

CENTRIA

Centro de Inteligência Artificial – UNL

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2002 Report of Activities

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April 2003

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1 CENTRIA 2002 report of activities

The present report was unanimously approved by the Scientific Committee of CENTRIA on April 16th, 2003. The plans approved in 2001 for 2002 were on the whole successfully carried out. This notwithstanding the significant event, reported in the plans for in 2002, that one senior researcher and one postdoc in natural language processing and their large students left to join another research centre, in the same department. As explained then, the centre took the opportunity to reconfigure its main research areas in order to reflect the new interests and composition, with the creation of the new area of "Intelligent Information Systems (IIS)", instead of the old "Natural Language Processing" one. In it natural language still figures, now not as an end in itself but subservient to demand in IIS. Notably, 3 senior researchers working in natural language did not accompany the outgoing ones, and the ties between the two departmental centres permit the continuity of collaboration of all involved. Such reconfigurations of centres' teams are normal, and indeed even desirable for the clarifications they bring about.

It is most noteworthy that, pursuant to its new strategic ends, the centre hired in 2002, for periods (renewable) of 1 year, five new foreign postdocs, four having started in September 1st, and a fifth in February 1st, from five different countries: China, France, Germany, Italy, and USA. Its first consequences in scientific productivity will be mainly felt and measurable in 2003.

To facilitate the overall evaluation in terms of our usual tables of results presented over the years with our reports, we have introduced in all the tables this year an intermediate column, labelled "01*", between the 01 and the 02 columns. These intermediate columns display our results in 01, had the above mentioned group already left then, ie. the 01 columns results minus its specific contributions. Thus, in the remainder analysis we shall compare columns 01* and 02.

Our evolution can then best be gauged by comparing the plans with the present report: an overall positive evolution. The global indicators in the tables in Section ?? show and highlight, with respect to 2002 compared with 2001*, that:

- Regarding publications: The total number of publications increased from 40 to 46. The number of journal publications decreased from 10 to 9, but in 01* four of these were national journal publications and in 2002 non were so. On the other hand, there was a marked increase, from 1 to 5, in book chapters. The number of publications in collaboration with outsiders decreased from 22 to 19, but we consider this more than a statistical glitch, having no profound significance.
- Regarding projects: The number of ongoing projects in 2002 increased to 16 from 10 in 2001, solely due to 4 new national projects (mentioned in last years plan), whilst the number of international projects was kept the same. This is due to that the European Sixth Framework calls opened only for 2003 (we are in the process now of submitting 2 new projects, and more are expected). Nevertheless, a couple of national projects are still awaiting their evaluation by FCT for a long time...
- Regarding Events organization: This figure went from an exceptional high of 5 in 2001* to the more normal 2 in 2002. This is also discounted as a seasonal glitch, as more are already committed to in 2003.
- Postgraduate students: The overall attraction of the centre for postgraduate students has improved. Our MSc in AI opened again for 2002/04, and significant progress has been made in the establishing of a distributed european MSc course, of which we are the prime movers with TU Dresden, in the context of NoE CoLogNet (cf. details at www.colonet.org). Very significantly, 3 PhD students passed their exams in 2002 and have now joined as full members of the centre. Notably, two of the thesis have already appeared in 2003 as books in IOS Press, and the third has been already accepted for publication by them, in the new AI european dissertation series, overseen by ECCAI. Besides, the total number of PhD students augmented from 12 to 14, and that of MSc students doing thesis work went from 11 to 12, with 1 finishing.

Other indicators, including a more detailed examination of types of publication, and publications by each subarea, are to be found in the annexes, and mentioned in each of the subarea reports.

The 2002 budget was executed according to plan, including the programatic funding for equipment and library. The programatic funding for postdocs was allocated and assigned after announcements were posted for four visiting positions starting 2002, another being supported directly by FCT, ie. a postdoc position was obtained from separate FCT funds for Dr Reinhard Kahle, from Germany, to start April 2002. The distribution of the running funds among the members was made on the basis of publication productivity, in number and type, according to a pre-defined set of rules we have been using for the past years. We intend to revise the points assigned to each publication type to further encourage publication in journals and highly recognized conferences.

The Advisory Committee was duly notified of last year's report and informally congratulated us on the activities reported. No specific recommendations were made.

The detailed rendition of each of the subareas' activities is to be found below. The plans for 2003 and beyond, some already mentioned in our 2001 trienal report, consist in 4 major projects (2002-05) submitted to POSI, according to FCT's new instructions.

A number of scientific bridges were pursued between the subareas, to reinforce the unity and cross-fertilization within the Centre. Namely, between KRR and IIS, between CPML and KRR, and CPML and IIS. The activities of 2002 and the projects for 2002-05 further detail the construction of these bridges.

1.1 Subarea: Knowledge Representation and Reasoning, and Logic Programming

The research work on "Knowledge Representation and Reasoning, and Logic Programming" continued in 2002 in foundations of logic programming for knowledge representation and reasoning, applications and implementation of logic programming systems, as can be gauged from the publications.

The scientific projects covering this activity were FLUX, POLAR (with Málaga), RRA (with Pisa), TARDE, IQN Rational Mobile Agents and Systems of Agents (with Dresden), "Extensions au Logiciel Libre GNU Prolog" project (with INRIA), and the networks Network of Excellence in Computational Logic - CoLogNet, Network of Excellence in Inductive Logic Programming - ILPnet2.

CENTRIA members co-organized the following scientific meeting in this area:

- "3rd Workshop on Computational Logic in Multiagent Systems (CLIMA'02)", which took place in August at Copenhagen, Denmark, in conjunction with the FLOC'02 and ICLP'02 conferences, was co-chaired by João Leite, jointly with Jürgen Dix and Ken Satoh. It was then decided to form a Steering Committee for CLIMA workshops, João Leite being one of its founding members.

The following special journal issues were co-edited by us:

- M. O. Aciego, I. P. de Guzmán, G. Brewka and L. M. Pereira (eds.), Special issue on Logics in Artificial Intelligence, *Studia Logica* journal, 2002.
- J. Dix, J. Leite and K. Sato, Special issue on Computational Logic in Multi-Agent Systems, *Electronic Notes in Theoretical Computer Science*, 2002.

The international collaboration was strengthened and continued with U. California at Riverside, U. Ferrara, U. Bologna, U. Pisa, U. Malaga, U. Dresden, INRIA, and U. Linköping, through projects and visits, and witnessed in most cases by the publication of co-authored papers.

An American postdoc, Greg Wheeler, was hired for a year, starting in September 2002, specializing on Statistical Default Logic, to work on its connections to Uncertainty Reasoning. A German postdoc, Reinhard Kahle, was hired for a year, starting in April 2002, specializing in Proof Systems, to work on garbage collection in Updates. A new PhD student, Federico Banti from Pisa,

has started his thesis work with us in October 2002. Ongoing PhD and MSc theses proceeded according to plan. João Leite passed his PhD exam in July 2002, the thesis title being “Evolving Logic Programs” [53]. His thesis has since been published in book form by IOS Press. Agostinho Monteiro passed his MSc exam in September 2002 with a thesis on the application of Dynamic Logic Programming to Legal Reasoning.

The education and training aspects have been covered by our MSc in Applied AI, and a joint Distributed Masters in Computational Logic being put together in the context of CoLogNet. A workshop in Madrid in September 2002, on Education and Training was for that purpose co-organized by us for the European NoE CoLogNet.

During 2002, CENTRIA member José Alferes participated in several evaluation panels of European projects (Future and Emerging Technologies).

Part of our activities, in conjunction with the Intelligent Information Systems area, were related to the Semantic Web. Here, CENTRIA joined the RuleML initiative (<http://www.ruleml.org>). More important, CENTRIA is a major partner of a consortium which intends to submit a Network of Excellence proposal to the Sixth Framework Programme. In this topic we started the development of standard Prolog technology for parsing of XML documents, RuleML compilers and reasoning engines for this language. These can have a major impact in the community, and will be found in The W^4 Home Page (<http://centria.di.fct.unl.pt/~cd/projectos/w4/index.htm>). Furthermore, we envisage that rule systems in the Web will work together to answer to user’s queries and requests. This requires distributed reasoning capabilities of the kind we are investigating in the TARDE project. In particular several distributed strongly connected detection algorithms have been analyzed and benchmarked in order to select one for supporting the table completion mechanisms of the distributed system. We have also started the migration to JAVA implementation of our distributed tabling algorithms without default negation for the datalog subset of RuleML (i.e., programs without complex terms). The system will be available as Web Services communicating via SOAP messages. In a longer term, we also intend to implement the same system in the .NET architecture.

Due to the expected adoption of WFS as a major player semantics of RuleML, the impact of our more theoretical lines of research can be very significant. We’ve continued to explore our logic programming framework [5] in close cooperation with the group of Dept. Matemática Aplicada E.T.S.I. Informática da Universidade de Málaga, supported by the POLAR project. We have developed tabling procedures for special classes of residual logic programs, which are able to capture both fuzzy and probabilistic rule expert systems, and corresponding termination conditions (submitted for publication). We continued to address paraconsistency and reasoning in face of contradiction, resulting in paraconsistent and paracomplete versions of antitonic logic programs [21, 22]. An application of extended logic programming to diagnosis of cellular phone networks has also been published [8].

Mainly within the new project FLUX, foundational work on logic programming updates has been developed, and applications studied. This year, previous results have been consolidated (a survey paper was published as a book chapter [13], and an extended version of the paper defining the language LUPS has been published in the AI Journal [4]) and new foundational results were obtained. Namely: by the definition of the new language EVOLP which aims at combining, in a unified framework, knowledge about a domain, as well as knowledge about the domains evolution [24]; and by the extension to multi-dimensional updates [38, 37, 11]. The combination of updates and preferences, studied in the recent past by us, has been put to work by defining and implementing a compilation method combining these two reasoning mechanism [25]. An application of preferences to flexible query-answering as also been studied [33].

Applications of this foundational work have been pursued in the areas of legal reasoning and of multi-agent systems. We developed a prototype of a legal knowledge oracle server able to handle dynamic changes and multiple law sources. In the context of this server, laws can be produced by entities with different levels of priorities. The server, whose basis uses LP updates, is able to answer queries about what is valid in specific states, using the information received and the entities priorities. Regarding multi-agent systems we worked on the definition of agent architectures based

on languages of updates [16, 32], and on the computation of environment-aware agent behaviours [23]. In collaboration with U. Bologna, and combining our expertise on updates with theirs on logical representations of protocols for multi-agent systems, we started to investigate temporal evolution of logic based protocols for multi-agent systems, this appearing to be a fruitful subject.

Within the context of the projects COOPERATIVE and ABC, and related also to the area of Intelligent Information Systems, LP updates have been used to build a specialized agent able to handle dialog interactions between users and information retrieval systems [18, 42]. Additional work was done trying to use LP as a base framework for the representation and inference of semantic text knowledge [45, 46].

Regarding implementation of logic programming systems, AJACS project as started this year. We have been running into material difficulties as FCT has, as of April 2003, not yet transferred any funds. Up to this point, we have nonetheless been carrying out extensive benchmarking experiments to establish a plausible basis for the definition of an efficient computational model for AJACS, based on Distributed Shared Memory (DSM) systems.

The SIIUE project has been continuing to expand its scope, having spawned a new project proposal, submitted to the FC&T SAPIENS programme in March 2002, involving several CENTRIA researchers. SIIUE is based on the ISCO language, which integrates several paradigms around Logic Programming. Developments were made in 2002 which initiate the specification and implementation of a new language, ISTO, based on our previous work and making use of an improved form of Contextual Logic Programming together with Constraint reasoning which will lead to a powerful tool for the construction of real-world information systems. Work has also started in the direction of making ISTO an appropriate formalism in which to specify and implement agents in a Semantic Web setting.

The collaboration with INRIA centered on improvements to the GNU Prolog language implementation (which also happens to be the basis for ISCO and ISTO) started in 2002, having already produced a prototype for contextual logic programming. The project has been renewed for 2003.

1.2 Subarea: Intelligent Information Systems

This area research work was done in following topics: semantic web definition, tools for semantic web based integration of heterogeneous databases, intelligent agents for automatic classification of documents, definition of semantic web ontologies, and natural language dialogue systems for information retrieval from intelligent Information systems.

The research work was partly developed within the following projects: COOPERATIVE - Automatic Clustering and Visualization of Legal Documents in a Cooperative Information Retrieval Web System (POSI/40197/CHS/2001); ABC Intelligent Access to Legal Knowledge Bases (POSI-I&D in consortium ref. 6192); DIRPI - Development and Integration of Resources for Information Retrieval (ICCTI/CAPES bilateral project); SIIUE - Univ. Évora's Integrated Information System (funded by Univ Évora); TECA - Natural language interface to SIIUE (submitted to Sapiens in April 2001, still under evaluation); AJACS - Yet Another Java Constraint Programming System (POSI/40197/CHS/2002); Extensions au Logiciel Libre GNU Prolog (INRIA/ICCTI, April 2002).

International cooperation included the visit of Renata Vieira and Vera Lima to work in the development of computational resources for the Portuguese language; and Daniel Diaz to work on extensions to GNU Prolog. Pedro Patinho visited INRIA/Rocquencourt to work on the implementation of an initial version of multi-threaded GNU Prolog. Carlos Damásio visited Dagstuhl, Germany, to participate and to present an invited talk in the Seminar "Rule Markup Techniques for the Semantic Web", organized by H. Boley, B. Grosz, S. Tabet, and G. Wagner. Dagstuhl Seminar N^o 02061.

Carlos Viegas Damásio was invited to participate in the Dagstuhl seminar in Rule Markup Techniques. This supplied international contacts with groups working in areas related to the Semantic Web Activity of the World Wide Web Consortium (W3C). As immediate outcome of this participation, CENTRIA joined the RuleML initiative (<http://www.ruleml.org>). More important, CENTRIA is a major partner of a consortium which intends to submit a Network of Excellence proposal to the Sixth Framework Programme. Therefore, most of our last year activities were

related to the Semantic Web and addressed both practical and theoretical aspects.

We have developed more powerful modules for web information retrieval systems, this work was done mainly in the context of the dialog manager and the clustering process [18, 43, 35, 42]. In the context of the semantic enrichment of IR systems work has already produced some results and some papers were published [45, 46] and others are accepted to be published in 2003. In the context of the collaboration project, DIRPI, 3 missions were done between Brasil and Portugal and join work was produced. This work will be published in 2003 (1 paper was already accepted to be published).

We have been developing a logic programming based dialogue system that enables the access in natural language to a web law information retrieval system. The documents in the IR system are composed by the set of documents produced by the Portuguese Attorney General since 1940 extended with the Portuguese Supreme Courts Decisions. These documents were analyzed and an ontology describing their structure was defined. Then, they were automatically parsed and a (partial) semantic structure was created. The ontology and the semantic content was represented in OWL (Ontologie Web Language). The developed system has the capability of inferring user attitudes and due to the documents web semantics classification is able to reason using the documents semantic content.

The SIIUE project has been continuing to expand its scope, having spawned a new project proposal, submitted to the FC&T SAPIENS programme in March 2002, involving several CENTRIA researchers. SIIUE is based on the ISCO language, which integrates several paradigms around Logic Programming. Developments were made in 2002 which initiate the specification and implementation of a new language, ISTO, based on our previous work and making use of an improved form of Contextual Logic Programming together with Constraint reasoning which will lead to a powerful tool for the construction of real-world information systems. Work has also started in the direction of making ISTO an appropriate formalism in which to specify and implement agents in a Semantic Web setting.

A logic programming based dialogue system with the capability of inferring user attitudes and accessing heterogeneous external relational databases (the SIIUE) while doing syntactic and semantic sentence parsing is under development

Luis Quintano passed his MSc exam in June 2002 with a thesis on Natural Language queries to Data Bases, he continues his work as a Phd student.

Due to Universidade de Évora's initiative of restructuring *all* of its undergraduate study programmes, the board of directors of U. Évora funded a 1-year project based on SIIUE, entitled "SIIUE.sac: the Academic Information System", which involves several CENTRIA researchers and aims at the complete design and development of a new information system geared towards the meeting of academic information needs. This project is to take place entirely in 2003.

Besides, the SIIUE project will enter a new expansion phase in which several other related sub-projects are expected to start, some of which are applications while others are more research-oriented. The latter include the integration of Contextual Logic Programming (CxLP) concepts in ISCO and the development of language features to support: temporal information, schema evolution, reliable and convenient access control and semantic web integration.

During 2002, we started the development of standard Prolog technology for parsing of XML documents, RuleML compilers and reasoning engines for this language. These can have a major impact in the community, and will be found in The W^4 Home Page

(<http://centria.di.fct.unl.pt/~cd/projectos/w4/index.htm>).

A major open problem is the definition of semantics for rule systems and corresponding query engines. Due to the expected adoption of WFS as a major player semantics of RuleML, the impact of our more theoretical lines of research can be very significant. We've continued to explore our logic programming framework [5] in close cooperation with the group of Dept. Matemática Aplicada E.T.S.I. Informática da Universidade de Málaga, supported by the POLAR project. We have developed tabling procedures for special classes of residual logic programs, which are able to capture both fuzzy and probabilistic rule expert systems, and corresponding termination conditions (submitted for publication).

1.3 Subarea: Soft Computing and Constraints

In the area of constraint programming, we continued in 2002 our planned research in project Proteins, aiming at the determination of proteins 3D-structure, through three different directions. Firstly, following previous work on propagation and local search [10], Ludwig Krippahl has been developed a preliminary version of the handling of global distance constraints, where global means the global consideration of distances between a set of atoms, rather than through distance pairs. This version should be finalised in 2003. Secondly, the preparatory work on heuristics for the enumeration of the constraint propagation phase of the protein structure determination was finalised, and Marco Correia has produced a tool (and a report [52]) where the different heuristics that have been tested can be assessed. Thirdly, Jorge Cruz has completed a new general purpose propagator for non-linear constraints, that achieves consistency higher than the basic type of consistency provided for this kind of domains (e.g. box-consistency), global-hull consistency, has been completed by Jorge Cruz, has completed an algorithm for obtaining global ns results published in [31].

During this year Paula Amaral has finished her Ph.D. [50] and developed a technique to obtain optimal corrections for a set of unfeasible linear constraints, by a systematic search of sets of unfeasible constraints, for which the total least squares method are applied. She proved that this correction guarantees local optimal corrections and that the subsequent search, that can be used with tens of constraints (much more constraints makes analysis difficult, anyway). This method was presented and published at [26].

Francisco Azevedo also finished his Ph.D. during this year [51], finalising the development of a technique to obtain minimal input test patterns to diagnose digital circuits. He developed some variations of previous 5- and 9- valued logics, that proved quite useful to guide a process of local optimisation that is integrated with the constraint propagation and branch and bound optimisation previously used for this type of problems [28, 29]. This work will be the basis of CENTRIA participation on project PRACTIC, that was accepted by the FCT, and also involves a INESC team specialised in SAT solving.

It is worth mentioning that Pedro Barahona was granted the "Aggregation" degree by the University of Lisbon, by his overall academic work, summarising in the public examination much of the research done in the last few years in CENTRIA regarding the integration of constraint propagation and local search.

Work has started within the AJACS project, by carrying out extensive benchmarking experiments to establish a plausible basis for the definition of an efficient computational model for AJACS, based on Distributed Shared Memory (DSM) systems.

The SIIUE project has been continuing to expand its scope, having spawned a new project proposal, submitted to the FC&T SAPIENS programme in March 2002, involving several CENTRIA researchers. SIIUE is based on the ISCO language, which integrates several paradigms around Logic Programming.

Developments were made in 2002 which initiate the specification and implementation of a new language, ISTO, based on our previous work and making use of an improved form of Contextual Logic Programming together with Constraint reasoning which will lead to a powerful tool for the construction of real-world information systems. Work has also started in the direction of making ISTO an appropriate formalism in which to specify and implement agents in a Semantic Web setting.

The collaboration with INRIA centered on improvements to the GNU Prolog language implementation (which also happens to be the basis for ISCO and ISTO) started in 2002, having already produced a prototype for contextual logic programming. The project has been renewed for 2003.

In what concerns the Machine Learning focussed research, Nuno Marques has focussed research on three complementary areas. In Data Mining and Machine Learning several contacts have been established with IBM Portugal, regarding the use of the data mining package Intelligent Miner, namely to Text Mining problems. In another research line, pursued jointly with Veska Noncheva, a theoretical model for evaluating agent's statistical Agent's belief has also been proposed with possible applications in Text Mining when dealing with verbal sub categorisation. However is more general and should be studied in other Data Mining problems [40]. In Text Mining, work has continued on the development of the part-of-speech neural network tagger. Both the central

model has improved (pentagrams are now supported) and several preliminary studies have been pursued regarding the application of the tagger to specific application domains, namely in project Tradaut-PT and to the detection of addresses in web-pages. He also has started collaboration (see below) with Agnès Braud on extraction of relevant tokens from a corpus for Text and with Marco Castellani regarding evolutionary neural network training and optimisation.

In 2002 Susana Nascimento has finished her Ph.D. [54], where it has been proposed fuzzy clustering with proportional membership (FCPM) for mining typological classifications, based on a fuzzy clustering model of data generation from cluster structures. The FCPM framework involves a family of square-error clustering criteria and corresponding alternating optimisation algorithms, developed in a MatLab based platform, which offers a specifically designed data generator, a visualization tool and post-processing indices for clustering validation.

Still in the Machine Learning and Datamining domain, 4 Post-Doctoral Researchers (Agnès Braud, Marco Castellani, Chen Ning and Greg Wheeler) have started working in CENTRIA, supported by the Programatic Funding, and have been gradually integrated within the CENTRIA activities.

Agnès Braud has been working in two areas: the first, (in collaboration with Nuno Marques) on character based n-grams as a mean for extracting relevant tokens from a corpus for Text Mining purposes, avoiding some drawbacks of techniques based on word identification which uses words separators. This work is described in the technical report, submitted to KDD'03. The second area, following her Ph.D. work on GRIL (Genetic Relational Inductive Learner) , consists on the study of query optimisation techniques in order to improve the step of evaluating rules in some data mining systems.

The research of Marco Castellani focused on the evolutionary generation and training of Neural Network architectures. The work included the creation of several general purpose C++ classes for Neural Network implementation and their Gradient Descent and Evolutionary training. The experimental phase is close to completion, several different approaches were tested and analysed. In particular, the research focused on the self-adaptive tuning of the Evolutionary parameters.

Chen Ning research work includes two parts: self-organizing map (SOM) algorithms and Web service. In the first part, several fuzzy SOM algorithms are investigated for clustering and classification. SOM is also used for image analysis to solve a shape detection problem in a real world application. The experiments and technical reports are in progress. In the second part, a paper concerning distributing data mining based on web service will be published in the proceedings of an international workshop in April.

Despite her leave from Portugal, Gabriela Guimarães has still been working in this area, and has continued the application of machine learning techniques to the interpretation of medical data, in the areas of sleep apnea and protein structure [15].

2 List of ongoing projects in 2002

Name	RRA - Rational and Reactive Agents
Status	Ongoing
Funding Institution	ICCTI
Funding for 2002	3.000 (our part)
Principal researcher	Luís Moniz Pereira (national part)
Participants (ours)	José Júlio Alferes, Carlos Damásio, João Leite
Description	The objective of this proposal is precisely to define a simple, logic-based model for developing agents featuring rational-reactive behaviour. The effectiveness of the proposed approach will be demonstrated by applying it to Internet-based multi-agent systems, such as in business-to-business e-commerce and in security policy settings.
Results	2 publications, 1 prototype and 1 visit in 2002.

Name	ILPnet2 - the Network of Excellence in Inductive Logic Programming
Status	Ongoing
Funding Institution	EU-IST
Funding for 2002	500 (our part)
Principal researcher	Luís Moniz Pereira (national part)
Participants (ours)	CENTRIA
Description	Development and use of Inductive Logic Programming for Machine Learning.
Results	Participation in network activities.
Name	IQN (International Quality Network) - Rational Mobile Agents and Systems of Agents
Status	Ongoing
Funding Institution	German DAAD
Funding for 2002	2.000 (our part)
Principal researcher	Luís Moniz Pereira (national part)
Participants (ours)	CENTRIA
Description	Centered around the research on Rational Mobile Agents and Systems we aim at amplification and strengthening of cooperation among the partners of the IQN, where special attention will be given to the fostering of young scientists. This shall be accomplished by the following measures: Further development of the International Masters Programme in Computational Logic aiming at the creation of a distributed Masters Programme; Joint supervision of Ph.D. theses within international cooperations ; Mutual exchange of professors, post-docs, Ph.D. students and master students in order to amplify education, research and lecturing ; Joint cooperation for the acquisition of further scientific research projects .
Results	2 visits in 2002.
Name	CoLogNet - European Network of Excellence in Computational Logic
Status	Ongoing
Funding Institution	EU-IST
Funding for 2002	21.000 (our part)
Principal researcher	Luís Moniz Pereira (national part)
Participants (ours)	CENTRIA
Description	Computational Logic has outgrown its humble beginnings and early expectations by far: with close to ten thousand people working worldwide in research and development of logic-related methods, with several dozen international conferences and workshops and more than one hundred international and national scientific societies related to research in logic addressing the growing richness and diversity of the field, and with the foundational role and importance these methods now assume in mathematics, computer science, artificial intelligence, cognitive science, linguistics and many engineering fields –where logic-related techniques are used inter alia to state and settle correctness issues – the field has diversified in ways that the pure logicians working in the early decades of the last century could have hardly anticipated. http://www.eurice.de/colognet/ .
Results	Participating in the Executive Council. Setting up of a distributed master in Computational Logic with T.U.Dresden. Participation in network activities.

Name	PROTEIN: Improving Constraint Solving to Predict Protein Structure
Status	Ongoing
Funding Institution	Fundação para a Ciência e Tecnologia
Funding for 2002	18000
Principal researcher	Pedro Barahona
Participants	Ludwig Krippahl, Jorge Cruz, Marco Correia
Description	The project aims at developing advanced computing techniques, focussing in constraint programming, and to show how their integration with other techniques such as automated learning and meta-heuristics optimisation, can be used to solve a very important problem: the determination of protein structure from Nuclear Magnetic Resonance (NMR) spectroscopy
Results	2 Publications ([10, 31]) , an internal report ([52])
Name	PRACTIC: Processing and Reuse of Advanced Computational Techniques to Improve Constraint Solving
Funding Institution	Fundação para a Ciência e Tecnologia
Funding for 2002	0
Principal researcher	Pedro Barahona
Participants	Ludwig Krippahl, Jorge Cruz, Marco Correia
Description	The project aims at improving the resolution of constraint solving problems (possibly with some optimising function) involving variables in discrete domains, through Boolean satisfaction (SAT) and constraint propagation over finite domains (CP), exploiting features such as machine learning and randomisation, and synergies between the two different approaches.
Results	Not Applicable
Name	FLUX
Status	Started.
Start Date	2002
End Date	2005
Budget in 2002	22.053 Euro
Funding Institution	POSI
Principal researcher	José Alferes
Participants	CENTRIA and Declarativa - Serviços de Informática Lda.
Description	Started in March 2002, this project aims at establishing a flexible declarative language for the specification of dynamic knowledge, and to apply it to realistic application domains. During the first months of the project steps have been taken in the definition and prototypical implementation of that language, and experimentation was made in applying it to the domains of legal reasoning and of rational agents
Results	Various publication in conferences and journals, and the organization of a workshop

Name	TARDE - Tabulation And Reasoning in a Distributed Prolog Environment
Status	Ongoing.
Funding Institution	POSI
Start Date	2001
End Date	2004
Budget in 2002	approx. 10000 Euro
Principal researcher	Carlos Viegas Damásio
Participants	CENTRIA/UNL and CITI/UNL
Description	The combination of tabling systems, reasoning systems and distributed programming is mandatory and promising. It is expected in this much-focused project to cross-fertilise the know-how in the implementation of PROLOG distributed systems with the know-how in tabling systems and reasoning techniques. This will result in building an advanced and efficient portable distributed logic programming system, incorporating the most recent semantical and operational techniques currently available. The initial 2 year project has been extended in order to achieve its objectives. Our focus is now the development of tools for the Semantic Web.
Results	2 journal papers, 4 conference papers, and 2 software libraries.
Name	POLAR
Status	Ongoing.
Start Date	2002
End Date	2003
Budget in 2002	1100 Euro
Funding Institution	Integrated actions of CRUP/Ministerio de Ciencia y Tecnologia.
Principal researcher	Carlos Viegas Damásio (portuguese side)
Participants	DI/FCT/UNL and Dept. Matemática Aplicada E.T.S.I. Informática da Universidade de Málaga.
Description	Started on November 2001, a cooperation research project on the integration of residuated logic programming with multi-adjoint logic program, competing proposals for the semantics of logic programs dealing with uncertainty, namely fuzzy and probabilistic reasoning.
Results	Two publications have been produced and submitted
Name	COOPERATIVE - Automatic Clustering and Visualization of Legal Documents in a Cooperative Information Retrieval Web System.
Status	Ongoing
Funding Institution	FCT/MCES
Principal researcher	Paulo Quaresma
Participants	Salvador Abreu, Irene Rodrigues, Fernando Moura Pires, Teresa Gonçalves, Luis Rosário, 1 scholarship student
Description	This project aims to build a cooperative web IR system applying knowledge representation, classification and clustering techniques to legal documents. Moreover, documents will be transformed from standard text bases to semantic web texts (OWL).
Results	4 papers and 2 visits in 2002.

Name	ABC – Intelligent Access to Knowledge Bases
Status	Ongoing (started in October 2002)
Funding Institution	Agência de Inovação
Principal researcher	Paulo Quaresma
Participants	Irene Rodrigues, 1 scholarship student
Description	Development of an agent-based architecture composed by specialized interaction and information retrieval agents.
Results	
Name	DIRPI – Desenvolvimento e Integração de Recursos para a Pesquisa de Informação
Status	Ongoing
Funding Institution	GRICES/CAPES
Principal researcher	Paulo Quaresma
Participants	Renata Vieira (UNISINOS/Br)
Description	Develop natural language processing tools for the Portuguese language in order to increase the power of information retrieval systems.
Results	2 papers and 3 visits in 2002.
Name	AJACS – Yet Another Java Constraint Programming System
Status	Started in July 2002
Funding Institution	FCT SAPIENS (POSI)
Principal researcher	Salvador Abreu
Participants	Irene Rodrigues Lígia Ferreira
Description	This project aims at developing a dialect for the Java programming language, implementing the Constraint Programming paradigm over a distributed network of inexpensive workstations. We will develop a model for the representation of CSPs (Constraint Satisfaction Problems), susceptible of being efficiently implemented in a network-aware object-oriented programming language, such as Java. This model will be the object of a prototype implementation on a distributed system made up of a cluster of 16 nodes, which will extend the presently existing cluster of 8 nodes. There will be two prototypes: a sequential and a parallel one. The system will also be used to prototype a class scheduling application, based on real-world data: University of Évora’s Integrated Information System.
Results	none yet.
Name	Extensions au Logiciel Libre GNU Prolog
Status	Started in April 2002
Funding Institution	INRIA/ICCTI
Principal researcher	Salvador Abreu
Participants	Pedro Patinho
Description	This project will lead to the development of several extensions to the GNU Prolog implementation, originally developed at INRIA. Planned enhancements include a novel approach to Contextual Logic Programming (CxLP), a multi-threading implementation and a graphical user-interface system.
Results	none yet.

Name	SIUE – Universidade de Évora’s Integrated Information System
Status	Ongoing
Funding Institution	Universidade de Évora
Principal researcher	Salvador Abreu
Participants	Lígia Ferreira
Description	Design and implementation of a logic language to build web-based information systems, featuring transparent use of heterogeneous databases. Application to the administrative, academic and scientific management of the University.
Results	4 publications and several prototypes in 2002.
Name	GODE – Gestão dos Órgãos e Deputados Eleitos da Assembleia da República
Status	Ongoing
Funding Institution	Portuguese Parliament
Funding for 2002	15000 Euro
Principal researcher	Joaquim Nunes Aparício
Participants	Prof Fernando Abreu, 2 graduate Students, 1 undergraduate student
Description	Design, development and Implementation of a Database system for management of the daily activity (meetings) of the deputies in the Portuguese Parliament.

3 List of M.Sc. and Ph.D. students and topics in 2002

3.1 M.Sc. Students

Name	Miguel Bento Alves
Degree	M.Sc.
Supervisor	Carlos Viegas Damásio
Topic	Distributed tabled query evaluation of logic programs
Start date	March 2001
Finish date	March 2004 (expected)
Name	Marco Correia
Degree	M.Sc.
Supervisor	Pedro Barahona
Topic	Study of Heuristics for the Protein Structure Prediction Problem
Start date	October 2002
Finish date	October 2003 (expected)
Name	Joaquim Godinho
Degree	MSC.
Supervisor	Salvador Abreu
Topic	
Start date	June 2001
Finish date	September 2003 (expected)
Name	David Mendes
Degree	MSC.
Supervisor	Salvador Abreu
Topic	Integration of Prolog and Java
Start date	June 2001
Finish date	September 2003 (expected)

Name	Agostinho Monteiro
Degree	M.Sc.
Supervisor	Luís Moniz Pereira
Topic	Aplicação da Programação em Lógica Dinâmica ao Raciocínio Legal - O caso da Protecção Fitossanitária de Vegetais
Start date	Março 2001
Finish date	September 2003
Name	Pedro Patinho
Degree	MSC.
Supervisor	Salvador Abreu
Topic	Extensions to the GNU Prolog system
Start date	December 2002
Finish date	December 2003 (expected)
Name	Luis Quintano
Degree	M.Sc.
Supervisor	Irene Pimenta Rodrigues
Topic	Acesso a Bases de Dados em Língua Natural
Start date	October 2002
Finish date	June 2002
Name	Luis Rosário
Degree	M.Sc.
Supervisor	Paulo Quaresma
Topic	Resolução de anáforas e o seu impacto em sistemas de pesquisa de informação
Start date	October 2002
Finish date	October 2003
Name	José Saias
Degree	M.Sc.
Supervisor	Paulo Quaresma
Topic	Utilização de informação semântica em sistemas de pesquisa de informação
Start date	October 2002
Finish date	December 2003
Name	João Silva
Degree	M.Sc.
Supervisor	Joaquim N. Aparício
Topic	Object Oriented Databases
Start date	2009
Finish date	(expected) 2003
Name	Leonilde Varela
Degree	M.Sc.
Supervisor	Joaquim N. Aparício
Topic	XML and WebServices for Scheduling Problems
Start date	2001
Finish date	(expected) 2003

3.2 Ph.D. Students

Name	João Fernando Lima Alcântara
Degree	Ph.D.
Supervisor	Carlos Viegas Damásio and Luís Moniz Pereira
Topic	Abduction and Belief Revision in Uncertain Logic Programming Systems
Start date	September 2001
Finish date	September 2005 (expected)
Name	Iara de Almeida
Degree	Ph.D.
Supervisor	José Alferes
Topic	Argumentation and cooperation in multi-agent logic programming systems, with application to distributed diagnosis
Start date	October 1997
Finish date	June 2003 (Expected)
Name	Paula Amaral
Degree	Ph.D.
Supervisor	Pedro Barahona
Topic	Contribution to the Study of Inconsistent Linear Systems
Start date	October 1997
Finish date	May 2002
Name	Francisco Azevedo
Degree	Ph.D.
Supervisor	Pedro Barahona
Topic	Constraint Solving over Multivalued Logics: Application to Digital Circuits
Start date	October 1998
Finish date	July 2002
Name	Jorge Cruz
Degree	Ph.D.
Supervisor	Pedro Barahona
Topic	Non-linear Constraints over Continuous Domains Including Differential Equations
Start date	October 1997
Finish date	May 2003 (expected)
Name	Lígia Ferreira
Degree	Ph.D.
Supervisor	Salvador Abreu
Topic	Constraint Programming Toolkits for Parallel Execution
Start date	June 1999
Finish date	December 2003 (expected)
Name	Ludwig Krippahl
Degree	Ph.D.
Supervisor	Pedro Barahona (co-supervisor)
Topic	Spatial Constraint Solving and its Application in Protein Structure Determination
Start date	October 1999
Finish date	September 2003 (expected)
Name	João Leite
Degree	Ph.D.
Supervisor	Luís Moniz Pereira
Topic	Evolving Knowledge Bases
Start date	October 1997
Finish date	October 2002

Name	Susana Nascimento
Degree	Ph.D.
Supervisor	Fernando Moura Pires (Universidade de Évora, Portugal Boris Mirkin (Birkbeck College, University of London, UK)
Title	Contact Element at CENTRIA Luís Moniz Pereira
Start date	Fuzzy Clustering via Proportional Membership Model
Finish date	October 1996
	October 2002
Name	Vítor Nogueira
Degree	Ph.D.
Supervisor	Salvador Abreu and Gabriel David (Faculty of Engineering, University of Porto)
Topic	Constraint and Logic Languages for Heterogeneous Database Systems
Start date	October 2001
Finish date	December 2004 (expected)
Name	Valéria Pequeno
Degree	Ph.D.
Supervisor	Joaquim N. Aparício
Topic	Object Oriented Data Warehousing
Start date	2001
Finish date	(expected) 2005
Name	Luis Quintano
Degree	Phd
Supervisor	Irene Pimenta Rodrigues
Topic	Natural Language Dialogues for IR from BD
Start date	October 2003
Finish date	June 2006 (expected)
Name	João Paulo Santos
Degree	Ph.D.
Supervisor	Joaquim N. Aparício
Topic	Relational Data Bases
Start date	1997
Finish date	
Name	Jorge Simão
Degree	Ph.D.
Supervisor	Luís Moniz
Topic	Computational Modeling and Simulation of Human Social Behavior
Start date	September 2001
Finish date	September 2005 (expected)

4 Publications

4.1 Edited books and journal special issues

- [1] M. O. Aciego, I. P. de Guzmán, G. Brewka, and L. M. Pereira, editors. *Special issue on Logics in Artificial Intelligence*. Studia Logica Journal, 2002.
- [2] J. Dix, J. A. Leite, and K. Satoh, editors. *Computational Logic in Multi-Agent Systems: 3rd International Workshop, CLIMA'02, Copenhagen, Denmark, August 1, 2002, Proceedings*, number 93 in Datalogiske Skrifter (Writings on Computer Science). Roskilde University, Denmark, 2002.
- [3] J. Dix, J. A. Leite, and K. Satoh, editors. *Computational Logic in Multi-Agent Systems: 3rd*

4.2 In International Journals

- [4] J. J. Alferes, L. M. Pereira, H. Przymusinska, and T. C. Przymusinski. Lups - a language for updating logic programs. *Artificial Intelligence*, 138(1-2), 2002.
- [5] C. V. Damásio and L. M. Pereira. Hybrid probabilistic logic programs as residuated logic programs. *Studia Logica*, 72(1):113–138, 2002.
- [6] P. Dell’Acqua, Ulf Nilsson, and L. M. Pereira. A logic based asynchronous multi-agent system. *Electronic Notes in Theoretical Computer Science*, 70(5), 2002.
- [7] J. Dix, J. A. Leite, and K. Satoh. A report on the 2002 workshop on computational logic in multi-agent systems (clima’02). *The Association for Logic Programming Newsletter*, 15(3), 2002.
- [8] P. Froehlich, W. Nejdl, M. Schroeder, C. V. Damásio, and L. M. Pereira. Using extended logic programming for alarm-correlation in cellular phone networks. *International Journal of Applied Intelligence*, 17(2):187–202, 2002.
- [9] Reinhard Kahle. Mathematical proof theory in the light of ordinal analysis. *Synthese*, 133(1-2):237–255, 2002.
- [10] L. Krippahl and P. Barahona. Psico: Solving protein structures with constraint programming and optimisation,. *Constraints*, *Kluwer Academic Press*, 7(3/4):317–331, July/October 2002.
- [11] J. A. Leite, J. J. Alferes, L. M. Pereira, H. Przymusinska, and T. C. Przymusinski. A language for multi-dimensional updates. *Electronic Notes in Theoretical Computer Science*, 70(5), 2002.
- [12] Volker Peckhaus and Reinhard Kahle. Hilbert’s paradox. *Historia Mathematica*, 29(2):157–175, 2002.

4.3 Book chapters

- [13] J. J. Alferes and L. M. Pereira. Logic programming updating - a guided approach. In A. Kakas and F. Sadri, editors, *Logic Programming into the Future - Essays in honour of Robert Kowalski*, volume 2408 of *LNAI*, pages 382–412. Springer-Verlag, 2002.
- [14] M. Bruynooghe, L. M. Pereira, J. Siekmann, and M. van Emden. A portrait of the scientist as a computational logician. In A. Kakas and F. Sadri, editors, *Logic Programming into the Future - Essays in honour of Robert Kowalski*, volume 2407 of *LNAI*, pages 1–4. Springer-Verlag, 2002.
- [15] G. Guimarães and W. Urfer. Self-organizing maps and its applications in sleep apnea research and classification in protein sequences. In O. Optiz and M. Schwaiger, editors, *Exploratory Data Analysis in Empirical Research, Studies in Classification, Data Analysis and Knowledge Organisation*. Springer-Verlag, Heidelberg, 2002.
- [16] J. A. Leite, J. J. Alferes, and L. M. Pereira. Minerva - a dynamic logic programming agent architecture. In J. J. Meyer and M. Tambe, editors, *Intelligent Agents VIII — Agent Theories, Architectures, and Languages*, volume 2333 of *LNAI*, pages 141–157. Springer-Verlag, 2002.
- [17] L. M. Pereira. Philosophical incidence of logical programing. In Gabbay et al, editor, *Handbook of the Logic of Argument and Inference*, volume 1 of *Studies in Logic and Practical Reasoning*, pages 425–448. Elsevier Science, 2002.

4.4 In Proceedings of International Conferences

- [18] S. Abreu, P. Quaresma, L. Quintano, and I. Rodrigues. A natural language dialogue manager for accessing databases. In E. Ranchhod and Nuno Mamede, editors, *PorTAL – Proceedings of the 3rd International Conference on Natural Language Processing*, Lecture Notes in Artificial Intelligence LNCS/LNAI 2389, University of Algarve, Faro, Portugal, June 2002. Springer-Verlag.
- [19] Salvador Abreu. Modeling Role-Based Access Control in ISCO. In Lígia Maria Ribeiro and José Marques dos Santos, editors, *The 8th International Conference of European University Information Systems*. FEUP Edições, June 2002. ISBN 972-752-051-0.
- [20] Salvador Abreu, Paulo Quaresma, Luis Quintano, and Irene Rodrigues. A Natural Language Dialogue Manager for Accessing Databases. In Elisabete Ranchod and Nuno J. Mamede, editors, *Advances in Natural Language Processing, Third International Conference, PorTAL 2002, Faro, Portugal, June 23-26, 2002, Proceedings*, volume 2389 of *Lecture Notes in Computer Science*. Springer-Verlag, 2002.
- [21] J. L. Alcântara, C. V. Damásio, and L. M. Pereira. Paraconsistent logic programs. In S. Flesca and G. Ianni, editors, *Proceedings of Logics In Artificial Intelligence, 8th European Conference (JELIA2002)*, Lecture Notes in Artificial Intelligence 2424, pages 345–356, Cosenza, Italy, September 2002. Springer.
- [22] J. L. Alcântara, C. V. Damásio, and L. M. Pereira. Paraconsistent logic programs. In *Workshop on Paraconsistent Logics of ESSLLI'2002*, Trento, Italy, August 2002. CLE e-Prints Vol 2(7).
- [23] J. J. Alferes, A. Brogi, J. A. Leite, and L. M. Pereira. Computing environment-aware agent behaviours with logic program updates. In A. Pettorossi, editor, *Proceedings of the Eleventh International Workshop on Logic-based Program Synthesis and Transformation LOPSTR'01*, volume 2372 of *LNCS*, pages 216–232. Springer, 2002.
- [24] J. J. Alferes, A. Brogi, J. A. Leite, and L. M. Pereira. Evolving logic programs. In S. Flesca, S. Greco, N. Leone, and G. Ianni, editors, *Proceedings of the 8th European Conference on Logics in Artificial Intelligence (JELIA'02)*, volume 2424 of *LNAI*, pages 50–61. Springer-Verlag, 2002.
- [25] J. J. Alferes, P. Dell'Acqua, and L. M. Pereira. A compilation of updates plus preferences. In S. Flesca, S. Greco, N. Leone, and G. Ianni, editors, *Proceedings of the 8th European Conference on Logics in Artificial Intelligence (JELIA'02)*, volume 2424 of *LNAI*, pages 62–73. Springer-Verlag, 2002.
- [26] Amaral and P. Barahona. On optimal correction of inconsistent linear constraints. In Pascal Van Hentenryck, editor, *Principles and Practice of Constraint Programming, CP'2002 (Procs.)*, volume 2470 of *Lecture Notes in Computer Science*, pages 33–46. Springer, September 2002.
- [27] Joaquim Nunes Aparício, Leonilde Varela, and Carmo Silva. Share your (scheduling) problems. In J. C. Carvalho, J. R. Menezes, E. Reis, and R. C. Pinto, editors, *6th World MultiConference on Systemics, Cybernetics and Informatics*, Orlando, Florida, USA, 2002. International Institute of Informatics and Systemics (IIIS).
- [28] F. Azevedo and P. Barahona. Constraint programming and local search with multi-valued logics for optimisation of test patterns. In *Procs. of ETW'02, IEEE European Test Workshop*, pages 11–12, Corfu, Greece, May 2002.
- [29] F. Azevedo and P. Barahona. Using multi-valued logics to model digital circuits problems. In *First International Workshop on Constraints in Formal Verification, colocated with CP'02*, Cornell Un., Ithaca, NY, USA, Sept. 8 - 13 2002. J. Marques-Silva, P. Jackson, K. Sakallah, T. Walsh.

- [30] Miguel Calejo, Mário Araújo, Sónia Mota Araújo, and Nuno Soares. Web application maker: a model-based approach to web database development. In José Braz, Mario Piattini, and Joaquim Filipe, editors, *Procs of the 4rd International Conference on Enterprise Information Systems*, Ciudad Real, Spain, April 2002. ICEIS Press. ISBN 972-98050-6-7.
- [31] J. Cruz and P. Barahona. Maintaining global-hull consistency with local search for continuous cps. In *First International Workshop on Global Constrained Optimization and Constraint Satisfaction, Cocos'02*, October 2002.
- [32] P. Dell'Acqua, Ulf Nilsson, and L. M. Pereira. A logic based asynchronous multi-agent system. In J. Dix, J. A. Leite, and K. Satoh, editors, *Computational Logic in Multi-Agent Systems: Proceedings of the 3rd International Workshop, CLIMA'02*, number 93 in Datalogiske Skrifter (Writings on Computer Science), pages 63–78. Roskilde University, Denmark, 2002.
- [33] P. Dell'Acqua, L. M. Pereira, and A. Vitoria. User preference information in query answering. In Ami Motro and Troels Andreassen, editors, *Fifth International Conference on Flexible Query Answering Systems (FQAS'02)*, LNAI 2522, pages 163–173, Copenhagen, Denmark, October 27 - 29 2002. Springer.
- [34] J. Dix, J. A. Leite, and K. Satoh. Preface. In J. Dix, J. A. Leite, and K. Satoh, editors, *Computational Logic in Multi-Agent Systems: 3rd International Workshop, CLIMA'02, Copenhagen, Denmark, August 1, 2002, Proceedings*, number 93 in Datalogiske Skrifter (Writings on Computer Science), pages iii–v. Roskilde University, Denmark, 2002.
- [35] P. Gamallo, A. Agustini, P. Quaresma, and G. Lopes. Using semantic word classes in text information retrieval systems. In R. Vieira, editor, *SBIE'2002 – XII Simpósio Brasileiro de Informática na Educação, Workshop de Ontologias*, Porto Alegre, Brasil, 2002. Unisinos.
- [36] E. Lamma, L. M. Pereira, and F. Riguzzi. Belief revision via lamarckian evolution. In Claudio Delrieux, editor, *Second International Workshop on Computation Models of Scientific Reasoning and Applications (II CMSRA) online proceedings, <http://www.lip.uns.edu.ar/cmsra/>, held at IC-AI 2002 Conference*, Monte Carlo Resort, Las Vegas, Nevada, USA, June 27 2002.
- [37] J. A. Leite, J. J. Alferes, L. M. Pereira, H. Przymusinska, and T. C. Przymusinski. A language for multi-dimensional updates. In J. Dix, J. A. Leite, and K. Satoh, editors, *Computational Logic in Multi-Agent Systems: Proceedings of the 3rd International Workshop, CLIMA'02*, number 93 in Datalogiske Skrifter (Writings on Computer Science), pages 19–34. Roskilde University, Denmark, 2002.
- [38] J. A. Leite, J. J. Alferes, L. M. Pereira, H. Przymusinska, and T. C. Przymusinski. A language for updates with multiple dimensions. In J. J. Moreno-Navarro and J. M. Carballo, editors, *Procs. of the APPIA-GULP-PRODE'02 Joint Conference on Declarative Programming (AGP'02)*, pages 325–341. Facultad de Informática de Madrid, 2002.
- [39] Vitor Beires Nogueira, Salvador Abreu, and Gabriel David. Towards Temporal Reasoning in ISCO. In *Proceedings of AGP'02*, Madrid, Spain, 2002. FI/UPM.
- [40] Veska Noncheva and Nuno Marques. Agent's belief: A stochastic approach. In Hendrik Blockee and Marc Denecker, editors, *Proceedings of the 14th Belgian-Dutch Conference on Artificial Intelligence (BNAIC'02)*, pages 227–234, Leuven, October 2002.
- [41] L. M. Pereira. On philosophical incidences of logic programming. In Claudio Delrieux, editor, *Second International Workshop on Computation Models of Scientific Reasoning and Applications (II CMSRA) online proceedings, <http://www.lip.uns.edu.ar/cmsra/>, held at IC-AI 2002 Conference*, Monte Carlo Resort, Las Vegas, Nevada, USA, June 27 2002.
- [42] Paulo Quaresma and Irene Pimenta Rodrigues. A dialogue manager for semantic web documents. In *ICON'2002 - International Conference on Natural Language Processing*, Bombaim, India, Dezember 2002.

- [43] Paulo Quaresma and Irene Pimenta Rodrigues. Intelligent clustering as source of knowledge for a web dialogue manager in an information retrieval system. In P. Szczepaniak, J. Segovia, J. Kacprzyk, and L. Zadeh, editors, *Intelligent Exploration of the Web*, Studies in Fuzziness and Soft Computing, pages 166–180. Springer-Verlag, November 2002.
- [44] Luís Quintano, Gonalo Marrafa, Joaquim Godinho, and Salvador Abreu. Logic Programming for Network Management. In *V Portuguese Computer Network and Applications Conference (CRC'02)*. FCCN, September 2002.
- [45] J. Saias and Paulo Quaresma. Construção automática de ontologias e sua utilização em sistemas de recuperação de informação em texto. In R. Vieira, editor, *SBIE'2002 – XII Simpósio Brasileiro de Informática na Educação, Workshop de Ontologias*, Porto Alegre, Brasil, 2002. Unisinos.
- [46] José Saias and Paulo Quaresma. Semantic enrichment of a web legal information retrieval system. In T. Bench-Capon, editor, *JURIX'2002 - Fifteenth Annual International Conference on Legal Knowledge and Information Systems*, London, UK, December 2002. IOS Press.
- [47] Leonilde Varela, Joaquim Nunes Aparício, and Carmo Silva. Developing a web scheduling system based on xml modeling. In V. Marik, L. M. Camarinha-Matos, and H. Afsarmanesh, editors, *Knowledge and Technology Integration in Product and Services Balancing Knowledge and Technology in Product and Service Life Cycle*, Lecture Notes in Computer Science Series, pages 61–70, London, 2002. Kluwer Academic Publishers.
- [48] Leonilde Varela, Joaquim Nunes Aparício, and Carmo Silva. Scheduling problems modeling with xml. In J. C. Carvalho, J.Ř. Menezes, E. Reis, and R.Č. Pinto, editors, *International Meeting for Research in Logistics*, pages 897–909, Lisbon, Portugal, 2002.
- [49] Leonilde Varela, Joaquim Nunes Aparício, and Carmo Silva. An xml knowledge base system for scheduling problems. In H. Unger, T. Boehme, and A. Mikler, editors, *Innovative Internet Computing Systems*, Lecture Notes in Computer Science Series, pages 63–74, Germany, 2002. Springer-Verlag.

4.5 Other publications

- [50] Paula Amaral. *Contribuições para o Estudo de Sistemas Lineares Inconsistentes*. PhD thesis, Universidade Nova de Lisboa, May 2002.
- [51] Francisco Azevedo. *Constraint Solving over Multi-valued Logics - Application to Digital Circuits*. PhD thesis, Universidade Nova de Lisboa, May 2002.
- [52] Marco Correia. A profiler for the csp solver of project proteina. Technical report, Department of Computer Science, FCT/UNL, 2002.
- [53] J. A. Leite. *Evolving Knowledge Bases - Specification and Semantics*. PhD thesis, New University of Lisbon, July 2002.
- [54] Susana Nascimento. *Fuzzy Clustering via Proportional Membership Model*. PhD thesis, Universidade Nova de Lisboa, October 2002.
- [55] Luís Jorge Catela Quintano. Acesso a bases de dados em língua natural. Master's thesis, Universidade de Évora, May 2002.

5 Missions

Salvador Abreu

- Paris, France, March 2002
Purpose: Visit to INRIA/Rocquencourt to initiate the collaboration in the framework of the INRIA/ICCTI-funded programme, aiming at the development of several extensions to the GNU Prolog system.
- Coimbra, Portugal, April 2002
Purpose: participation in the jury for the 5th National Logic Programming Contest/Meeting (CeNPL'02), organized for students of Portuguese Universities.
- Faro, Portugal, September 2002
Purpose: participation in the 5th Portuguese Conference on Computer Networking and Applications (CRC'02).
- Porto, Portugal, December 2002
Purpose: invited talk at the Faculty of Sciences of Universidade do Porto and contacts with the chair of APPIA (the Portuguese AI society) in preparation of the International Conference EPIA'03.
- Porto, Portugal, June 2002
Purpose: participation in the 11th International Conference on European University Information Systems (EUNIS'02).
- Faro, Portugal, June 2002
Purpose: participation in the Third International Conference on Advances in Natural Language Processing (PorTAL'02).

José Júlio Alferes

- Brussels, Belgium, January and March 2002
Purpose: Participation in evaluation panels of European projects in the area of “Future and Emerging Technologies”
- Cosenza, Italy, September 2002
Purpose: Participation in JELIA 2002, European Conference on Logics and Artificial Intelligence, and present joint papers.

João Lima Alcântara

- Trento, Italy, August 2002
Purpose: Participation in the Workshop on Paraconsistent Logics of the European Summer School on Logic Language and Information'2002. Attendance to the courses.
- Cosenza, Italy, September 2002
Purpose: Participation and presentation of a paper in the 8th European Conference on Logics In Artificial Intelligence (JELIA2002).

Pedro Barahona

- Ithaca, September
Purpose: Participation in CP'02, 8th nternational Conference on Principles and Practice of Constraint Programming.

Carlos Viegas Damásio

- Dagstuhl, Germany, February 2002
Purpose: Participation and presentation of an invited talk in the Seminar “Rule Markup Techniques for the Semantic Web”, organized by H. Boley, B. Grosz, S. Tabet, and G. Wagner. Dagstuhl Seminar N^o 02061.
- Trento, Italy, August 2002
Purpose: Participation and presentation of a paper in the Workshop on Paraconsistent Logics (WOPALO) of the European Summer School on Logic Language and Information'2002. Attendance to some of the advanced courses.

Pierangelo Dell'Acqua

- Copenhagen, Denmark, October 2002
Purpose: Participation in Fifth International Conference on Flexible Query Answering Systems (FQAS'02), and present a joint paper.
- Roskilde, Denmark, October 2002
Purpose: Participation in 3rd International Workshop on Computational Logic in Multi-Agent Systems, (CLIMA'02), and present a joint paper.

João Leite

- Dagstuhl, Germany, November 2002
Purpose: Participation in *Programming Multi Agent Systems based on Logic*, Dagstuhl Seminar 02481.
- Cosenza, Italy, Setembro 2002
Purpose: Participation in *8th European Conference on Logics in Artificial Intelligence (JELIA '02)*.
- Copenhagen, Denmark, Agosto 2002.
Purpose: Participation in *3rd Workshop on Computational Logic in Multiagent Systems (CLIMA '02)*.
- Copenhagen, Denmark, Agosto 2002.
Purpose: Participation in *19th International Conference on Logic Programming (ICLP'02)*. (CLIMA'02).
- Copenhagen, Denmark, Agosto 2002.
Purpose: Participation in *3rd Federated Logic Conference (FLoC'02)*. (CLIMA'02).

Nuno C. Marques

Leuven, Belgium, October 2002
Purpose: participation in the Fourteenth Belgium-Netherlands Conference on Artificial Intelligence (BNAIC'02).

Vítor Nogueira

- Madrid, Spain, September 2002
Purpose: participation in the International Conference on Declarative Programming (AGP'02).

Pedro Patinho

- Paris, France, September 2002
Purpose: Visit to INRIA/Rocquencourt to implement an initial version of multi-threaded GNU Prolog.

Luís Moniz Pereira

- Dresden, Germany, January 2002
Purpose: Participation in meeting of project IQN Rational Mobile Agents and Systems of Agents, giving a talk, and participation in a preparatory meeting of the European Distributed Master in Computational Logic of the European NoE CoLogNet (Computational Logic Network).
- Las Vegas, Nevada, USA, June 2002
Purpose: Participation in Second International Workshop on Computation Models of Scientific Reasoning and Applications (II CMSRA), and present a paper.
- Cosenza, Italy, September 2002
Purpose: Participation in JELIA 2002, European Conference on Logics and Artificial Intelligence, and present several joint papers.

- Madrid, Spain, September 2002
Purpose: Participation in the APPIA-GULP-PRODE'02 Joint Conference on Declarative Programming (AGP'02), and present a joint paper.
- Madrid, Spain, September 2002
Purpose: Participation in the Education and Training Workshop co-organized by him for the European NoE CoLogNet (Computational Logic Network).
- Madrid, Spain, October 2002
Purpose: Participation in the Executive Council meeting of the European NoE CoLogNet (Computational Logic Network).

Paulo Quaresma

- Faro, Portugal, June 2002
Purpose: Participation in PorTAL, 3rd International Conference on Natural Language Processing
- London, UK, December 2002
Purpose: Participation in JURIX, 15th Annual Conference on Legal Knowledge and Information Systems

Luís Quintano

- Faro, Portugal, June 2002
Purpose: Participation in PorTAL, 3rd International Conference on Natural Language Processing

Fabrizio Riguzzi

- Las Vegas, Nevada, USA, June 2002
Purpose: Participation in Second International Workshop on Computation Models of Scientific Reasoning and Applications (II CMSRA), and present a joint paper.

Irene Pimenta Rodrigues

- Faro, Portugal, June 2002
Purpose: Participation in PorTAL, 3rd International Conference on Natural Language Processing

José Saias

- Porto Alegre, Brasil, November 2002
Purpose: Participation in SBIE'2002, XII Simpósio Brasileiro de Informática na Educação.

Jorge Simão

- Monte Verità, Sweden, September 2002
Purpose: Participation in Workshop on Self-Organization, Evolution and Social Behavior, and present a joint paper.

6 Visitors

Federico Banti , University of Pisa, Italia, 3 months, October/December 2002. Collaboration in bilateral project GRICES-CNR.

Paolo Torroni , University of Bologna, 1 weeks, November 2002. Collaboration in developing a framework for the specification of logic programming based evolving protocols for multi-agent systems.

Pascal Hitzler , T.U. Dresden, Germany, 2 weeks, November 2002. Collaboration in the context of a joint bilateral project IQN Rational Mobile Agents and Systems of Agents, and giving talks.

Tom Dietterich , Oregon State University, September 2001. Collaboration in project Protein, to discuss the integration of machine learning in the enumeration phase of Constraint Satisfaction, through Learning Heuristic Functions.

Renata Vieira , UNISINOS, Porto Alegre, Brasil, 1 week, September 2002. Collaboration in the scope of the GRICES/CAPES DIRPI research project for the development of computational resources for the Portuguese language.

Manuel Ojeda-Aciego, University of Málaga, 1 week, September 2002.
Definition of tabulated proof procedures for residuated logic programming and termination properties for definite residuated logic programs.

Aida Vitória, University of Linköping, 2 weeks, July 2002.
Research on the encoding of rough sets querying languages into Answer Set Programming.

Pierangelo Dell'Acqua , University of Linköping, Sweden, 6 weeks, June/July 2002. Collaboration in the context of bilateral joint project, and national project FLUX.

Vera Lima , PUCRS, Porto Alegre, Brasil, 1 week, June 2002. Collaboration in the scope of the GRICES/CAPES DIRPI research project for the development of computational resources for the Portuguese language.

Daniel Diaz , University of Paris I and INRIA, 1 week, April 2002. Collaboration on extensions to GNU Prolog, supported by the bilateral cooperation programme with INRIA, be funded by ICCTI.

Reinahrd Kahle , University of Tübingen, Germany, 3 months, January/March 2002. Collaboration in national project FLUX.

Antonio Brogi, University of Pisa, 1 week, January 2002.
Collaboration in bilateral project

7 CENTRIA evolution graphics in 2002

