



**LASIGE**

**LABORATÓRIO DE SISTEMAS INFORMÁTICOS DE  
GRANDE-ESCALA**

**(LARGE-SCALE INFORMATICS SYSTEMS LABORATORY)**

**ACTIVITY REPORT  
2003-2006**

**July 2007**

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## **1. START PAGE**

### **1.1. *Name of the Research Unit***

LABORATÓRIO DE SISTEMAS INFORMÁTICOS DE GRANDE-ESCALA

### **1.2. *Main Scientific Domain***

Electrical and Computer Engineering

### **1.3. *Other subdomains***

- Distributed Systems;
- Human Computer Interaction and Multimedia;
- Information Management;
- Security and Dependability.

## **2. Host Institutions**

### **2.1 *Leading Host Institution***

Faculdade de Ciências da Universidade de Lisboa

### **2.2 *Other Institutions***

N/A

## **3 Objectives and Achievements**

### **3.1 *Unit Description***

LASIGE, the LARGE-SCALE INFORMATICS SYSTEMS LABORATORY, covers a number of research lines in several sub-areas of Informatics (Informatics is a synonym for Computer Science and Engineering) including distributed systems, human computer interaction and multimedia, information management, security and dependability.

The permanent or long-term research staff, members of FCUL faculty, are hosted in offices of the FCUL (Faculty of Sciences) Department of Informatics (DI). Besides, LASIGE maintains its own physical space also inside the DI premises. These are used to host post-docs or invited scientists, research associates, graduate and under-graduate students, and laboratory activities.

LASIGE is hosted in the C6 building and operates in three large open-space office rooms, plus an open-space laboratory. The offices can host a total of 36 researchers in individualized office slots, one of the rooms also hosts the unit's administrative staff. LASIGE has its own workstations, servers and printers to provide working facilities for researchers. LASIGE possesses currently an extensive set of laboratorial machines, amongst which: a 25+ computer farm for distributed systems experiments; a restricted and isolated network for security experiments; a cluster of high-performance servers for information integration experiments; an audio-video studio for HCI experiments. LASIGE is also currently a member of several worldwide computational experiments, such as PlanetLab, EmuLab, or Leurré. Internet connectivity is assured through the Informatics Department - FCUL - FCCN networking infrastructures.

**IMPORTANT NOTE:** Data about LASIGE described in this document are further developed in a full version of the report, available in:  
<http://lasige.di.fc.ul.pt/priv/RelAv07L.pdf>.

### **3.2 General objectives**

LASIGE currently has pursued a number of research lines that embody its over-arching strategic goals: *addressing top state-of-the art themes and promoting interdisciplinarity.*

As of the end of 2003, LASIGE's strategy was centered on four research groups or teams:

- Dialnp (<http://dialnp.lasige.di.fc.ul.pt/>);
- HCIM (<http://hcim.lasige.di.fc.ul.pt/>);
- Navigators (<http://navigators.lasige.di.fc.ul.pt/>);
- XLDB (<http://xldb.lasige.di.fc.ul.pt/>).

During the following years, the strategy became research-line centered, entailing the progressively clearer definition of a few key research lines as mid/long-term research objectives, namely:

- Biomedical informatics;
- Communication and coordination support for dynamic systems;
- Fault and intrusion tolerance in open distributed systems;
- Human computer interaction and multimedia;
- Information management;
- Middleware support for adaptive distributed systems;
- Timeliness and adaptation in dependable systems.

On the other hand, current research operation (projects, thematic or coordination actions, research networks) kept being steered by the research teams. This duality has drastically contributed to improving the dynamics of the laboratory and was a key factor of success for the sustained growth of LASIGE: simultaneous increase in dimension and improvement of consolidation of its operation. LASIGE has currently global and homogeneous procedures which researchers collectively decide and follow. Strategic research-related activities are collectively promoted by the Director and a body composed of the full-time PhD researchers of the Lab (including faculty), the Scientific Council. The former include: supporting the launch of new lines; seed support for innovative directions or exploratory actions such as preparation of new projects; support to young researchers; research logistics (space, equipment); event agendas.

Research teams *use* the support provided by the laboratory under a cooperative/competitive model, and *contribute* to improve its operation qualitatively and quantitatively, by developing new research ideas and ventures, such as promoting new research lines and setting-up externally funded research and development projects, national or international. These projects can take place with elements of more than one team but tend, for efficiency, to be coordinated by one of the teams. Research lines are normally developed by one team but can, when interdisciplinary, be steered by more than one team.

In short, teams are champions of one or more of LASIGE's research lines, and promoters of goal-oriented activities, such as R&D projects. Research teams can team-up in these endeavours. For these activities they both share and compete for resources managed collectively by the Scientific Council.

### **3.3 Main achievements in the 2003-2006 period**

LASIGE achieved a sustained level of high quality research activity, and a critical mass of mobilisation of research assets, measured by several indicators:

- Researchers from LASIGE received several national and international prizes in this period;
- LASIGE achieved a good record of successful participation and performance in research projects, and a good level of internationalization. In this interval, LASIGE has been involved in 25 projects, of which 10 were international;
- There has been an increasing level of publications, where over 200 international journal, conference and workshop publications were made in this interval;
- There was a sustained growth in number of PhD and MSc students, where 28 MSc and 9 PhD theses were completed in this period, with 19 MSc and 17 PhD theses ongoing;
- Researchers of LASIGE are regularly cited by peers, where the figures for citations (self-citations eliminated) are, for example (data specifically for 03-06 not available) over 3000 accumulated citations for the total of current PhD researchers;
- The top 5 most cited researchers have more than 300 citations and an H-index greater or equal to 10. The top 12 have more than 100, and an H-index greater or equal to 5. (For method of citation capture and meaning of Hirsch Index, see Section 6.4.1).

Details on some of these indicators follow.

#### **Prizes**

Researchers from LASIGE received several prizes in this period:

#### **2005**

LASIGE was in the final eight of the Descartes European Science Award 2004, through a team led by Prof. Paulo Verissimo with the work "Malicious and Accidental Fault Tolerance for Internet Applications MAFTIA";

IBM Scientific Prize 2004, won by Prof. Nuno Neves with a work on the area of Intrusion Tolerant Systems "Intrusion Tolerance in Informatics Systems", awarded in 2005 by IBM Portugal to scientists less than 36 years;

Innovation Young Engineer Prize 2004, awarded in 2005 by the Ordem dos Engenheiros Portugueses (Portuguese Engineers Guild) to Eng. Francisco Couto, with a work about Automatic Identification of Evidence Text in Scientific Literature that Substantiate Protein Annotations.

## **2006**

The paper by Daniel Gomes, Sérgio Freitas and Mário J. Silva, "Design and Selection Criteria for a National Web Archive", was distinguished with the Best Young Researcher Paper Award at ECDL2006 conference, held in Alicante, Spain in September 2006;

LASIGE members were ranked first in the Monolingual English and Monolingual Portuguese tasks at GeOCLEF2006, held in Alicante, Spain in September 2006.

## **Projects**

### **2003**

MAFTIA - EU-IST (2000-2003)  
GREASE - FCT - (2003-2006)  
MiNEMA - ESF - (2003 - 2007)

### **2004**

DYNAMO – EU-IST (COST) - (2004-2009)  
GORDA – EU-IST - (2004-2006)  
Linguateca – FCT - (2004-2008)  
ReBIL - (2004-2006)  
SCOPE – FCT - (2004 – 2006)  
SecurIST – EU-IST - (2004-2006)

### **2005**

AJECT – FCT - (2005-2007)  
DARIO – FCT - (2005-2008)  
ESFORS – EU-IST - (2005-2007)  
E-VOTING – FCT - (2005 – 2008)  
JoinTS – FCT - (2005-2008)  
MICAS – FCT - (2005-2008)  
P-SON – FCT - (2005-2008)  
PEPTIDES - (2005-2007)  
RICOBA – FCT - (2005-2008)  
RITAS – FCT - (2005-2007)  
TACID – FCT - (2005-2007)  
WrcK – FCT - (2005-2007)

### **2006**

CRUTIAL – EU-IST - (2006-2008)  
HIDENETS – EU-IST - (2006-2008)  
RESIST – EU-IST - (2006-2008)

AIR ESA/ITI- ESA - (2006-2007)

Detailed list fully described in Appendix A in:  
<http://lasige.di.fc.ul.pt/priv/RelAv07L.pdf>

### **Publications**

Detailed list fully described in Appendix B in: <http://lasige.di.fc.ul.pt/priv/RelAv07L.pdf>

## **4 Activities**

### ***4.1 Integrative/multidisciplinary activities in the 2003-2006 period***

Several members of LASIGE are involved in multidisciplinary activities through higher level education programmes and research projects. These activities include post-graduate courses and research projects in Bio-informatics and Information technologies applied Bio-medicine.

#### **Post-Graduate and Master Programme in Bio-informatics**

Since 2002, several members of LASIGE have been involved in the Post-Graduate and Master Programme in Bio-informatics. The course is organized to take advantage of the resources and expertise of five Departments of the FCUL: Animal Biology, Plant Biology, Chemistry & Biochemistry, Statistics and Informatics. Faculty for the programme has been recruited based on their competencies and scientific interests in Bio-informatics. In this initiative, FCUL make use of the teaching and research infrastructure of FCUL, with the added capability to offer post-graduate academic degrees, combined with the research and advanced training resources of the IGC (Gulbenkian Inst. for Science). This initiative includes two programmes: **Post-Graduate Programme**: The FCUL Post-graduate Programme in Bio-informatics lasts for one academic year, divided in two parts. **Master Programme**: The FCUL Master Programme in Bio-informatics lasts for two academic years, divided in two parts.

#### **Masters programme in Information Technologies Applied to Biological and Medical Sciences**

Members of the LASIGE participate to this post-graduate programme that is directed towards students graduated in Life and Health Sciences (Biology, Biochemistry, Pharmacy and Medicine). The post-graduation consists in courses in four different areas: Computer Science, Health Science, Statistics and Operational Research.

In terms of **research projects** that feature multidisciplinary activities we find:

#### **JoinTS**

JoinTS (Joint psychological TherapieS) is a project aiming at providing extended support to psychotherapy processes that focus patients' autonomy, activity and self-regulation, and was an interdisciplinary effort between informatics and psychology teams. It provides coverage of the patient centered activities through different settings and utilizing emerging technologies. This project is realized in collaboration with the Research Center in Health and Human Development (UNI).

## **MAFTIA**

The MAFTIA project investigated the dependability and security of large distributed applications thus addressing one of the four key issues of the IST Programme and in particular the main objectives of the interdisciplinary Cross-Programme Actions CPA2. Its major innovation was the interdisciplinary approach taken, pioneering the bridging of two areas until then disjoint: security and dependability.

## **Linguateca**

Since 2004 LASIGE hosts one of the poles of the Linguateca which is a resource center for Portuguese language. The main objectives are: Organize, document the collections for the evaluation of information recovering for the Portuguese language, Define processes for monitoring the web with respect to portuguese language, Develop programs that enhance the integration of the Linguateca resources with the Tumba! research engine.

### ***4.2 Outreach activities in the 2003-2006 period***

The Programme Ciência Viva (CV) of the Portuguese Ministry of Science and technology is an open programme to the promotion of a scientific and technological culture among the Portuguese population, promoting alliances and fostering autonomous actions. The programme CV assist projects whose aim is to encourage the use of experiments in learning science, involving scientific and school communities with a view to an exchange of knowledge and resources. In this context we have five projects approved by this programme.

The project on **Robots and Intelligent Agent Discover** is a Ciência Viva Project that is promoted by some members of LaSIGE and involves six secondary level schools partners, from the 10<sup>th</sup> and 12<sup>th</sup> grade in Lisbon metropolitan area. The project aims the accomplishment of a set of experimental activities in computer science that allows providing to the intermediate schools partners the contact with science and the technology carried through the diverse groups of the Department of Informatics of University of Lisbon (DI). For such, two main activities in the area of the robotics and intelligent agents are proposed. The DI functions as a pivot of these activities, organizing events with the joint participation of the schools, and helping the involved professors in each school. This project is foreseen for, after its launching, to have a continued functioning, throughout the years.

The last four projects in the context of the Ciência Viva Programme were completed, in cooperation with IGM (Instituto Geológico Mineiro). The projects aimed at the production of Educational CDs, that were delivered to several Primary level schools, from the 2<sup>nd</sup> to the 9<sup>th</sup> grade, regarding the "The water cycle", "Rock and minerals", "Earth history", and "Plate tectonics". CDs usage was primarily targeted for school libraries, for study and homework preparation, and included didactic games, especially those targeted from the younger population. The projects were developed by students of the Hypermedia advanced course, in a contest approach. Overall six works were selected and delivered to schools.

The project on **Hypervideos for Communicating and Learning Mathematics** was created in the scope of the Matemática em Acção Project initiatives to promote new ways of communicating mathematics, in particular through the use of new media, in a collaboration of LaSIGE with CMAF-UL: Center for Mathematics and Fundamental Applications at the University of Lisbon and some international partners. In this context, in 2007, "A História do Pi em hipervídeo" was published as an interactive CD.

The video on the story of Pi, authored by Tom M. Apostol, is complemented by information in the form of an electronic book, where different topics - the definition of the number Pi, its mathematical nature, and applications presented in historical perspective - are illustrated in a contextualized way by the video, augmenting its capabilities as a cognitive artifact. Different types of indexes and mechanisms allow to navigate the hypervideo in space and time, supporting diverse learning styles. This hypervideo was authored in a collaboration of LaSIGE, CMAF-UL, and CalTech, USA, and published by Texto Editores. It has been delivered to the secondary schools in Portugal, to be used by mathematics teachers and students, when preparing or complementing classes. This hypervideo is also useful to students at university level, or to the general public, due to the way topics are presented, allowing to be explored at different depth levels.

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

The next three years will bring some external challenges. The national S&T scenario will go through deep changes, associated to changes in the university system and the national and European funding systems, which will imply that research units acquire critical mass and capacity of intervention in a competitive international research arena. This implies not only sheer dimension but also, and perhaps especially for a small and limited-resources country, maximum efficiency and effectiveness of research results.

LASIGE has been preparing itself, by launching and addressing a few internal challenges over the past three years:

- by moving from a group-centered strategy to a research-line centered strategy and by opening-up new and sometimes interdisciplinary research lines;
- by evolving in consequence to a more homogeneous coordination model, or "single-group" model, in the terminology of this evaluation (as per Section 6);
- by introducing a cooperative/competitive management model, based on the symbiosis between research goals (lines) and champions (teams), which has proved stimulating of quantity and quality of activity and results;
- by promoting the sustained growth of the number of laboratory's PhDs;
- and finally by improving the already rather good internationalization of the unit and of its individual members, seen not only in visibility in EU and US fora, but also in international evaluation activities and in capacity to procure international research grants.

As assessed by the quantitative data in this report, LASIGE is now 25 FTE PhD large, and has a significant capacity of maneuver with regard to research funding procurement both in national and international forums. Its members are consistently present and influent in the academic activities of their sub-areas. There are sustained channels created, of affluence of PhD students, not only from national and FCUL's 2<sup>nd</sup> cycle Bologna degrees, but also from foreign communities with which close links have been established over the past few years, such as Brazil. More recently, LASIGE co-founded an informal research units network, INTERAC (further described in this report), creating a loosely-coupled virtual critical mass of over 160 PhDs, which is expected to improve the capacity of intervention and become a stimulating forum of complementary and interdisciplinary experiences.

As such, LASIGE sees the forthcoming period with optimism, expecting: to further improve the quality, efficiency and effectiveness of its research results; to augment its international visibility and capacity of attraction of the best students; to stimulate new research avenues interdisciplinary with Computer Science and Engineering.

#### **4.4 Future Networking activities in the 2007-2010**

LASIGE has a good track record in networking activities, national and international. Over the past years, LASIGE has been a member of:

- ReSIST - Resilience for Survivability in IST Funded by: E.C. IST Programme (4026764NOE);
- MiNEMA - Middleware for Network Eccentric and Mobile Applications Funded by: ESF (scientific programme);
- Dynamo - Dynamic Communication Networks Funded by: ESF (scientific programme) COST 295;
- Linguateca - Centro de Recursos Distribuído para a Língua Portuguesa Funded by: FCT (POSI/PLP/43931/2001);
- ESFORS - European Security Forum for Web Services, Software and Systems Funded by: IST Programme (Coordination Action 27599).

More recently, LASIGE co-founded an informal research units network, INTERAC, achieving a loosely-coupled virtual critical mass of over 160 PhDs. INTERAC draws from the capabilities of the four founding research units: CCTC (<http://cctc.uminho.pt/>), CISUC (<http://www.cisuc.uc.pt/>), IEETA (<http://www.ieeta.pt/>), LASIGE (<http://lasige.di.fc.ul.pt/>).

The participants hope to take advantage of the critical mass of INTERAC in several ways, namely: INTERAC will provide a forum for the discussion of research policies; it will lead to cross-fertilization in research organization methods in ICT; it will stimulate contacts among related teams; it will promote interaction among teams working on interdisciplinary topics; it will catalyze associations with other units, initiatives, projects or thematic networks of interest. It is important to note that a number of broad research topics are already present in at least two of the INTERAC research units to a significant extent. These areas include the following: Ambient Intelligence; Bioinformatics; Biomedical Informatics; Computer Networks; Distributed Systems; Human-Computer Interaction and Multimedia; Information Management; Secure and Dependable Computing; Software Engineering. The many common research interests are a strong indication of the extent to which INTERAC is meaningful, and prove that the network makes sense from the start.

## **5 General Indicators**

### **5.1 General indicators (of the Unit for the 2003-2006 period)**

	2003	2004	2005	2006
Nº of researchers (FTE)	13	14	16	19
Masters Completed	5	7	6	11
PhDs Completed	4	1	2	2

Further indicators in same section in: <http://lasige.di.fc.ul.pt/priv/RelAv07L.pdf> .

## 6 Research Groups Individual Group Report (2003-2006)

### 6.1 Group Description

#### 6.1.1 Group Name/Designation

LABORATÓRIO DE SISTEMAS INFORMÁTICOS DE GRANSE-ESCALA

#### 6.1.2 Location of Group (Host Institution)

Faculdade de Ciências da Universidade de Lisboa

#### 6.1.3 Keywords

Distributed Systems;  
Human Computer Interaction and Multimedia;  
Information Management;  
Security and Dependability.

#### 6.1.4 Funding, Source, Dates

The financing sources of LASIGE can be separated in baseline financing and competitive financing. The former, exclusively formed by the pluriannual amounts from FCT, allow a stable baseline support to the unit, immune to fluctuations of competitive financing, and are indeed one of the best instruments created by FCT in the past decade. The latter constitutes the greater part of LASIGE financing, but it is the less flexible part, once it is dedicated to very well defined budget items and tasks. It is probably worthwhile mentioning that overheads on research grants in Europe amount to at most 20%, and thus little slack is given for venture actions. As such, whilst LASIGE performs quite well in the competitive research arena, the pluriannual support is indispensable to support some day-to-day operation, and the risk of aggressive actions the lab has ventured in, e.g. in the quest for new projects.

#### **FCT Pluriannual Funding**

300.000,00 + , FCT, 2003-2006

#### **FCT Project Funding**

900.000,00 + , FCT, 2003-2006

#### **EU-IST Funding:**

2.100.000,00 + , EU-IST, 2003-2006

#### **Other Funding:**

50 000 + , 2003-2006

## **6.2 PI and Researchers**

### **6.2.1 Researchers in the Group (PhD only)**

Alysson Neves Bessani  
Ana Paula Pereira Afonso  
André Osório e Cruz Azeredo Falcão  
António Casimiro Ferreira da Costa  
Carlos Jorge da Conceição Teixeira  
Francisco Cipriano da Cunha Martins  
Francisco José Moreira Couto  
Hans Peter Reiser  
Hugo Alexandre Tavares Miranda  
José Manuel de Sousa de Matos Rufino  
Luís Eduardo Teixeira Rodrigues  
Luís Manuel Pinto da Rocha Afonso Carriço  
Maria Antónia Bacelar da Costa Lopes  
Maria Dulce Pedroso Domingos  
Mara Teresa Caeiro Chambel  
Mário João Barata Calha  
Mário Jorge Costa Gaspar Silva  
Miguel Nuno Dias Alves Pupo Correia  
Nuno Fuentecilla Maia Ferreira Neves  
Nuno Manuel Carvalho Ferreira Guimarães  
Paulo Jorge Esteves Veríssimo  
Paulo Jorge Paiva de Sousa  
Pedro Alexandre Mourão Antunes  
Thibault Nicolas Langlois  
Vasco Thudichum Vasconcelos

### **6.2.2 Other Researchers in the Group (PhD)**

Daniel Coelho Gomes

### **6.2.3 Other Researchers in the Group (non PhD)**

Alexandre Jorge Matos Pinto  
António Manuel Silva Ferreira  
Carlos Alberto Pacheco dos Anjos Duarte  
Catarina da Conceição Gonçalves Rodrigues  
Cátia Luísa Santana Calisto Pesquita  
Cláudio Miguel Garcia Loureiro S. Sapateiro  
Daniel Pedro de Jesus Faria  
David José Vaz Cruz  
David Soares Batista  
Emanuel Pedro Loureiro Teixeira  
Francisco Jorge Silva Vargas Cabrita  
Giuliana Teixeira dos Santos Veronese  
Henrique Lícias Senra Moniz

Hugo Miguel Marques Pinto  
Hugo Paulo da Silva Bastos  
Ibéria Vitória de Sousa Medeiros  
Inês Isabel Pimentel de Oliveira  
João Alexandre Simões Antunes  
João Carlos Antunes Leitão  
João Pedro Gonçalves Crespo Craveiro  
José Carlos Vitório Mocito  
José Pedro Santos Manso Corte-Real  
Liliana Wu Freitas Rosa  
Luís Miguel Santos Duarte  
Manuel José Ferreira Carneiro Mendonça  
Marcirio Silveira Chaves  
Marco Abelha César de Sá  
Mônica Lopes Muniz Côrrea Dixit  
Nuno Francisco Pereira Freire Cardoso  
Nuno Miguel Rei de Carvalho  
Paulo Jorge Fernandes Carreira  
Paulo Miguel Ciríaco P. Pombinho de Matos  
Pedro Macedo Ferreira dos Santos  
Pedro Miguel Real de Almeida Carvalho  
Ricardo Filipe Gonçalves Martinho  
Rui Miguel do Nascimento Dias Lopes  
Tiago Daniel Pereira Grego

### ***6.3 Objectives & Achievements***

#### ***6.3.1 General Objectives***

At the end of this period, LASIGE operates under homogeneous coordination, and presents itself under a “single-group” model, in the terminology of this evaluation (as per Section 6). A well-defined set of mid/long-term research objectives are materialized through several research lines, defined and pruned during the last period: Biomedical informatics; Communication and coordination support for dynamic systems; Fault and intrusion tolerance in open distributed systems; Human computer interaction and multimedia; Information management; Middleware support for adaptive distributed systems; Timeliness and adaptation in dependable systems.

Current, day-to-day research operation (projects, thematic or coordination actions, research networks) is steered by four research teams that work in cooperation: Dialnp (<http://dialnp.lasige.di.fc.ul.pt/>); HCIM (<http://hcim.lasige.di.fc.ul.pt/>); Navigators (<http://navigators.lasige.di.fc.ul.pt/>); XLDB (<http://xldb.lasige.di.fc.ul.pt/>). Although LASIGE follows a global and homogeneous set of procedures which researchers collectively decide and follow, the duality between research goals (lines) and champions (teams) has contributed to improving the dynamics of the laboratory and was a key factor of success for the sustained growth of LASIGE over the past few years.

### 6.3.2 Main Achievements

LASIGE achieved a sustained level of high quality research activity, and a critical mass of mobilisation of research assets, measured by several indicators:

- Researchers from LASIGE received several national and international prizes in this period;
- LASIGE achieved a good record of successful participation and performance in research projects, and a good level of internationalization. In this interval, LASIGE has been involved in 25 national and international projects, of which 10 were international;
- There has been an increasing level of publications, where over 200 international journal, conference and workshop publications were made in this interval;
- There was a sustained growth in number of PhD and MSc students, where 28 MSc and 8 PhD theses were completed in this period, with 19 MSc and 17 PhD theses ongoing;
- Researchers of LASIGE are regularly cited by peers, where the figures for citations (self-citations eliminated) are, for example (data specifically for 03-06 not available) over 3000 accumulated citations for the total of current PhD researchers;
- The top 5 most cited researchers have more than 300 citations and an H-index greater or equal to 10. The top 12 have more than 100, and an H-index greater or equal to 5. (For method of citation capture and meaning of Hirsch Index, see Section 6.4.1).

## 6.4 Productivity

### 6.4.1 Publications in peer review Journals

The impact factors and number of citations were retrieved from information electronically available on the web, which characterises the activity of the area of Computer Science and Engineering (CSE) in a very complete way, as considered e.g., by IEEE or ACM.

For the selected publications, we chose to use Google Scholar (GS) (<http://scholar.google.com>) ground-truth data, filtered and post-processed using Harzing's Publish or Perish (<http://www.harzing.com>). This public tool feeds from GS, and produces venue and author impact, number of citations, and Hirsch Index ([http://en.wikipedia.org/wiki/Hirsch\\_number](http://en.wikipedia.org/wiki/Hirsch_number)).

We removed garbage and self-citations, included by GS and Harzing when directly accessed. The numbers of citations are thus **exclusive of self-citations**, delivered next to each paper entry, in this report.

- José Mocito, Liliana Rosa, N. Almeida, Hugo Miranda, Luís Rodrigues, and Antónia Lopes. "Context adaptation of the communication stack", International Journal of Parallel, Emergent and Distributed Systems, (Vol 21, Nb. 3) pp 169-181, Taylor & Francis. June 2006. n° C= 4, IF: Cit/Yr 16,67, Cit/pap = 0,85.

- Paulo Veríssimo, Nuno Ferreira Neves, C. Cachin, J. A. Poritz, D. Powell, Y. Deswarte, R. J. Stroud, I. S. Welch, "Intrusion-Tolerant Middleware: The Road to Automatic Security", *IEEE Security & Privacy*, vol. 4, no. 4, pp. 54-62, Jul./Aug. 2006. n° C= 1, IF: Cit/Yr = 367, Cit/pap = 4,41.
- Pedro Antunes and P. André. "A Conceptual Framework for the Design of Geo-Collaborative Systems", *Group Decision and Negotiation*, 15:273-295. ISSN: 0926-2644. 2006. n° C= 1, IF: Cit/Yr = 225, Cit/pap = 8,71.
- Miguel Correia, Nuno Ferreira Neves, Paulo Veríssimo, Lau Cheuk Lung, "Low Complexity Byzantine-Resilient Consensus", *Distributed Computing*, vol. 17, n. 3, pp. 237--249, March 2005. n° C= 20, IF: Cit/Yr = 250, Cit/pap = 23,52.
- Francisco Couto, Mário J. Silva, Pedro Coutinho, "Finding Genomic Ontology Terms in Text using Evidence Content", *BMC Bioinformatics Journal*, 6(Suppl 1):S21, April 2005. n° C= 7, IF: Cit/Yr = 148, Cit/pap = 1,09.
- D. Rebholz-Schuhmann, H. Kirsch, Francisco Couto, "Facts from text: Is Text Mining ready to deliver?", *PLoS Biology Journal*, 3(2):e65, February 2005. n° C= 23, IF: Cit/Yr = 327, Cit/pap = 4,39.
- Carlos Duarte, Luís Carriço, Hugo Simões, Teresa Chambel, Nuno Guimarães. "Avaliação de aspectos de sincronização de Livros Falados Digitais", *Sistemas de Informação*, vol. 17, pp. 7-19. *Journal of the Portuguese Association of Information Systems (Associação Portuguesa de Sistemas de Informação)*. ISSN: 0872-7031, 2005. n° C= 1, IF: Cit/Yr = N/A, Cit/pap = N/A.
- Daniel Gomes, Mário J. Silva, "Characterizing a National Community Web", *ACM Transactions on Internet Technology (TOIT)*, volume 5, issue 3, pages: 508-531, August 2005. n° C= 8, IF: Cit/Yr = 438,86, Cit/pap = 23,45.
- Pedro Martins, Paulo Sousa, António Casimiro and Paulo Veríssimo, "A New Programming Model for Dependable Adaptive Real-Time Applications", *IEEE Distributed Systems Online*, vol. 6, n. 5, May 2005. n° C= 2, IF: Cit/Yr = 136,38, Cit/pap = 2,96.
- Thibault Langlois, Pedro Campos, "ABALEARN: a Program that Learns How to Play Abalone", *International Computer Game Association Journal*, Vol. 26 Number 4, December 2004. n° C= 1, IF: Cit/Yr = N/A, Cit/pap = N/A.
- J. Pereira, Luís Rodrigues and R. Oliveira. "Semantically Reliable Multicast: Definition, Implementation and Performance Evaluation", *IEEE Transactions in Computers*, Special Issue on Reliable Distributed Systems, (Vol 52, Nb. 2), pp. 150-165, February 2003. n° C= 14, IF: Cit/Yr = 1533, Cit/pap = 64,40.
- Luís Rodrigues and M. Raynal. "Atomic Broadcast in Asynchronous Crash-Recovery Distributed Systems and its use in Quorum-Based Replication", *IEEE Transaction on Knowledge and Data Engineering*. (Vol. 15, No. 5), pp.1206-1217. September/October 2003. n° C= 10, IF: Cit/Yr = 17,68, Cit/pap = 7.

The methodology is detailed in same section in:

<http://lasige.di.fc.ul.pt/priv/RelAv07L.pdf> , as well as impact factor figures. The complete list of publications can be found in Appendix B, in that document.

### 6.4.2 Other publications

- Teresa Chambel, Carmen Zahn, and Matthias Finke, "Hypervideo and Cognition: Designing Video-Based Hypermedia for Individual Learning and Collaborative Knowledge Building", Chapter II, in Eshaa Alkalifa (ed), *Cognitively Informed Systems: Utilizing Practical Approaches to Enrich Information Presentation and Transfer*, Idea Group Publishing, ISBN: 1-59140-842-3 (hard cover) 1-59140-843-1 (soft cover), pp.26-49, January 2006. n° C= 1, IF: Cit/Yr = N/A, Cit/pap = N/A.
- Rui Lopes, Luís Carriço, Carlos Duarte. "DiTaBBu - Automating the production of timebased hypermedia content". In *Proceedings of WWW'2006, 15<sup>th</sup> International World Wide Web Conference*, Edinburgh, Scotland, pp. 905-906, ACM Press, ISBN: 1-59593-178-3, May, 2006. n° C= 1, IF: Cit/Yr = N/A, Cit/pap = N/A.
- Daniel Gomes, Sérgio Freitas, Mário J. Silva, "Design and Selection Criteria for a National Web Archive", *ECDL 2006 - 10th European Conference on Research and Advanced Technology for Digital Libraries*, September 2006. n° C= 1, IF: Cit/Yr = N/A, Cit/pap = N/A.
- Francisco Couto, Mário J. Silva, Pedro M. Coutinho, "Validating Associations in Biological Databases", *ACM CIKM 06 - Conference in Information and Knowledge Management*, November 2006. n° C= 1, IF: Cit/Yr = 20, Cit/pap = 2,49.
- Henrique Moniz, Nuno Ferreira Neves, Miguel Correia, Paulo Veríssimo, "Randomized Intrusion-Tolerant Asynchronous Services", *Proceedings of the International Conference on Dependable Systems and Networks (DSN)*, Philadelphia, USA, pages 568-577, June 2006. n° C= 2, IF: Cit/Yr = 357, Cit/pap = 8,93.
- Paulo Sousa, Nuno Ferreira Neves, Paulo Veríssimo, "How Resilient are Distributed f Fault/Intrusion-Tolerant Systems?", In *Proceedings of the 2005 International Conference on Dependable Systems and Networks (DSN)*. Yokohama, Japan, pages 98-107, June 2005. n° C= 6, IF: Cit/Yr = 357, Cit/pap = 8,93.
- Bruno Martins, Mário J. Silva, "A Graph-Ranking Algorithm for Geo-Referencing Documents", *Proceedings of ICDM-05, the 5th IEEE International Conference on Data Mining*, New Orleans, USA, November 2005. n° C= 3, IF: Cit/Yr = N/A, Cit/pap = N/A.
- Filipe Araújo and Luís Rodrigues. "Long Range Contacts in Overlay Networks". In *Proceedings of the Euro-Par 2005*, Lisboa, Portugal, August 2005. n° C= 4, IF: Cit/Yr = N/A, Cit/pap = N/A.
- J. Pereira, Luís Rodrigues, A. Pinto, and R. Oliveira. "Low-Latency Probabilistic Broadcast in Wide Area Networks". In *Proceedings of the 23rd Symposium on Reliable Distributed Systems*, pp. 299-208, Florianopolis, Brazil, October 2004. n° C= 1, IF: Cit/Yr = N/A, Cit/pap = N/A.

- Mourão, H. and Pedro Antunes. "Exception Handling through a Workflow". On the Move to Meaningful Internet Systems 2004: Coopis, DOA, and ODBASE: OTM Confederated International Conferences, Coopis, DOA and ODBASE. R. Meersman and Z. Tari. Lecture Notes in Computer Science, vol.3290, pp.37-54. Heidelberg, Springer-Verlag, 2004. n° C= 5, IF: Cit/Yr = N/A, Cit/pap = N/A.
- Paulo Veríssimo and Nuno Ferreira Neves and Miguel Correia, "Intrusion-Tolerant Architectures: Concepts and Design", In Architecting Dependable Systems, R. Lemos, C. Gacek, A. Romanovsky (eds.), LNCS 2677, pages 3-36, Springer Verlag, 2003. n° C= 36, IF: Cit/Yr = N/A, Cit/pap = N/A.
- Luís Rodrigues, S. Handurukande, J. Pereira, R. Guerraoui, A.-M. Kermarrec. "Adaptive Gossip-Based Broadcast". In The International Conference on Dependable Systems and Networks (DSN), San Francisco, California, USA, June, 2003. n° C= 16, IF: Cit/Yr = 357, Cit/pap = 8,93.

The complete list of publications can be found in:

<http://lasige.di.fc.ul.pt/priv/RelAv07L.pdf> .

### **6.4.3 Master and PhD theses completed**

#### **2003**

##### **PhD**

António Casimiro Ferreira Costa, PhD, Adv.: P. Veríssimo.  
José Manuel Sousa Matos Rufino, PhD, Adv.: P. Veríssimo.  
Maria Teresa C. Chambel, PhD, Adv.: Nuno Guimarães.  
Miguel Nuno Dias Alves Pupo Correia, PhD, Adv.: P. Veríssimo.

##### **MSc**

Cláudia Carvalho, MSc, Adv. Nuno Neves.  
João P. Campos, MSc, Adv.: Mário J. Silva.  
João Travassos Cabral Martins, MSc, Adv.: Luís Rodrigues.  
Pedro Filipe Pereira Campos, MSc, Adv.: Thibault Langlois.  
Pedro Miguel Rebelo Martins, MSc, Adv.: P. Veríssimo.

#### **2004**

##### **PhD**

Ana Paula Afonso, PhD, Adv.: Mário J. Silva.

##### **MSc**

Bruno Martins, MSc, Adv.: Mário J. Silva.  
Duarte Miguel Freitas, MSc., DEI, IST-TU Lisbon, 2004, Adv.: Thibault Langlois.  
João Ramires, MSc, Adv.: Pedro Antunes.  
Maria Paula André, MSc, Adv.: Pedro Antunes.  
Miguel Costa, MSc, Adv.: Mário J. Silva.  
Norman Noronha, MSc, Adv.: Mário J. Silva.  
Pooja Jain, MSc, Adv.: Mário J. Silva.

## **2005**

### **PhD**

Dulce Domingos, PhD, Adv.s: Pedro Veiga and António Silva.  
João Rodrigues, PhD, Adv.: Luís Rodrigues.

### **MSc**

Manuel Mendonça, MSc, Adv.: Nuno Neves.  
Hugo Branco, MSc, Adv.: Ana P. Afonso.  
Manuel Costa, MSc, Adv.: Luís Carriço.  
Marco Sá, MSc, Adv.: Luís Carriço.  
Nuno Carvalho, MSc, Adv.: Luís Rodrigues.  
Paula André, MSc, Adv.: Pedro Antunes.

## **2006**

### **PhD**

Filipe Araújo, PhD, Adv.: Luís Rodrigues.  
Francisco Couto, PhD, Adv.: Mário J. Silva.

### **MSc**

André Barbosa, MSc, Adv.: António Casimiro.  
Henrique Moniz, MSc, Adv.s: Nuno Neves and Miguel Correia.  
João Antunes, MSc, Adv.: Nuno Neves.  
João Cardana, MSc, Adv.: Nuno Neves.  
José Mocito, MSc, Adv.: Luís Rodrigues.  
Licínio Pereira, MSc, Adv.: Pedro Antunes.  
Liliana Rosa, MSc, Adv.: Luís Rodrigues.  
Nuno Cardoso, MSc, Adv.: Mário J. Silva.  
Ricardo Martinho, MSc, Adv.: Dulce Domingos.  
Rui Lopes, FCUL, MSc, Adv.: Luís Carriço.  
Senthamaraiseivi Paliannapan, MSc, Adv.: Mário J. Silva.

Detailed list omitted for space reasons (3000 ca. limit), fully described in same section in: <http://lasige.di.fc.ul.pt/priv/RelAv07L.pdf> . Ongoing PhD and MSc also found there.

### ***6.4.4 Patents/prototypes***

More than 40 prototypes were produced by LASIGE in this period. Some of them are available publicly either from LASIGE website or from public-domain archives such as Source Forge.

Detailed list omitted for space reasons (2000 ca. limit), fully described in same section in: <http://lasige.di.fc.ul.pt/priv/RelAv07L.pdf> .

### ***6.4.5 Organization of conferences***

In this period, LASIGE researchers were profusely involved in activities related with national and international conferences and other academic events, such as: Organization of Conferences; Roles in International Scientific Organizations; Participation as chairs and/or invited or keynote speakers; Tutorials and Short Courses. For space reasons (2000 ca. limit), the detailed account is omitted but is fully described in same section in: <http://lasige.di.fc.ul.pt/priv/RelAv07L.pdf>.

### **Organization of Conferences**

LASIGE researchers assumed several leadership roles within this period, in the organisation of international conferences and workshops, such as, to name a few:

- Workshop on Adaptive Distributed Systems, Sorrento, Italy, September 30, 2003.
- WACERTS 04 - Workshop on Architectures for Cooperative Embedded Real-Time Systems @RTSS04, Lisboa, Portugal, December 2004.
- Workshop on Dependable Distributed Data Management, @SRDS04, Florianopolis, Brazil, October 17, 2004.
- The 25th IEEE Real-time Systems Symposium, Lisboa, Portugal, December 2004.
- EG Multimedia 2004 – 7th Eurographics Workshop on Multimedia, Nanjing, China, October 27-28, 2004.
- Workshop on Geographic Information Retrieval, In CIKM 2005.
- Dependable Systems and Network (DSN-2005), IEEE International Conference, Yokohama, Japan, June 2005.
- BKDB2005 - Bioinformatics: Knowledge Discovery in Biology, Lisboa, Portugal, June 2005.
- The 26th International Conference on Distributed Computing Systems, FCUL, Lisboa, Portugal, July 2006.

### **Roles in International Scientific Organizations**

LASIGE researchers assumed several leadership roles within this period, in reputed international research associations and conferences, such as, to name a few: Chair of the IEEE Technical Committee on Fault Tolerant Computing; Chair of the Steering Committee, Dependable Systems and Networks; Member of the Steering Committee, CRIWG, International Workshop on Groupware; Steering Committee Chair, ESF MiNEMA; associate editor of the IEEE Transactions on Dependable and Secure Computing; European Security & Dependability Advisory Board, IST Europ. Comm.; Executive Board of the Resist Network of Excellence, IST EC.; Scientific Evaluation Board of Laboratoire LAAS-CNRS de Toulouse; World Class Jury member for the France Telecom Research.

### **Distinguished Participation**

LASIGE researchers gave 13 keynote speeches or invited talks at international conferences and workshops in this period.

### **Tutorials and Short Courses**

LASIGE researchers gave 6 tutorials at reputed in international conferences in this period.

#### **6.4.6 Industry contract research**

LASIGE has been involved in several R&D contracts with industry.

CELPA - Associação da Indústria Papeleira - Consultancy for simulation of the sustainability of the private eucalyptol area at national level.

Silviconsultores/Silvisystems - for simulation of supply of woody material for two production centrals of energy through biomass.

Siemens, Compal and Altitude Software - Protocols for training in advanced engineering and supervision of trainee engineering projects.

Skysoft Portugal - AIR - ARINC 653 in RTEMS Participation in the ESA/ESTEC - European Space Agency project.

Dr. Alfredo da Costa Maternity - Consultancy on the analysis of the clinical and administrative processes and their articulation with the installed information systems.

BioAlma (Madrid, Spain) - FilBio: Filter Mistakes in the Recognition of Biological Entities in Text using Methods of Statistical Classification.

Proteomic Laboratory; Centre of Human Genetics, and Instituto Nacional de Saúde Dr. Ricardo Jorge (National Health Institute) - Entities using Bioinformatics tools to study new targets for the therapeutic interventions.

Public Administration – Project of the integration of all Autarkical Services Support Systems.

Continuent (USA) – Project on replication and load balancing of database solutions. This enterprise using the Appia system.

JAMM Consulting – Project on electronic commerce solutions needing replicated databases, using the Appia system.

Siemens SA - Collaboration in the development of the “Specification based Intrusion Detection System for Carrier Ethernet” system, in the context of a Master’s degree project in Eng. Computer Science.

OnTVGrupo Novabase - Consultancy Services.

Instituto Nacional de Habitação (National Habitation Institute) - Consultancy on the installed information systems.

Governo Português (Portuguese Government) - Auditing and security tests to the Government computer networks and services.

Polícia Judiciária (Portuguese Investigation Police) - Consultancy on secure informatics infrastructures and networks.

### **6.4.7 Internationalization and dissemination**

#### **Publications with foreign collaborators**

LASIGE has an excellent record of joint international research, already exemplified in previous sections, thorough publications and projects. In more detail, within 2003-06 more than 60 papers were co-authored with foreign authors by researchers of LASIGE.

#### **Invited Foreign Researchers**

LASIGE has a tradition of hosting and supporting invited seminars by distinguished researchers. Amongst past speakers we had the honour of hosting: Prof. Danny Dolev; Dr. Leslie Lamport; Prof. Michel Raynal; Prof. Sam Toueg. List of the recent guest speakers includes:

- Ulrich Schmid - Technische Universität Wien, Austria.
- Danny Dolev - The Hebrew University of Jerusalem, Israel.
- Hans-Arno Jacobsen - University of Toronto, Canada.
- William H. Sanders - University of Illinois at Urbana-Champaign, USA
- Dan Caragea – Cyberlex.
- Pierre Baldi - UC Irvine.
- Antony Rowstron - Microsoft Research, Cambridge.
- André Schiper - EPFL, Lausanne.
- Dietrich Rebholz-Schumann - European Bioinformatics Institute, UK.

#### **International scientific presentations (papers at conferences)**

Researchers have consistently been present abroad, either by presenting papers in conferences, or by giving invited talks, keynotes or tutorials. In the period of reference, more than 200 such presences were recorded.

#### **Participations to international program committees**

Moreover, international academic recognition has been evidenced by other roles, e.g., pc member and reviewer. Reviewing activity has been extensive, with more than 140 participations in international PCs, during the period.

The complete list can be found in Appendix D, in:  
<http://lasige.di.fc.ul.pt/priv/RelAv07L.pdf>

#### **Scientific Evaluation**

LASIGE researchers performed more than a dozen international evaluations in this period, including project calls for the EU and other international research sponsoring bodies.

#### **International relations (in the context of projects)**

In the context of projects, LASIGE members have maintained throughout this period, continued relations and interchange with a large number of foreign industrial and academic partners, in excess of 120 institutions.

#### **CMU-Portugal**

CMU-Portugal is a partnership between Carnegie Mellon University and the Portuguese Government through the Ministry of Science, Technology and Higher Education. This partnership, prepared during 2006, has an initial 5-year phase during 2007-11. LASIGE

members are heavily engaged in one of the initiatives of the CMU-PORTUGAL program, Information and Infrastructure Security and Dependability, which is led by FCUL. The proposal features: education at the level of MSc and PhD, and joint research. Both the Doctoral and the Masters program confer a dual degree, from CMU and from the University of Lisboa.

Detailed information on the points above can be found in same section in: <http://lasige.di.fc.ul.pt/priv/RelAv07L.pdf> .

## **6.5 Future Research**

### **6.5.1 Objectives**

The detailed description of the research objectives and activities for the next period follows. Given a reformulation of some of LASIGE's assets, with the movement of some senior personnel, there are slight modifications in the research lines pursued in LASIGE.

#### **Biomedical Informatics**

This line intends to investigate problems related to biological, clinical and epidemiological data management. Develops methods and tools to explore Biological and Medical information in automated and efficient ways. The current focus is on genomic and proteomic data mining and natural language processing.

#### **Communication and coordination support for dynamic systems**

This line intends to investigate protocols, algorithms, models and middleware solutions to build reliable, scalable, adaptive and dependable systems, with emphasis on very dynamic systems, i.e., systems where membership and topology is subject to change, including large-scale peer-to-peer networks and ad hoc networks.

#### **Global Computing**

This line of research investigates formal methods that ease the development and management of software systems under the emergent "Global Computing" paradigm. It explores the development of design techniques, programming languages, type systems and other program analysis that contribute to the reliable deployment and evolution of software systems that will successfully live in "Global Computers".

#### **Fault and Intrusion Tolerance in Open Distributed Systems**

This line intends to investigate models, protocols and architectures that are suitable for applications that need to automatically remain operational despite accidental faults or malicious attacks. The kind of target environments that are being investigated include Internet-based distributed applications, mobile networks and computing with small hand-held devices, scalable servers, and critical information infrastructures.

#### **Human Computer Interaction and Multimedia**

The specific directions of this research line for the next years are Advanced HCI & Usability Studies, Learning & Mixed Media Environments, and Group Interaction Analysis & Design. Selected domains of applied R&D are analysis and design of organizational information systems, biomedical informatics, risk management, e-Health, e-Inclusion, and e-Learning problems.

### **Information Management**

We intend to research on data management problems with a focus on systems for data analyses, information integration and user access to large quantities of complex data from heterogeneous platforms. Current research spans geographic information retrieval, text mining and natural language processing, web archive and search, and information visualization.

### **Timeliness and Adaptation in Dependable Systems**

The objectives of this research line encompass the study of models, algorithms and platforms, aimed at improving the timeliness and safety aspects of the operation of distributed embedded applications in open and unpredictable environments, which we propose to tackle in the context of hybrid distributed system models, in combination with notions like coverage stability and dependable QoS adaptation. We also intend to investigate the security of complex embedded systems.

#### ***6.5.2 Funding, source, dates***

The financing sources of LASIGE can be separated in baseline financing and competitive financing (see Section 6.1.4 for a discussion).

For the future, LASIGE counts on a continuation and hopefully a necessary improvement of the baseline pluriannual financing.

As for competitive financing, LASIGE has been successful in securing this kind of funds in the past, and counts on improving this capacity for FP7 of the EU, and for FCT programs. Several projects were submitted to current calls both in the EU and in FCT.

Some projects will run through 2007 and through 2008, assuring a certain level of competitive financing already:

AIR ESA/ITI, 14.957,00, ESA, 2006-2007  
CRUTIAL, 326.000,00, EU-IST, 2006-2008  
HIDENETS, 293.376,00, EU-IST, 2006-2008  
RESIST, 167.609,00, EU-IST, 2006-2008

#### ***6.5.3 Previous publications in the area***

- L. Rodrigues, H. Miranda, R. Almeida, J. Martins and P. Vicente. Strong Replication in the GlobData Middleware. In Proceedings Workshop on Dependable Middleware-Based Systems, pp. G96-G104, Washington D.C., USA (Volume 2 of DSN 2002). June 2002. n° C = 27.
- P. Veríssimo and L. Rodrigues. Distributed Systems for System Architects. Kluwer. ISBN 0-7923-7266-2. 2001. n° C = 106.
- H. Miranda, A. Pinto, L. Rodrigues. Appia, a flexible protocol kernel supporting multiple coordinated channels. In Proceedings of the 21st International Conference on Distributed Computing Systems (ICDCS-21)}, April 16-19, 2001. Phoenix, Arizona, USA. n° C = 73.

- LB Almeida, T Langlois, JD Amaral, A Plakhov. Parameter adaptation in stochastic optimization. On-line learning in neural networks table of contents. 1999. n° C = 25.
- P. Veríssimo, L. Rodrigues and A. Casimiro. CesiumSpray: a Precise and Accurate Global Time Service for Large-scale Systems. In Special Issue on the Challenge of Global Time in Large-Scale Distributed Real-Time Systems, Journal of Real-Time Systems, Vol 12, n. 3, Kluwer Academic Publishers. May 1997. n° C = 62.
- J.L.Fiadeiro and A.Lopes. Semantics of Architectural Connectors, in M.Bidoit and M.Dauchet (eds), Proc. TAPSOFT'97, LNCS 1214, pp. 505-519, Springer-Verlag, 1997. n° C = 31.
- Vasco T. Vasconcelos. Typed concurrent objects, In 8th European Conference on Object-Oriented Programming, volume 821 of LNCS, pages 100-117. Springer-Verlag, 1994. n° C= 87.
- JJ Puttress, NM Guimarães. The Toolkit Approach to Hypermedia. Procs. of Hypertext: Concepts, Systems and Applications. 1990. n° C = 26.
- MJ Silva, RH Katz, The case for design using the World Wide Web, Proceedings of the 32nd ACM/IEEE conference on Design automation, 1995. n° C = 22.
- N Maria, MJ Silva, Theme-based Retrieval of Web News, Proceedings of the 23rd annual international ACM SIGIR conference on Research and development in information retrieval, 2000. n° C = 9.

#### **6.5.4 Special requirements**

As it happened up to 2006, the future of LASIGE, despite its strong strategic drive, will be influenced and guided by the following external realities:

- a. **LOCAL.** Space problems have stood in the way of a more significant growth in past years. 2006 was a year of change, after the introduction of significant modifications in the organisation, operation and management frameworks of DI/LASIGE.
- b. **NATIONAL.** We would expect the direct multi-annual national funding to become above all steadier, otherwise the regular operation of units is drastically affected, as it has been in past years. Financing of PhD scholarships has been on the low side up to now.
- c. **INTERNATIONAL.** 2006-07 have witnessed the results of the effort dedicated by members of the unit to increase participation in IST projects, to be continued in future years, namely in FP7, and we are optimistic with this regard.
- d. **Framework Program 7 (EU).** LASIGE senior researchers have been heavily involved in the definition of the European Strategic Research Agenda for FP7, in view a very active participation in the FP7 projects. The evolution to non-100% funding models in FP7 should deserve great attention from FCT, to devise amortizing and complementary funding schemes. Likewise, the transposition of the EU Directive concerning IVA (Portuguese VAT) exemption for intra-communitarian business is crucial, perhaps a way out would be to promote, near the government, a partial IVA exemption, for example only for research related activities.

- e. **Classification and evaluation.** It is imperative to separate *Informatics (or Computer Science and Engineering)* from Electrical and Computer Engineering. These are different scientific areas, and LASIGE pertains to the former, as well as several other units in Portugal.