Nov-2009
A Residue Approach to the Finite Field Arithmetics
Jean-Claude Bajard, Université Pierre et Marie Curie

11-Nov-2009
Security: Enabling the Reliability of IP Telephony
Dr. François Cosquer CTO, Security and Technology Strategy, Alcatel-Lucent Enterprise Business

04-Nov-2009
High-Voltage-Enabled Analog/RF Circuit Techniques for Nanoscale CMOS
Pui-In (Elvis) Mak, University of Macao - Macao, China

03-Nov-2009
Power and Delay Comparison of Binary and Quaternary Arithmetic Circuits
Cristiano Lazzari, Inesc-ID

23-Oct-2009
Hacking life: how to build a new life form in your computer
Arlindo L. Oliveira, INESC-ID

15-Oct-2009
Solving Implicit Problems and Using Cyclic Graphs for Graphics
Brian Wyvill, University of Victoria

13-Oct-2009
SMART-System - Metadata-based Sports Video Database, Its Development and Experience
Chikara Miyaji, Japan Institute of Sports Sciences

09-Oct-2009
Preparing a cyanobacterial chassis for H2 production: a synthetic biology approach
Catarina Pacheco, Institute for Molecular and Cell Biology (IBMC)

06-Oct-2009
Power Macro-Modelling using an Iterative LS-SVM Method
J. Monteiro, INESC-ID

29-Sep-2009
Observability-based Coverage-directed Path Search using Pseudo-Boolean Optimization
J. Monteiro, INESC-ID Lisboa
29-Sep-2009
Neurodynamic Optimization with Its Application for Model Predictive Control
Jun Wang, Chinese University of Hong-Kong

25-Sep-2009
Apt-pbo: Solving the Software Dependency Problem using Pseudo-Boolean Optimization
Paulo Trezentos, ISCTE

10-Sep-2009
Next-generation sequencing (for dummies)
Paulo Fonseca, INESC-ID

28-Jul-2009
Dynamic Programming Optimization of Multi-rate Multicast Video-Streaming Services
Nestor Michael C. Tiglao, INESC-ID

27-Jul-2009
In Search of Shapes
Karthik Ramani, Purdue University, USA

24-Jul-2009
Single nucleotide polymorphisms characterization in a Portuguese Caucasian breast cancer and control population
Bruno Costa Gomes, Departamento de Genética / FCM / UNL

21-Jul-2009
ARM5 - Automatic Residue-Minimization based Sampling for Multi-Point Modeling Techniques
Jorge F. Villena, Inesc-ID

20-Jul-2009
Toward Energy-efficient Computing
David Brown, Sun Microsystems Inc.

17-Jul-2009
Taking the Turn — Or Not: Turn Management in Spoken Dialogue Systems
Julia Hirschberg, Columbia University

17-Jul-2009
CSI: are Mendel's data too good to be true?
Ana Pires, Instituto Superior Técnico

30-Jun-2009
Data Parallel Acceleration of Decision Support Queries Using Cell/BE and GPUs

29-Jun-2009
Transaction Activation Scheduling Support for Transactional Memory
Gilles Muller, INRIA

25-Jun-2009
Language Technologies and CALL
Maxine Eskenazi, Carnegie-Mellon

22-Jun-2009
Test of NoCs and NoC-based Systems-on-chip
Érika Fernandes Cota, Universidade Federal do Rio Grande do Sul

19-Jun-2009
What can we do with a multitude of genome sequences?
Martin Tompa, University of Washington

05-Jun-2009
Speech Synthesis: past, present and future and how it mirrors speech processing development in general
Alan W Black, Carnegie-Mellon

02-Jun-2009
Introdução ao C++ numa hora ... para quem já sabe C
Luís Guerra e Silva, IST DEI

25-May-2009
Information Extraction: Knowledge Discovery from Text
Ralph Grishman, New York University

21-May-2009
Modeling and control of microflow sensors based on temperature measurement
Milan Adamek, Universidade Tomas Bata - Zlin - Seminário

15-May-2009
DFY/DFM - design for yield and manufacturability
Prof. Hans Zapf, University of Applied Sciences
13-May-2009
Semantic web applications to variable discovery in the life sciences: a cloudy future?
Jonas S. Almeida, University of Texas
M.D. Anderson Cancer Center

08-May-2009
Model checking in systems biology: an introduction
Pedro T. Monteiro, INRIA Rhône-Alpes

30-Apr-2009
Minimal Perfect Hashing: A Competitive Method for Indexing Internal Memory
Guilherme Menezes, Universidade Federal de Minas Gerais

24-Apr-2009
DNA Sequence Alignment - A brief overview on computational algorithms and architectures
Nuno Sebastião, Inesc-ID

23-Apr-2009
Scoring functions for learning Bayesian networks
Alexandra M. Carvalho, INESC-ID

17-Apr-2009
Social Computing in Education
Irwin King, Chinese University of Hong-Kong

16-Apr-2009
O rio da minha aldeia: from Recife to Lyon and Lisbon
Paulo G. S. da Fonseca, INESC-ID Lisboa

15-Apr-2009
Probabilistic retrieval and visualization of biologically relevant microarray experiments
José Caldas, Helsinki University of Technology

08-Apr-2009
On the Efficient Reduction of Complete EM based Parametric Models
Jorge F. Villena, Inesc-ID

07-Apr-2009
Beyond Edman Degradation: Algorithmic De novo Protein Sequencing of Monoclonal Antibodies
Nuno Bandeira, University of California, San Diego

13-Mar-2009
Elementos para um estudo comparativo da tipologia rítmica do Português
Plínio A. Barbosa, Instituto de Estudos da Linguagem/Unicamp

06-Mar-2009
Parameter Tuning in SVM-Based Power Macro-Modeling
António Gusmão, Inesc-ID

20-Feb-2009
Programming Distributed Systems: an Introduction to MPI
J. Monteiro, INESC-ID Lisboa

29-Jan-2009
Estimating Local Ancestry in Admixed Populations
Eran Halperin, International Computer Science Institute (ICSI)

23-Jan-2009
Programming Multicores
J. Monteiro, INESC-ID Lisboa

21-Jan-2009
Challenges in the Application of Quantum Mechanics to Biomolecular Problems
Ricardo Mata, Faculdade de Ciências da Universidade de Lisboa

16-Jan-2009
Modelling HIV-1 Evolution under Drug Selective Pressure
Anne-Mieke Vandamme, Katholieke Universiteit Leuven