# CENTRIA Centro de Inteligência Artificial — UNL

Faculdade de Ciências e Tecnologia Universidade Nova de Lisboa Quinta da Torre, Monte da Caparica 2829-516 Caparica, Portugal

2001 Report of Activities2002 Planned Activities2002 Budget

Director: Luís Moniz Pereira

Other board members: José Alferes

Pedro Barahona Irene Rodrigues

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### 1 CENTRIA 2001 report of activities

The present report was unanimously approved by the Scientific Committee of CENTRIA in April, 2002. The plans approved in 2000 for 2001 were successfully carried out, as can be seen by comparing the plans with the present report: an overall quite positive evolution, as measured by output per PhD holder. The global indicators in the tables in Section 9 show, with respect to 2001, that:

- Regarding publications: The total number of publications was 54, compared to 69 in 2001, but several already accepted journal publications have delayed in appearing though already accepted. Even so, the number of journal publications increased from 9 to 11, which compensates for the lesser number of total publications, and corresponds to a greater stress and incentive having been made towards journal publications. The number of publications in collaboration decreased from 35 to 31 in absolute numbers, but in percentage of the number of publications there was actually an increase (from 51% to 57%). Those with international collaboration increased from 33% to 37%, showing a trend towards increased internationalization.
- Regarding projects: The number of ongoing projects in 2001 increased to 16 from 15 in 2000, but the number of international projects increased from 5 to 9, confirming the above mentioned internationalization trend. Because of the delay caused by the September 11 events in the USA, the evaluation of projects submitted in 2001 was delayed from September 2001 to March 2002. We are happy to report that, additionally to those mentioned, 4 new projects submitted in early 2001 were approved, and have already started.
- Event organization: This figure also shows a positive trend from 3 in 2000 to 5 in 2001, and again confirming the internationalization effort.
- Postgraduate students: The overall attraction of the centre for postgraduate students has improved, despite the fact that the MSc in AI did not open for new registrations in the past two years (it will reopen in 2002), though the MSc in Computer Science did open every year. Indeed, here was in 2001 an increase to 21 of ongoing PhD students (with 1 finishing), compared to 17 in the previous year (with 1 finishing). There was a marked increase in 2001 to 12 of the ongoing MSc students (with 1 finishing), compared to 5 in the previous year (with 2 finishing).

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

The 2001 budget was executed according to plan, including the programatic funding for equipment and library. The programatic funding for visitors was allocated, and announcements were posted for two visiting positions in 2001 in the Machine Learning and combined Machine Learning and Natural Language areas. Of these, the latter was filled by Dr Veska Noncheva, from Bulgaria, from September 1st onwards for a year. The other position has found candidates, but these can only start in 2002. However, a postdoc position was obtained from separate FCT funds for Dr Reinhard Kahle, from Germany, to start April 2002, in the area of formal proog theory applied to updates. 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.

Recall that the centre's Director had proposed to the University the setting up of a Council of Centres of the Faculty of Science and Technology, comprised of its 14 Directors, who elect a President amongst themselves, in order to help establish and administrate university policy towards the Centres. This committee has since been formally adopted by the Faculty and worded into its new statutes.

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

In the centre's board of directors, Gabriel Pereira Lopes was substituted at his request, having been replaced through election by Irene Pimenta Rodrigues.

The detailed rendition of each of the subareas' activities is to be found below. The plans for 2002, included, detail how they will develop.

A number of scientific bridges were pursued between the subareas, to reinforce the unity and cross-fertilization within the Centre. Namely, between KRR and NL, between SCC and KRR, and SCC and NL. The activities of 2001 and the plans for 2002 further detail the construction of these bridges.

In July 2001, the centre's director was made a fellow of ECCAI, the European Coordinating Committee on Artificial Intelligence.

# 1.1 Subarea: Knowledge Representation and Reasoning, and Logic Programming

CENTRIA's "Knowledge Representation and Reasoning, and Logic Programming" area focused its activities in 2001 on the following main topics: foundational research in the area of rational computational logic agents, logic programs and knowledge base updates; a general framework for integrating several reasoning forms (including fuzzy-logic, possibilistic logic, probabilistic systems, and non-monotonic logics); distributed tabling and revision systems; computational models and their implementation for a parallel and distributed logic programming language.

One member (Luís Moniz Pereira) was elected a "Fellow of the European AI Society".

Dissemination of results continued to be an important concern, and there was an increase in publications on the previous year. In this respect, 26 papers were published in this subarea in 2001: 2 in international journals, 5 in national journals, 11 in proceedings commercially distributed, 8 in other proceedings. Of all publications 31% comprised international cooperation authorship.

Two scientific meetings in this area were organized by CENTRIA members:

- "Joint Conference on Declarative Programming AGP'01", which took place in Évora, organized and chaired by Paulo Quaresma and Luís Moniz Pereira. This conference, co-sponsored by FCT under program FACC, aims to join researchers from Portugal, Spain, Italy, and Latin America and to improve the knowledge of the state of the art of declarative programming and to show the ongoing research done.
- "Logic Programming for Artificial Intelligence and Information Systems", a thematic workshop of EPIA'01 (Portuguese Conference on Artificial Intelligence), which took place in Porto, organized and chaired by Salvador Abreu and José Alferes.

The international collaboration was strengthened and continued with U. California at Riverside, U. Ferrara, U. Bologna, U. Pisa, U. Malaga, U. Dresden, and INRIA, through projects and visits. New PhD and MSc students were accepted, and one postdoc scholarship was obtained for Dr Reinhard Kahle from Tübingen, starting beginning of April 2002. Ongoing PhD and MSc theses proceeded according to plan. And we are involved with teaching at the MSc in Informatics Engineering.

Ongoing foundational research in the area of rational computational logic agents was continued and strengthened. Namely, with respect to agent functionalities, and their combination, such as abduction, preferences, environment awareness, genetic learning, and self and mutual updating [22, 47, 46, 41, 42, 35, 34, 33]. Also investigated with significant success were evolving agent architectures and multi-agent systems [6, 45, 32]. In all cases theory, procedures, implementation, and applications were explored.

The sizeable project MENTAL, in the area of rational computational logic agents, having come to an end at the close of 2000, new projects were started or proposed:

• FLUX project proposal – This 3-years POCTI/FCT project proposal has been approved and will start in 2002. FLUX has the goal of establishing a flexible declarative language for the

specification of dynamic knowledge, and to apply it to realistic application domains. The application domains to be studied within FLUX, besides that of rational agents, are those of legal reasoning and software specification languages.

- COOPERATIVE project proposal This POCTI/FCT project proposal has also been approved to start in 2002. Related to this subarea, the project aims at applying the LP framework to the construction of specialized agents in the context of legal information retrieval systems,
- SIPOGE project proposal This "Agência de Inovação" project proposal still under evaluation aims at applying the LP paradigm to the problem of automatically generating and updating emergency plans in the context of the "Serviço Nacional de Protecção Civil".

Following up on the topics of MENTAL, two governamental (ICCTI) bilateral projects were begun in 2001. One, titled "Rational and Reactive Agents", with the University of Pisa, Italy, aims at precisely defining a simple, logic-based model for developing agents featuring rational-reactive behaviour. The other, titled "Rational mobile agents and systems of agents", with the University of Dresden, Germany, deals with problems of specification of mobile processes and systems of processes, formal verification of properties of such mobile processes and systems of processes, as well as an implementation on real robots based on a pioneer platform.

Collaboration with Pierangelo Dell'Acqua, an associate member of CENTRIA and senior lecturer at Linköping University, has continued during 2001, in the area of logic-based multi agent systems. This collaboration was funded by the Swedish project "Organisational reflection in multiagent systems".

An industrial B2B R&D project, NetBE, with the national software company ParaRede took place for the duration of 2001, complemented by training courses. Within this project we have constructed software components for output generation in the NetBE application server. This allowed a deep understanding of XML and related technology, in particular XPath and XSLT.

We are a partner, and a member of its executive council, in a newly approved European Network of Excellence in computational logic: "Computational Logic Network of Excellence - CoLogNet".

Another important line of research successfully pursued has been that of a general more expressive logic programming framework integrating several reasoning forms, including in particular, fuzzy-logic, possibilistic logic, probabilistic systems, non-monotonic and paraconsistent logics, and hybrid programs. Promising inroads into Bayesian logic programming were made as well. In recent work, we have partially shown how this amalgamation can be achieved via logic programming extensions, resorting to program transformations and complex fixpoint definitions. This work appeared in [30, 31]. Preliminary work has been accepted for publication in Studia Logica.

In the last quarter of 2001, we started to investigate the problem of explicit negation and paraconsistency in the above general framework. This has been the major concern of the new Ph.D. student João Alcântara, supported by a Brazilian scholarship from CAPES.

Regarding implementation of tabling systems, we devised a new algorithm for distributed detection of strongly connected components, essential for the distributed query evaluation of tabled logic programs. This algorithm has been developed in cooperation with Terrance Swift and is being explored in a M.Sc. dissertation, a topic of the TARDE project.

As for the work on implementation of parallel and distributed implementations, work within the OAR project proceeded, and a prototype was built which exhibited satisfactory results. Besides the goal of having a distributed implementation of GNU Prolog, the project spurred the development of a distributed constraint programming library for use by Java applications. Encouraging early results in developing this system has spurred the submission to the POCTI/FCT programme of a new 2-year project.

The SIIUE project has been expanding in scope, having spawned a new project proposal, submitted to the POCTI/FCT programme, involving several CENTRIA researchers, on the topic of network failure diagnosis. SIIUE is based on the ISCO language, which integrates several

paradigms around Logic Programming. One avenue of research, which has been initiated and will be further investigated, is the use and evolution of ISCO in the context of the Semantic Web.

The foundations of a longer-term collaboration with INRIA centered on the further development of the GNU Prolog implementation were laid down, and the project was submitted to ICCTI for funding. We have confirmation that it has been approved for 2002.

#### 1.2 Subarea: Natural Language

Intelligent Information Retrieval, Cross Language Information, Retrieval and Machine Translation were the applications chosen for our research activities. It required the integration of language dependent competence (parsing), language independent competence (machine learning, text mining and information extraction), and techniques (symbolic, logic-based, neural-nets-based softcomputing, statistics).

In 2001, we continued to address two complementary problems:

• Text processing for automatic information extraction In this area we have continued previous work on neural-networks-based Part-of-speech taggers generation, adapted to no matter the language and text genre, comparing our claims that large hand tagged corpora is mainly used for learning lexical information. As a matter of fact, if we have a large external lexicon, the neural net can learn patterns of tags from corpora with 5,000 words, which is rather small when compared with the size of the hand tagged corpora required by other authors (500,000 tagged words). So, for each not found word in the training corpus, the tagger may resort to the external lexicon. Comparisons were made using the Suzanne corpus for English using our approach and the results were published in two papers [49, 10].

Work on POS-tagged corpora was used on robust parsing of text, including faultfinding and fault repairing of either text faults, or system faults, or faulty knowledge resources. This is the theme of the PhD thesis of Vitor Rocio that was submitted in October 2001 and is awaiting the constitution of a jury. This work also gave rise to a paper in the Journal Grammars published in 2001 [11]. Moreover the work on partial parsing done on a subcorpus of the PGR collection with approximately 1,800,000 words was used for extracting word syntactical contexts for clustering words and extracting syntactical and semantic subcategorization, and for automatic thesaurus construction. Pablo Gamallo, a Spanish post-doc that started to work with the natural language group in June 2000, mainly supervised this work. 6 papers were published [26, 17, 38, 36, 21, 37]. Work on extraction of contiguous and non-contiguous patterns from simple and annotated text (word patterns, character patterns, part-of-speech tag patterns) continued. Multiword lexical units automatically extracted were used as features for unsupervised document clustering and for topic extraction from text clusters. This work gave rise to 2 papers [58, 59] and is the basis for the Ph.D. thesis work by Joaquim Ferreira da Silva. The extraction of non-contiguous patterns [57] is the focus of the Ph.D. thesis work by Gael Dias that was almost ready by the end of 2001. This thesis was not yet submitted because some reformulations were required. Non-contiguous character patterns extracted from bilingual parallel corpora were used for finding out possible character sequences that may be selected as alignment points, acting then as cognates. This work was presented to the Machine Translation Summit, 2001. In 2000, the work done just used homograph tokens (words, numbers, punctuation signs). The alignment we do, both at the character level or at the token level, is finer than sentence level. Each segment may have an average number of characters ranging from 8 for Spanish to 13 for English. More extended experiments were performed for other languages: the 11 European languages and for the pair Portuguese-Chinese. This was the focus of the Ph.D. thesis of António Ribeiro that will be submitted towards 7 March 2002. This work gave rise to 4 papers [57, 50, 24, 23].

In the framework of the project TRADAUT, this technology was industrially implemented in order to enable the alignment of large parallel corpora. The aligned corpora was indexed and a mono and a bilingual concordencer were built. These tools enabled an sharp improvement in the creation of new entries for the SYSTRAN STEM dictionary, once the whole

corpus was translated and the words that were not known by the system were automatically sorted and presented to the linguists for coding them. Moreover, this work on alignment, as it is language independent, allows the alignement of automatically translated texts with their official versions. As a consequence, it enables to compare the evolution of automatic translations regarding its similarity with the official (human) translations. Moreover, the visualization of the two translated versions contributes for easier identification of translation problems with compound terms that have a translation that are non-compositional.

In the same framework, 60,000 entries for the SYSTRAN MT system were automatically generated with inflexional information as well as homographic information. Even without translation, those entries will contribute to achieve a more correct analysis of Portuguese, even if the word or the term where it appears will not be correctly translated. However, it will not affect the translations of surrounding phrases.

#### • Co-operative Information Retrieval Dialogues

The use of multi-word lexical units (MWUs) extracted by Ferreira da Silva and Gael Dias is used for filtering the documents obtained by a simple boolean query. Work on visual organization of those MWUs, in order that the shorter ones will appear prior to the longer ones which contain the shorter as sub-strings, was performed. It is intended for informing the user about the content of the collection without overloading him/her with too much information. The extracted thesauri were also organized so that the user may know that in a collection there are other words having the same meaning as the ones the user has chosen for the formulation of his/hers information needs. The use of such a thesaurus will augment recall. The use of MWUs will help her/him to rapidly obtain the information s/he is looking for. Unsupervised, language independent, clustering of documents and automatic extraction of those topics that most contributed to discriminate the documents collection into various clusters, will be used for finding similar documents treating a subject matter similar to the one that the user selected. Acting this way, despite the fact that we are indexing documents by every word appearing in the text, and are using boolean queries, we have augmented the boolean model with features that make it more similar to Latent Semantic approaches but we are not indexing document collections by a few concepts automatically extracted by Latent Semantic methodologies. The knowledge about the content of the collections is automatically extracted and used at various levels of the interaction process.

From another perspective, Paulo Quaresma and Irene Rodrigues have worked mainly on the components of a co-operative dialogue system for interfacing legal information retrieval systems. Such a dialogue system is intended for helping users to define their own goals. For accomplishing this purpose user information requests are used for assessing user intentions. Knowledge about text content which is extracted using above mentioned methodologies, as well as domain rules represented in a knowledge base, are also used for supporting the same purpose.

Traditional dialogue systems must recognise their users' goals and plans. User intentions for achieving goals and for acting are represented and inferred by the system by using domain knowledge which includes a library of plans, and by reasoning in order to check if a plan is correct. The discourse structure of this kind of dialogue is complex. It has many kinds of segments (continuation, elaboration, repair, clarification, etc.) and it is built by inferring user intentions, taking into account clue words and using plans structure (task and dialogue plans).

In the system we have developed, each event (utterance) is represented by logic programming facts that are used for dynamically updating the system's previous model. Using this approach it is possible to represent new events as update logic programs and to attain new states. Moreover it is possible to reason about past events and to represent non-monotonic behaviour rules. Each utterance will trigger the inference process about user intentions taking into account his/her attitudes (beliefs and profile).

The results of the inference of the user intentions are: a new set of user and system beliefs;

a new set of user and system intentions (such as user intention of being informed about something); a new dialogue structure.

The dialogue structure keeps the dialogue context allowing for the interpretation of user acts in its occurrence context. The dialogue structure constraint the interpretation of user intentions and is built as a result of the intention inference.

Along the year 2001 we developed:

- A Logic Programming Agent for Controlling Distributed Web Dialogues. The architecture for this Prolog based dialogue manager for a Web Information Retrieval system includes: an agent manager that receives all the user requests and keeps a database with all the users' interrogation (dialogue) context; several process agents that, given a user request and the corresponding interrogation context, are able to answer him/her and to update his/her interrogation context; an agent monitor that informs the agent manager of the latest changes in the documents databases.
- Automatic classification of case-law texts. An automatic case law supervised classifier based on a neural Network was developed. The classifier receives as input a legal text and proposes a set of key words characterising it. These key words belong to a taxonomy of juridical concepts developed by the Portuguese Attorney General Office.
- Intelligent Clustering. Another important aspect of the system developed is its ability to compute document clusters associating a keyword with each cluster. This ability allows the system to model world knowledge such as the granting of a pension for relevant services, or the refusal to grant it. The clustering and reclustering process proposed requires the classification of all documents using the set of keywords of the juridical thesaurus that was available.
- Neural POS tagger In 2001 the neural network tagger based on a set of UNIX scripts was improved. Two versions are now available: one is ready for public distribution over the Internet and other for development and industrial exploration. The public version is being used

for supporting teaching activities regarding the Neural Network part-of-speech tagger and Unix text processing tools (a series of classes are now offered in DI-FCT/UNL Masters in Computer Science). The development/industrial version is being used for tagging texts for other

GLINT modules, namely the grammar module [11].

Dissemination of obtained results was an important concern. As a consequence 23 papers were published: 2 papers in journals; 1 book chapter; 12 in very important conference proceedings published by Springer and similar publishers; 8 in less important conferences.

Praxis project PGR was completed and its final report was delievered. The evaluation of the project was highly flattering.

A cooperation project with INRIA-Rocquencourt and the University of Orleans, France, has started.

A European MLIS project on Machine Translation with SYSTRAN has started and a cooperation project with the University of Coruña has also been approved. Both projects, with Spain and France, aim at strengthening previously initiated co-operation in the framework of the completed RELING project. Project FUNDAÇÕES with Brazil has been approved for continuation and will end next March 2002.

Collaboration with statisticians was strengthened for supporting on-going work on text alignment and translation equivalents extraction and on statistically based classification of documents. Meanwhile, in the framework of our Programmatic funding an Bulgarian statistician was hired and started work in September. First results on clustering of MWUs is just popping up.

Collaboration with Brazilian universities was prospected in order to reinforce further previously activated small-scale co-operations. The identified areas and possible collaborations are: syntactic checking, with Universidade Federal de São Carlos (S. Paulo) and Microsoft-ITAUTEC; distant

learning, with Universidade Federal do Espirito Santo, at Vitória, Universidade Federal de Santa Catarina, at Florianopolis, Pontificia Universidade Católica do Rio Grande do Sul and Universidade Federal do Rio Grande do Sul, both at Porto Alegre; Digital Libraries, with UNISINOS, near Porto Alegre, Rio Grande do Sul, Brazil. In Portugal, a similar effort was made and new collaborations have started: with Faculdade de Ciências Sociais e Humanas of Universidade Nova de Lisboa, for the Machine Translation Project and with Universidade de Aveiro, with the submission of various projects in the framework of ALFA programme. Despite the fact that this project was submitted in the begining of 2001, it still has not been evaluated.

#### 1.3 Subarea: Soft Computing and Constraints

In project Proteins, research was still focussed on various tasks for determining the structure of proteins. A key task was the gathering, during search, a number of indicators that measure the quality of the choices made during the enumeration of the domains, which may provide the basis for good heuristic functions. A number of these measurements have been collected by Marco Correia, a new collaborator of the project, and preliminary studies on their usefulness were made, but their integrated use in a heuristic function was left for 2002. The collaboration with Thomas Dietterich (Oregon State University, USA) was setup in this context. He visited CENTRIA in February, and our software has been adapted to the needs of their team, namely for automated learning appropriate heuristic functions. Further collaboration with Machine Learning that was planned with Gabriela Guimarães from CENTRIA was temporarily suspended due to her leaving the Centre in September for a job in Germany with Allianz, though continuing as an associate member.

Meanwhile the integration of local search and constraint propagation was pursued and the interaction of our constraint propagation technique with Computational Geometry methods explored by Michael Trosset (William and Mary College, VA,USA) was improved. The results obtained were presented in the CP-AI-OR Workshop organised by Imperial College, London, in April 2001.

Still in project Proteins, we have started research on the propagation of a specific type of global constraints, namely those involving the translation and rotation of relatively rigid protein substructures. This work has been initiated by Ludwig Krippahl, and involves the finding of upper and lower bounds for the spatial regions that the atoms of these substructures may occupy. Ludwig Krippahl is exploiting some very specific techniques to deal with this problem in the context of global constraint propagation. Nevertheless, this problem involves dealing with a set of nonlinear constraint over continuous domains, the type of constraints where Jorge Cruz is exploiting techniques for integrating local search within constraint propagation, to maintain Global Hull Consistency. He obtained promising results regarding the tradeoff between the pruning of the search space achieved with this type of consistency and the computational cost of achieving it. Preliminary results were presented at EPIA'01, Portuguese Int. Conference on Artificial Intelligence, for a number of artificial problems. Nevertheless, problems of this type were identified for dealing with the above global spatial constraints and we hope to explore them further in 2002.

Both the work on proteins structure and on non-linear constraints have a strong biomedical motivation, an important application sub-area of Artificial Intelligence in Medicine, in which Pedro Barahona has been involved for a number of years. In particular, he organised AIME'01, the 8th European Conference on Artificial Intelligence in Medicine in Europe in Cascais, in July. He also organized "CSOR - Constraint Satisfaction and Operational Research Techniques for Problem Solving", a thematic workshop of EPIA'01.

Gabriela Guimarães and Susana Nascimento continued their work on learning, reported in their publications. Gabriela Guimarães also organized *IDA'01*, 4th International Symposium on Intelligent Data Analysis, held in Cascais in September 2001.

Paula Amaral has carried out her work on the correction of unfeasible linear programs. The main results she obtained include a formal proof of the relationship between the corrections made by the total least square methods on a set of equality constraints and the corrections due in a set of linear inequality constraints, namely the conditions in which the corrections made would lead to local optima. This would involve a selection of active constraints and she has shown that good

results could be achieved by means of a tree search for the global optima in some medium sized problems. Her work is detailed in the Ph.D. thesis she has finished in December.

Francisco Azevedo has carried out further work on constraints over multivalued logics, applying it to problem with combinational digital circuits. He also integrated local search and constraint propagation in an optimisation problem regarding the generation of minimal test patterns, i.e. the least number of specified inputs to detect faulty gates. The efficiency of this modelling and the solving of these problems proved competitive with the alternative of using boolean models (to which SAT solvers are applied) used by the team of INESC in Lisbon led by João Marques Silva. The comparison of our approaches and the synergies that could be obtained from finite domains constraints and Boolean satisfiability led us to propose a joint project to Fundação de Ciências e Tecnologia (meanwhile approved).

The modelling of sets has also been found useful to our colleagues in CENTRIA that work in the area of Knowledge Representation, to formalise more general frameworks for logic programming and use it in modelling abductive reasoning. We have compared our methods, that shown that, in the context of propositional theories (e.g. digital circuits), our modelling of dependencies through set constraints was much faster than the alternative logic programming methods.

### 2 CENTRIA 2002 planned activities

Below each subarea provides in detail its plans for 2002.

# 2.1 Subarea: Knowledge Representation and Reasoning, and Logic Programming

Our general plans in this area are to continue the natural developments arising from our present lines of research, according to the ongoing and already approved projects to start in 2002, keeping always in mind the interplay of theory, procedure, implementation, and application.

Within the COOPERATIVE project, started at the end of January 2002, we expect to have results and published papers showing the possibility of using LP to create specialized agents in the context of information retrieval systems and in the semantic web environment. In fact, we have already started work trying to show the applicability of logic programming agents to the semantic web (one preliminar paper is under evaluation by an international conference program committee).

Within FLUX, to start in March 2002, we expect to have results in the definition of evolving logic programs, a language for declaratively specifying dynamic knowledge. These results are to be pursued in collaboration with Univ. Pisa, via the bilateral project. We also plan to work on the application of this logic programming framework to the legal domain (where a M.Sc. thesis, by Agostinho Monteiro, is being developed with preliminary results in this direction) and to software specification, mainly in what regards the specification of software reconfiguration. The possibility of declaratively specifying software changes will be put to work by studying its incorporation in the WAM language, a language developed by the company partner of FLUX, Declarativa, for designing WWW user interfaces. Completion of João Leite's Ph.D. thesis is expected for March on Knowledge Base Updating.

The SIIUE project will enter a new expansion phase in which several 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:

- Schema evolution.
- Time information.
- Reliable and convenient access control.
- Semantic Web integration.

From the experience gathered in the OAR project, an incremented implementation effort is to be started, around GNU Prolog. This will be partly supported by the cooperation with INRIA, to which a graduate (MSC) student is already assigned.

One of us was invited to participate in the Dagstuhl seminar in Rule Markup Techniques on January 2002. This supplies international contacts with groups working in areas related to the Semantic Web Activity of the W3C. As a result, we are making part of a consortium, which has submitted a project proposal to the FET Open programme of IST. This will apply CENTRIA's expertise to the modelling of business processes and rules in a reactive rule based environment.

So, part of our activities for 2002 will also be related to the Semantic Web. A major problem is the definition of semantics for rule systems and corresponding query engines. We intend to contribute with proposals and solutions to the previous, in continuation of last year activities. Regarding the semantics, we will continue to explore our logic programming framework in close cooperation with the group of Dept. Matemática Aplicada E.T.S.I. Informática da Universidade de Málaga, supported by the POLAR project. The main topics of study are continuity conditions and development of a procedural semantics. João Alcântara will continue to address paraconsistency and reasoning in face of contradiction. These areas were all identified by Tim Berners-Lee has important for the Semantic Web. Furthermore, we envisage that rule systems in the Web will work together to answer users' queries and requests. This requires distributed reasoning capabilities of the kind we are investigating in the ongoing project TARDE. We expect to work in the description of the algorithms for detecting strongly connected components and corresponding leader election and termination mechanisms, accompanied with practical evaluation work.

The cooperation with the company PARAREDE will continue through new projects in B2B, and negotiations are under way with another important national software company, ALTITUDE, in the area of automatic call and email routing and reply, by means of updatable policy rules.

In collaboration with the "Serviço Nacional de Protecção Civil", we plan to work in the application of the logic programming paradigm to the problem of automatically generate and update emergency plans. This is the subject of the project SIPOGE, under evaluation by "Agência de Inovação".

Our MSc in Applied Artificial Intelligence is planned to reopen in the academic year 2002/03. A distributed European Computational Logic MSc is being setup by us and Dresden in the context of a workpackage of the European network of excellence CoLogNet and a bilateral project.

One workshop is being co-organized by us at the ICLP'01 conference in July 2002 in Copenhagen, on "Computational Logic in Multi-Agent Systems – CLIMA'02". A special issue of the journal "Annals of Mathematics an Artificial Intelligence" is being co-edited by us, arising from the workshop above. Regarding editions, a special issue on Logics in AI of the journal "Studia Logica" is coming out in 2002, and a special issue of "Theory and Practice of Logic Programming" on "Updating non-monotonic knowledge bases" has been approved, both co-edited by one of us. One of us has been invited to the editorial committee of a new series, by IOS Press, dedicated to european PhD theses, starting in 2002.

#### 2.2 Subarea: Natural Language

In this area, one Ph.D. thesis was submitted and passed in Febuary 2002 (Berilhes Borges Garcia) and another awaits its exam (Vitor Rocio). Two other Ph.D thesis will be submitted in March 2002 by Gael Dias and António Ribeiro. Two other Ph.D thesis are expected till the end of 2002.

By intensifying the co-operation with the Linguistics Centre of Universidade Nova de Lisboa, by participating in the same European project on Machine translation, new steps were given in order to enable the launching of a Laboratory dedicated to Written Language Technologies and multilingual and multimodal man-machine interfaces. Such a Laboratory will include specialists on Linguistics, Natural Language Processing, graphics processing, video indexing, machine learning and other co-related subject matters, namely software engineering and parallel and distributed architectures. Contacts with enterprises were also carried out.

• Automatic Selection Restriction Extraction

The work on automatic selection restriction extraction, apart from being used by our parser in order to enable more complete and correct parses of Portuguese will also be used for automatic generation of entries for the terminology dictionary of SYSTRAN. For example, it was discovered that "emanar" (to emanate) semantically subcategorizes two classes of words: "emanar de legislação — artigo — protocolo — ..." should be translated in a different order "LAW PRESCRIBES..." (The subject in Portuguese becomes the object in English). But, "emanar de Governo — Assembleia — ..." must be translated by "Government — Assembly — ... propose ...". The automatic generation of entries for terminologies and for correcting literal translations, together with the automatic extraction of translation equivalents from aligned paralle text will also contribute to enhance linguistic productivity, as they will have just to check and accept correct entries and correct those entries that were not correctly extracted.

• Dialogues One of our goals for the next year is to develop a cooperative web legal information retrieval system. The other will be to build a natural language interface to the University of +vora Information system, SIUE.

Web Information retrieval dialogues: Cooperation is achieved through the modeling of a proactive system behavior based on a logic interaction manager agent. This agent is able to infer the user attitudes from his actions and to interact with an information retrieval system in order to obtain a set of relevant documents. This set of documents is clustered and it is shown to the user as a graph structure allowing the refinement of user queries. As the clustering algorithm needs a previous document classification, an automatic document classifier, which uses natural language pre-processing techniques to extract nominal expressions and to solve anaphoras, will be developed.

A natural language interface to the University of +vora Information system, SIUE: This interface, if the project is approved, will be build as a dialogue system allowing users to dialogue with the system. The dialogue system will take into account the dialogue context, the user intentions and beliefs inferred using a user's previous queries in order to interpret each user natural language query. In order to interpret user queries we need a knowledge base to give the correct semantics to user sentences. This knowledge base as well as the initial vocabulary will be built automatically from the description of the SIUE in the extended logic programming language, ISCO. The final semantics of each user query will be an ISCO expression that can be directly interpreted by SIUE even when it needs access to different databases. A natural language interface to an University information system with several databases, that builds its linguistic resources (dictionaries and knowledge bases) automatically from the Information system description, is still an original goal.

#### 2.3 Subarea: Soft Computing and Constraints

We plan to continue our research on the current topics in Project Proteins, focussing in two main topics. The indicators collected by Marco Correia should be aggregated in order to produce effective heuristic functions. Tom Dietterich from Oregon State U. will visit our Centre in April, and we will then discuss different possibilities of applying both supervised and unsupervised automated learning to obtain better heuristic functions. The other line of work is the propagation of spatial global constraints. Specific methods will be researched by Ludwig Krippahl, but we antecipate that the techniques being developed by Jorge Cruz , that integrate local search within the propagation of non-linear constraint over continuous domains will eventually play an important role in this problem.

We expect that Paula Amaral will improve the methods she developed for achieving global optima on the corrections of unfeasible linear inequality constraints, namely better tree search methods. Francisco Azevedo will expectably finish his Ph.D. on constraints over multivalued logics and its application to many problems on combinational digital. One such technique, iterative

time bound search involves an integration of a restart policy and backtracking. This integration of techniques, and their further logical continuation (random restarts, local search within backtracking, automated learning of choices, etc) will be researched and compared with similar ones developed in the context of SAT solvers, assuming that a project recently jointly submitted with the INESC team led by João Marques Silva to Fundação de Ciências e Tenologia is funded.

The complementary nature of local search and constraint processing will also be hopefully exploited in collaboration with the team lead by Celso Ribeiro (Pontifícia Universidade Católica, Rio de Janeiro). A joint collaboration that would allow mutual visits was eventually funded for 2001, but this funding was known too late to be used.

We also plan to work on Knowledge Extraction from Large Sources of Information. Here one of our goals for the year of 2002 is to apply distributed machine learning algorithms inherently robust to noise and ambiguity to the task of knowledge extraction from large sources of information. Data mining is usually performed requiring little or no noise in data bases. Unfortunately knowledge is mainly inserted in computers by humans and, usually after little or none preprocessing, aims to transmit information to humans. Documents that to a human are unambiguous and free of noise are, to the computer limited understanding capabilities, usually full of ambiguous and noisy information. In order to extract knowledge of these kinds of sources, we will focus on two machine learning techniques that have been particularly successful in treating problems were noise is present: artificial neural networks and genetic algorithms.

Artificial neural networks are particularly robust when the learning examples contain errors or miss interpretations, as it is the case of unrestricted text. Unfortunately learning from huge volumes of data with a neural network is very slow and usually restricted to learning sub-optimal functions. Based on this problems, in 2002 we intend to start studying the application of genetic algorithms for improving learning in neural networks in a distributed framework.

We will try to implement a model for providing neural networks with a genetic based learning paradigm (the model should be inspired on the one proposed by Gerald Edelman). Wherever possible we will try to apply this system to text mining problems.

# $3\quad \text{Base Funding for } 2002$

All values in EUR.

Central Funding (Managed by the Board)	23 165
Seminars	500
Advisory Committee	5 000
Internal Strategic Funds	16 400
Services	500
Other management costs	765
Assigned individual management by PhD's	38 335
Travel	15 335
Equipment	23 000
TOTAL	61 500 (Awarded by FCT/MCT)

#### Breakdown:

Scholarships and technical staff	15 260	Services, and 90% Internal
		Strategic
Current	22 475	Travel, advisory committee,
		seminars, and 10% Internal
		Strategic
Consumables	765	Other management costs
Capital	23 000	Equipment
TOTAL	61 500	(Awarded by FCT/MCT)

## 4 List of ongoing projects in 2001

Tame Computational Logic Network of Excellence - CoLogNet	
tatus Three year ongoing project; start date December 2001	
unding Institution IST programme, European Commission	
rincipal researcher Luís Moniz Pereira	
f portuguese team	
Yarticipants King's College, London and DFKI, Saarbrucken are the coo	ordinat-
ing nodes, in a total of 14 european partners.	
Description Establishes a european network of excellence in the broad	area of
Computational Logic, concerned with coordinating research	h, edu-
cation, and training.	,
Results None in 2001.	
Iame OAR – Object-Oriented And-Or Tree Rewriting Systems	
tatus Ended September 2001	
unding Institution PRAXIS XXI	
rincipal researcher Salvador Abreu	
'articipants Lígia Ferreira	
Description Design and development of a parallel and distributed AND-0	OR tree
re-writing system, building on previous experience on the A	KL and
EAM architectures. The language being targeted is close to	Prolog
with Contextual Logic Programming. Physical shared-memory	ory and
distributed Implementation. Application to the development	
Information System for Academic Organizations incorpor	
deductive functionality.	
tesults 1 journal publication, 1 prototype and 1 visit in 2001.	
Iame SIIUE – Universidade de Évora's Integrated Information S	ystem
tatus Ongoing	
unding Institution Universidade de Évora	
rincipal researcher Salvador Abreu	
Participants Lígia Ferreira	
Description Design and implementation of a logic language to build well	b-based
information systems, featuring transparent use of hetherogen	geneous
databases. Application to the administrative, academic and	d scien-
tific management of the University.	
tesults 4 publications and several prototypes in 2001.	
Rational mobile agents and systems of agents	
tatus Two year ongoing project; start date October 2001	
Sunding Institution International Quality Network (IQN) of DAAD, Germany	
rincipal researcher Luís Moniz Pereira	
f portuguese team	
Participants Department of Computer Science, University of Dresden, G	ermany
and others; cf. http://www.ki.inf.tu-dresden.de/Research/l	
Deals with problems of specification of mobile processes a	
tems of processes, formal verification of properties of such	
processes and systems of processes as well as an implementa	I
real robots based on a pioneer platform. cf. http://www.ki	I
dresden.de/Research/IQN/	
arcsacii.ac/iwscarcii/iⅈ/	

Name	Rational and Reactive Agents
Status	Two year ongoing project; start date January 2001
Funding Institution	ICCTI-CNR bilateral project with University of Pisa, Italia
Principal researcher	Luís Moniz Pereira
of portuguese team	
Participants	Department of Informatics, University of Pisa, Italia
Description	The theme of the project is the study of rational reactive agents
	in Computer Science. The objective is to precisely define a simple,
	logic-based model for developing agents featuring rational-reactive
	behaviour. On the one hand, the availability of a well-founded
	model for rational-reactive agents will support the analysis and the
	verification of multi-agent systems. On the other, the availability
	of executable specifications will support the rapid prototyping of
	complex systems. The effectiveness of the approach will be demon-
	strated by applying it to Internet-based multi-agent systems, such
	as in business-to-business e-commerce and in security policy set-
	tings.
Results	One visit to Pisa, and one joint publication in 2001 [22].
Name	Business to Business Software - NetBe
Status	January to December 2001
Funding Institution	PARAREDE company, and Agência de Inovação, Portugal
Principal researcher	Luís Moniz Pereira
Participants	PARAREDE, a portuguese software company
Description	Conception, modelling, and implementation of software to address
	specification language user-defined web presentation of formatted
	data extracted from a B2B data warehouse. Efficient output generation for NetNE application servers resorting to XML tools and
	systems.
Results	Two software components were integrated with NetBE application
10050105	server.
Name	TARDE - Tabulation And Reasoning in a Distributed Prolog En-
Name	vironment
Status	Ongoing.
Funding Institution	PRAXIS.XXI (2nd phase)
Principal researcher	Carlos Viegas Damásio
Participants	CENTRIA/UNL and CITI/UNL
Description	The combination of tabling systems, reasoning systems and dis-
D occurpation	tributed 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 pro-
	gramming system, incorporating the most recent semantical and
	operational techniques currently available. The initial 2 year por-
	ject has been extended in order to achieve its objectives. Our focus
	is now the development of tools for the Semantic Web.
Results	3 papers in international conferences.

Name	POLAR
Status	Ongoing.
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. In-
	formática 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 pro-
	grams dealing with uncertainty, namely fuzzy and probabilistic rea-
	soning.
Results	Just started.
Name	Organisational reflection in multi-agent systems
Status	Ongoing.
Funding Institution	Stiftelsen Lars Hiertas Minne (Sweden).
Principal researcher	Pierangelo Dell'Acqua
Participants	Linköping University
Description	Swedish project funding the collaboration of Dr. Dell'Acqua with
	CENTRIA. Its goal is to define and develop an architecture allow-
	ing to integrate epistemic agents by defining the roles and the kind
	of interactions that can occur among them.
Name	PROTEINS: Improving Constraint Solving to Predict Protein
	Structure
Status	Ongoing
Funding Institution	PRAXIS.XXI
Principal researcher	Pedro Barahona
Participants	CENTRIA/UNL
Description	The project aims at developing advanced computing techniques,
	focusing in constraint programming, and to show how their in-
	tegration with other techniques such as automated learning and
	meta-heuristics optimisation, can be used to solve a very impor-
	tant problem: the determination of protein structure from Nuclear
Results	Magnetic Resonance (NMR) spectroscopy.
	Described in [29, 40].
Name	TRADAUT-PT — Automatic Translation System from and into
Status	Portuguese for public administration Ongoing
I .	Ongoing European Commission and Fundação para a Ci%ncia e Tecnologia
Funding Institution	Gabriel Pereira Lopes
Principal researcher Participants	CENTRIA/DI/FCT/UNL, CLUNL, SYSTRAN, FCT/MCT and
1 articipants	Instituto Cam
Description	Development of a quality translation by the SYSTRAN system
Describiton	for the pairs of languages Portuguese-English, English-Portuguese,
	and French-Portuguese.
Results	Several versions of SYSTRAN system for project pairs of languages
10000100	peretai retaions of bilitim system for project pans of languages

Name	Analysis and Synthesis of sentences in Portuguese and French
Status	Ongoing
Funding Institution	Scientific and Technical Institute for the International Cooperation (ICCTI, PT) and CNRS (FR) - (ICCTI/CNRS Contract 423/France)
Principal researcher Participants	Gabriel Pereira Lopes (CENTRIA) Robert Pasero (LIM/CNRS) researchers from CENTRIA and Laboratoire d' Informatique de Marseille (LIM).
Description	This project aims at: designing and developing a kernel grammar description for Portuguese (lexicon, syntax, compositional semantics); integrating this kernel into the system ILLICO; designing and developing a Data Base kind of application that may be queried in Portuguese and French; taking into account context and discourse levels.
Results	Designing and developing a kernel grammar description for Portuguese (lexicon, syntax, compositional semantics); integrating this kernel into the system ILLICO; designing and developing a Data Base kind of application that may be queried in Portuguese and French
Name	PGR - Selective Access to the information contained in the Opin-
	ions of the Portuguese Republic
Status	Finished
Funding Institution	Agência de Inovação
Principal researcher	Gabriel Pereira Lopes
Participants	Heurística, CENTRIA and Procuradoria Geral da República.
Description	Access to the opinions of the Portuguese Republic Attorney (PGR) via web, by incorporating knowledge about Portuguese Language (namely a large lexicon, and multi-word units automatically extracted from the PGR corpus) in the search engine used
Results	1) Automatic extraction of thesaurus from partially parsed PGR corpus. The results of this effort were not yet inserted in the search engine used in this project. 2) Supervised and unsupervised classification of documents of this collection of opinions. The first method used a neural network based approach and the key words used in those documents. The unsupervised classification used automatically extracted multi-word lexical units and statistical methods. Both must still be incorporated in the search engine used. 3) Statistically based parallel text alignment and translation equivalents extraction from parallel corpora continued. However it is: still required a large effort in order to enable access to the opinions of the Portuguese General Attorney, using any of the European Community languages. Work in the framework of project TRADAUT-PT will provide a large basis for making this possible, at least for English and French speaking people. # 28 publications and a demo, together with final report, are available at: http://coluna.di.fct.unl.pt/pgrd.

Name	FUNDAÇÕES - Multi Agent Systems and Natural Language Pro-
1 (61110	cessing: Foundations and Aplications
Status	Finished
Funding Institution	Scientific and Technical Institute for the International Co-
T dilding institution	operation (ICCTI, PT) and CAPES (BR)
Principal researcher	Gabriel Pereira Lopes (CENTRIA) e Vera Lima (PUCRS)
Participants	CENTRIA; Departamento de Informática da Universidade de
1 articipants	Évora; Instituto de Informática da Pontificia Universidade Católica
	do Rio Grande do Sul de Porto Alegre, Brazil (PUCRS).
Description	This project was aimed at supporting the co-operation of the pro-
	ponent teams for the application of Multi-Agents Architectures to
	Natural Language Processing Systems. This project builds on top
	of the projects: NALAMAS (BR) and DIXIT, PGR, CORPUS
	and JUSTIÇA (PT). Additional co-operation will exist on training
	master's and Ph.D. students.
Results	In 2001, a course was taught by Paulo Quaresma in the master's
	programme of Pontifícia Universidade Católica do Rio Grande do
	Sul, at Porto Alegre, Brazil, Cooperative dialogues in Information
	Retrieval. Two publications were produced.
Name	IGM — access to information available at OCRed reports on ore
Traine	prospecting and partial integration of a full text information Re-
	trieval System with a Geographic Information System
Status	Ongoing Ongoing
Funding Institution	IGM
Principal researcher	José Gabriel Pereira Lopes
Participants	CENTRIA, IGM
Description	definition of the logical structure IGM reports on ore prospecting;
_	use of that definition for obtaining OCRed reports; control of OCR
	quality; automatic extraction of multi-word lexical units from those
	reports; construction of an information retrieval system using the
	technology developed in the framework of PGR project for enabling
	rapid access to the reports relevant for a user query. First attempt
	for integrating the IGM Geographic Information System with the
	full text retrieval system built
Results	No papers were produced yet. A demo was constructed and is
	currently available at: http://coluna.di.fct.unl.pt/ĩgm
Name	ORLISINROC — ORLeães - Lisboa -Inria ROCquencourt
Status	Ongoing
Funding Institution	ICCTI and French Embassy
Principal researcher	José Gabriel Pereira Lopes
Participants	CENTRIA, University of Orleans (FR) and INRIA-Rocquencourt
	(FR)
Description	development of a co-operation among the Portuguese and French
	teams in the area of Language Engeneering. This co-operation will
	be based on the development of tools, programming platforms and
	systems with diversified applications in Human language Technolo-
	gies.
Results	Two missions and two papers

# 5~ List of M.Sc. and Ph.D. students and topics in 2001~

### 5.1 M.Sc. Students

Name	Agostinho Monteiro
Degree	M.Sc.
Supervisor	Luís Moniz Pereira
Topic	Modelling and updating of normative regulations in logic programming
Start date	October 2001
Finish date	October 2002
Name	David Mendes
Degree	M.Sc.
Supervisor	Salvador Abreu
Topic	Integration of Prolog and Java
Start date	June 2001
Finish date	September 2002 (expected)
Name	João Nascimento Silva
Degree	M.Sc.
Supervisor	Joaquim Nunes Aparício
Topic	Object Oriented Databases
Start date	December 2001
Finish date	December 2002
Name	Joaquim Godinho
Degree	M.Sc.
Supervisor	Salvador Abreu
Topic	Sistemas de Informação Universitários
Start date	June 2001
Finish date	September 2002 (expected)
Name	Leonilde Varela
Degree	M.Sc.
Supervisor	Joaquim Nunes Aparício
Topic	An XML based Knowledge Base for scheduling problems
Start date	December 2001
Finish date	December 2002
Name	Luís Quintano
Degree	M.Sc.
Supervisor	Irene Pimenta Rodrigues
Topic	Acesso a base de Dados Relacionais em Lingua Natural
Start date	November 2000
Finish date	April 2002 (Expected)
Name	Luís Rosário
Degree	M.Sc.
Supervisor	Paulo Quaresma
Topic	Juridical Documents Clustering
Start date	April 2000
Finish date	June 2002 (Expected)
Name	Mário Amado Alves
Degree	M.Sc.
Supervisor	Gabriel Pereira Lopes
Topic	Lexicon building for multi-word lexical units and integration with word
	lexicon for Portuguese.
Start date	April 2000
Finish date	April 2002 (Expected)

Name	Mattias Engberg
Degree	M.Sc.
Supervisor	Pierangelo Dell'Acqua and Luís Moniz Pereira
Topic	Implementation of a logic based agent
Start date	September 2001
Finish date	June 2002 (predicted)
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	February 2003 (expected)
Name	Paula Miranda
Degree	M.Sc.
Supervisor	Joaquim Nunes Aparício
Topic	The mapping between XML and Relational Databases
Start date	December 2001
Finish date	December 2002
Name	Vitor Nogueira
Degree	M.Sc.
Supervisor	Carlos Damásio
Topic	Negação em Lógica Transacional
Start date	October 1998
Finish date	February 2001

### 5.2 Ph.D. Students

Name	Alexandre Agustini
Degree	Ph.D.
Supervisor	Gabriel Pereira Lopes
Topic	Adaptive Parsing Systems capable of overcoming incomplete lexical knowl-
	edge by parsing large corpora
Start date	September 1999
Finish date	2003 (Expected)
Name	António Ribeiro
Degree	Ph.D.
Supervisor	Gabriel Pereira Lopes
Topic	Extraction of translation equivalents from parallel corpora (English and
	Portuguese)
Start date	October 1996
Finish date	2002 (expected)
Name	Berilhes Borges Garcia
Degree	Ph.D.
Supervisor	Gabriel Pereira Lopes
Topic	Reasoning with plausability measures in the assimilation of new evidence
Start date	October 1996
Finish date	February 2002 (submitted September 2001)

Name	Francisco Azevedo
Degree	Ph.D.
Supervisor	Pedro Barahona
Topic	Constraint Solving and Optimisation with various logics and its use to dig-
	ital circuits problems
Start date	October 1998
Finish date	June 2002 (expected)
Name	Gael Dias
Degree	Ph.D.
Supervisor	Gabriel Pereira Lopes / Sylvie Guilloré (Université de Orléans)
Topic	Extraction of translation equivalents from parallel corpora (French and Por-
	tuguese)
Start date	October 1997
Finish date	2002 (expected)
Name	Iara de Almeida
Degree	Ph.D.
Degree   Supervisor	José Alferes
11 -	
Topic	Argumentation and cooperation in multi-agent logic programming systems,
C++ 1 +	with application to distributed diagnosis
Start date	October 1997
Finish date	June 2003 (Expected)
Name	João Balsa da Silva
Degree	Ph.D.
Supervisor	Gabriel Pereira Lopes
Topic	Multi-Agent Architecture for declarative fault finding in parsing tasks
Start date	October 1996
Finish date	2002 (expected)
Name	João Fernando Lima Alcântara
Degree	Ph.D.
Supervisors	Luís Moniz Pereira and Carlos Damásio
Topic	Possibilistic Logic Programs
Start date	September 2001
Finish date	September 2005 (expected)
Name	João Leite
Degree	Ph.D.
Supervisor	Luís Moniz Pereira
Topic	Architecture of rational multi-agent systems
Start date	October 1997
Finish date	March 2002 (expected)
Name	João Paulo Portelinha Santos
Degree	Ph.D.
Supervisor	Joaquim Nunes Aparício
Topic	Relational Database Systems
Start Date	1999
Finish Date	2005
Name	Joaquim Ferreira da Slva
Degree	Ph.D.
Supervisor	Gabriel Pereira Lopes
Topic	Extraction of Multi-word units from text corpora and decision about pp-
F = -	attachement
Start date	March 1998
Finish date	2002 (expected)
1 minim date	poor (orpoolog)

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	September 2002 (expected)
Name	Jorge Simão
Degree	Ph.D.
Supervisor	Luís Moniz Pereira
Topic	Computer modelling and exploration of human mating strategies
Start date	April 1999
Finish date	September 2002 (expected)
Name	Lígia Ferreira
Degree	Ph.D.
Supervisor	Salvador Pinto 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 Deter-
	mination
Start date	October 1999
Finish date	September 2003 (expected)
Name	Paula Amaral
Degree	Ph.D.
Supervisor	Pedro Barahona
Topic	Optimal Corrections to Unfeasible Sets of Linear Inequality Constraints
Start date	October 1997
Finish date	December 2001 (submitted)
Name	Rui Ribeiro
Degree	Ph.D.
Supervisor	Gabriel Pereira Lopes
Topic	Automatic thesaurus construction, design of thesauri and use in information
O	retrieval systems
Start date	2000
Finish date	2004 (Expected)
Name	Sérgio Andrade de Freitas
Degree	Ph.D.
Supervisor	Gabriel Pereira Lopes
Topic	Ellipsis and pronoun and definite anaphora resolution
Start date	October 1993
Finish date	December 2002 (expected)

Name	Susana Nascimento
Degree	Ph.D.
Supervisor	Fernando Moura Pires and Boris Mirkin
Contact	Luís Moniz Pereira
element at	
CENTRIA	
Topic	Data-Driven Fuzzy Cluster Modelling
Start date	October 1995
Finish date	2002 (expected)
Name	Vitor Jorge Ramos Rocio
Degree	Ph.D.
Supervisor	Gabriel Pereira Lopes / Pierre Boullier (Université de Orléans, France)
Topic	Infra-structure for partial parsing natural language input and for diagnosing
	possible faults (in the lexicon, pre-processing phases, and in the input)
Start date	April 1995
Finish date	April 2002 (expected)
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)

#### 6 Publications

#### 6.1 Edited books and journal special issues

- [1] S. P. Abreu and J. J. Alferes, editors. Logics for AI and Information Systems A Thematic workshop of EPIA'01. Univ. Porto, December 2001.
- [2] Luís Moniz Pereira and Paulo Quaresma, editors. *Proceedings of AGP'2001 AP-PIA/GULP/PRODE Joint Conference on Declarative Programming*, Évora, Portugal, September 2001. Universidade de Évora.
- [3] M. O. Aciego, I. P. de Guzmán, G. Brewka, and L. M. Pereira, editors. *Special issue on Logics in Artificial Intelligence*. Studia Logica Journal, expected December 2001. Delayed to 2002.
- [4] S. Quaglini, P. Barahona, and S. Andreassen, editors. Artificial Intelligence in Medicine, 8th Conference on Artificial Intelligence in Medicine in Europe, AIME'2001 (Procs.), volume 2101 of Lecture Notes in Artificial Intelligence. Springer, 2001.
- [5] F. Hoffmann, D. J. Hand, N. Adams, D. Fisher, and G. Guimarães, editors. Advances in Intelligent Data Analysis. Procs of 4th Intl. Conf, IDA 2001, volume 2189 of Lecture Notes in Computer Science, Cascais, Portugal, September 2001. Springer.

#### 6.2 In International Journals

- [6] J. J. Alferes, P. Dell'Acqua, E. Lamma, J. A. Leite, L. M. Pereira, and F. Riguzzi. A logic based approach to multi-agent systems. The Association for Logic Programming Newsletter, 14(3), August 2001. Invited paper.
- [7] P. Barahona, F. Azevedo, M. Veloso, N. Estêvão, and R. Gallego. Computerising a guideline for the management of diabetes. *International Journal of Medical Informatics*, 64:275–284, August 2001.
- [8] Lígia Ferreira and Salvador Abreu. Design for AJACS, yet another Java constraint programming framework. In Maria Chiara Meo Agostino Dovier and Andrea Omicini, editors, *Electronic Notes in Theoretical Computer Science*, volume 48. Elsevier Science Publishers, 2001.
- [9] G. Guimarães, J.-H. Peter, T. Penzel, and A. Ultsch. A method for automated temporal knowledge acquisition applied to sleep-related breathing disorders. Artificial Intelligence in Medicine, 624:1–27, 2001.
- [10] N.C. Marques and J.G.P. Lopes. A pos-tagger generator for unknown languages. Revista de la SEPLN -sociedad Española para el Procesamiento del Linguaje Natural, pages 199–206, 2001.
- [11] Vitor Jorge Rocio, Gabriel Pereira Lopes, and Éric Villemonte de la Clergerie. Tabulation for multi-purpose partial parsing. *Grammars*, 4(1):41–65, 2001.

#### 6.3 In National Journals

- [12] L. M. Pereira. Conversando sobre IA. Revista Intelecto, Revista da Sociedade Portuguesa de Filosofia, 5, February 2001.
- [13] L. M. Pereira. Incidência lógica da IA. Disputatio, 10:36-57, May 2001.
- [14] L. M. Pereira. Inteligência artificial: mito e ciência. Revista Intelecto, Revista da Sociedade Portuguesa de Filosofia, 5, February 2001. Reprinted invited paper in: Revista Colóquio/Ciências, Fundação Calouste Gulbenkian, no. 3, pages 1-13, Lisboa, October 1988.
- [15] L. M. Pereira. Philosophical incidence of logical programing. Revista Intelecto, Revista da Sociedade Portuguesa de Filosofia, 6, December 2001.

[16] L. M. Pereira. Recenção de "Science et Communication" de João Caraça. *Análise Social*, 25(157):1154–1158, 2001.

#### 6.4 Book chapters

- [17] Pablo Gamallo. Análisis de las categorías gramaticales desde el punto de vista semántico-cognitivo. In Augusto Soares Da Silva, editor, Linguagem e Cognição: a perspectiva da Linguística Cognitiva, pages 355–374. Associação Portuguesa de Linguística, 2001.
- [18] P. Quaresma and I. Rodrigues. Using dynamic logic programming to model cooperative dialogues. In Fawzi Daoud, editor, Modal and Temporal Logics based Planning for Open Networked Multimedia Systems. IOS Press, 2001. Extended and revised version of the AAAI'99 Fall Symposium paper.

#### 6.5 In Proceedings of International Conferences

- [19] Salvador Abreu. Isco: A practical language for heterogeneous information system construction. In *Proceedings of INAP'01*, Tokyo, Japan, October 2001. INAP.
- [20] Salvador Abreu and Joaquim Godinho. Logic-based Network Configuration and Management. In The 7<sup>th</sup> International Congress of European University Information Systems, Berlin, March 2001. Humboldt University.
- [21] Alexandre Agustini, Pablo Gamallo, and Gabriel Pereira Lopes. Selection restrictions acquisition for parsing and information retrieval improvement. In *Proceedings of the 14th International Conference On Applications of Prolog (INAP 2001)*, pages 466–479, University of Tokyo, Tokyo, Japan, 2001.
- [22] J. J. Alferes, A. Brogi, J. A. Leite, and L. M. Pereira. Environment-aware computations via program updates. In A. Pettorossi, editor, *Pre-Procs. of the Eleventh International Workshop* on Logic-based Program Synthesis and Transformation (LOPSTR'01), pages 112–123, Paphos, Cyprus, November 2001.
- [23] J. Gabriel P. Lopes António Ribeiro and Jo ao Mexia. Building bilingual terminology databanks for greek from parallel texts. In *Hellenic Language and Terminology 3rd. Conference Papers*, Athens, Greece, 1 3 November 2001. Hellenic Language and Terminology Association.
- [24] J. Gabriel P. Lopes António Ribeiro and Jo ao Mexia. Extracting translation equivalents from portuguese-chinese parallel texts. In Lee Sangsup, editor, Asialex 2001 Proceedings: Asian Bilinguism and the Dictionary, 2nd ASIALEX International Conference, Seul, South Coreia, 8 – 10 August 2001. Asian Association for Lexicography.
- [25] F. Azevedo and P. Barahona. Interaction of constraint programming and local search for optimisation problems. In Toby Walsh, editor, Principles and Practice of Constraint Programming, CP'2001, volume 2239 of Lecture Notes in Computer Science, pages 554–559. Springer, November 2001.
- [26] Gasperin C., P. Gamallo, A. Agustini, and J. G. P. Lopesand V. de Lima. Using syntactic contexts for measuring word similarity. In *Proceedings of the ESSLLI'01 Workshop on Semantic Knowledge Acquisition and Categorisation*, Helsinki, Finland, 13–17 August 2001.
- [27] N. Chang and T. Maia. Grounded learning of grammatical constructions. In AAAI Spring Symposium on Learning Grounded Representations, Stanford, CA, 2001.
- [28] N. Chang and T. Maia. Learning grammatical constructions. In *Proceedings of the 23rd Annual Meeting of the Cognitive Science Society (COSCI 2001)*, Edinburgh, Scotland, 2001.

- [29] J. Cruz and Pedro Barahona. Global hull consistency with local search for continuous constraint solving. In P. Brazdil and A. Jorge, editors, Progress in Artificial Intelligence, 10th Portuguese International Conference on Artificial Intelligence (EPIA'01), volume 2258 of Lecture Notes in Artificial Intelligence, pages 349–362, Porto, Portugal, December 2001. Springer.
- [30] C. V. Damásio and L. M. Pereira. Antitonic logic programs. In T. Eiter, W. Faber, and M. Truszczynski, editors, Logic Programming and Nonmonotonic Reasoning, 6th International Conference, LPNMR01, volume 2173 of Lecture Notes in Artificial Intelligence, pages 379–392. Springer, September 2001.
- [31] C. V. Damásio and L. M. Pereira. Monotonic and residuated logic programs. In Salem Benferhat and Philippe Besnard, editors, *Symbolic and Quantitative Approaches to Reasoning with Uncertainty, 6th European Conference, ECSQARU-2001*, volume 2143 of *Lecture Notes in Artificial Intelligence*, pages 748–759. Springer, September 2001.
- [32] P. Dell'Acqua, J. A. Leite, and L. M. Pereira. Evolving multi-agent viewpoints an architecture. In P. Brazdil and A. Jorge, editors, *Progress in Artificial Intelligence*, 10th Portuguese International Conference on Artificial Intelligence (EPIA'01), volume 2258 of Lecture Notes in Artificial Intelligence, pages 169–182, Porto, Portugal, December 2001. Springer.
- [33] P. Dell'Acqua and L. M. Pereira. Enabling agents to update their knowledge and to prefer. In P. Brazdil and A. Jorge, editors, *Progress in Artificial Intelligence*, 10th Portuguese International Conference on Artificial Intelligence (EPIA'01), volume 2258 of Lecture Notes in Artificial Intelligence, pages 183–190, Porto, Portugal, December 2001. Springer.
- [34] P. Dell'Acqua and L. M. Pereira. Prefering and updating in abductive multi-agents. In Andrea Ominici et al, editor, *Post-Proceedings of the 2nd International Workshop on Engineering Societies in the Agents' World (ESAW'01)*, volume 2203 of *Lecture Notes in Artificial Intelligence*. Springer, 2001.
- [35] P. Dell'Acqua and L. M. Pereira. Prefering and updating in multi-agents. In 9th International DDLP-Workshop on "Deductive Databases and Knowledge Management", which is held in the Stream "Content Management" of the 14th International Conference on Applications of Prolog (INAP'2001), pages 20–22, Tokyo, Japan, October 2001.
- [36] Pablo Gamallo, Alexandre Agustini, and Gabriel P. Lopes. The role of co-specification for the acquisition of selection restrictions from unsupervised corpora. In *Workshop on Applications Apprentissage, Acquisition des connaissances à partir de Textes Electroniques (A3CTE)*, pages 27–33, Grenoble, France, 2001.
- [37] Pablo Gamallo, Alexandre Agustini, and Gabriel P. Lopes. Selection restrictions acquisition from corpora. In Pavel Brazdil and Alipio Jorge, editors, Progress in Artificial Intelligence: Knowledge Extraction, Multi-agent Systems, Logic Programming and Constraint Solving, 10th Portuguese Conference on Artificial Intelligence (EPIA'01), Lecture Notes in Artificial Intelligence LNCS/LNAI 2258, pages 30 43, Porto, Portugal, 2001. LNAI, Springer-Verlag.
- [38] Pablo Gamallo, Caroline Gasperin, Alexandre Agustini, and Gabriel P. Lopes. Syntactic-based methods for measuring word similarity. In V. Mautner, R. Moucek, and K. Moucek, editors, Text, Speech, and Discourse (TSD-2001), Lecture Notes in Artificial Intelligence LNCS/LNAI 2166, pages 116–125. Berlin:Springer Verlag, 2001.
- [39] G. Guimarães and F. Moura-Pires. An essay in classifying self-organising maps for temporal sequence processing. In N. Allinson et al., editor, *Advances in Self-organising Maps*, pages 259–266. Springer, 2001.
- [40] Ludwig Krippahl, Michael Trosset, and Pedro Barahona. Combining constraint programming and multidimensional scaling to solve distance geometry problems. In *Procs. of CP-AI-OR'01* Workshop, pages 67–80, Kent, April 2001.

- [41] E. Lamma, L. M. Pereira, and F. Riguzzi. Belief revision by lamarckian evolution. In E. J. W. Boers et al, editor, Applications of Evolutionary Computing Procs. of the First European Workshop on Evolutionary Learning (EvoLEARN2001), volume 2037 of Lecture Notes in Computer Science, pages 404–416. Springer, 2001.
- [42] E. Lamma, L. M. Pereira, and F. Riguzzi. Belief revision by multi-agent genetic search. In J. Dix and K. Satoh, editors, Procs. of the ICLP-2001 Workshop on Computational Logic in Multi-Agent Systems (CLIMA'01), Cyprus, 2001.
- [43] J. A. Leite. A modified semantics for lups. In P. Brazdil and A. Jorge, editors, *Progress in Artificial Intelligence, Proceedings of the 10th Portuguese International Conference on Artificial Intelligence (EPIA01)*, volume 2258 of *LNAI*, pages 261–275, Berlin, 2001. Springer.
- [44] J. A. Leite, J. J. Alferes, and L. M. Pereira. Combining societal agents' knowledge. In L. M. Pereira and P. Quaresma, editors, *Procs. of the APPIA-GULP-PRODE'01 Joint Conference on Declarative Programming (AGP'01)*, pages 313–327. Universidade de Evora, September 2001.
- [45] 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, Pre-Procs. of the Eighth International Workshop on Agent Theories, Architectures, and Languages (ATAL'01), pages 133–145, Seattle, USA, August 2001.
- [46] J. A. Leite, J. J. Alferes, and L. M. Pereira. Multi-dimensional dynamic knowledge representation. In T. Eiter, W. Faber, and M. Truszczynski, editors, Procs. of the Sixth International Conference on Logic Programming and Nonmonotonic Reasoning (LPNMR'01), volume 2173 of Lecture Notes in Artificial Intelligence, pages 365–378, Wien, Austria, September 2001. Springer.
- [47] J. A. Leite, J. J. Alferes, and L. M. Pereira. Multi-dimensional dynamic logic programming to represent societal agents' viewpoints. In P. Brazdil and A. Jorge, editors, Progress in Artificial Intelligence, 10th Portuguese International Conference on Artificial Intelligence (EPIA'01), volume 2258 of Lecture Notes in Artificial Intelligence, pages 276–289, Porto, Portugal, December 2001. Springer.
- [48] T. Maia and N. Chang. Grounding the acquisition of grammar in sensorimotor representations. In AAAI Spring Symposium on Learning Grounded Representations, Stanford, CA, 2001.
- [49] N.C. Marques and J.G.P. Lopes. Tagging with small training corpora. In F. Hoffmann, D. Hand, N. Adams, D. Fisher, and G. Guimaraes, editors, Advances in Intelligent Data Analysis (LNCS 2189), 4th International Conference, IDA 2001, pages 63–72. Springer Verlag, 2001.
- [50] Palmira Marrafa and António Ribeiro. Quantitative evaluation of machine translation systems: Sentence level. In *Proceedings of the MT Evaluation Workshop in the framework of the MT Summit VIII*, pages 39–43, Santiago de Compostela, Spain, 22 September 2001. European Association of Machine Translation.
- [51] S. Nascimento, B. Mirkin, and F. Moura-Pires. Proportional membership in fuzzy clustering as a model of ideal types. In P. Brazdil and A. Jorge, editors, *Progress in Artificial Intelligence*, 10th Portuguese International Conference on Artificial Intelligence (EPIA'01), volume 2258 of Lecture Notes in Artificial Intelligence, pages 52–62, Porto, Portugal, December 2001. Springer.
- [52] Pedro Patinho and Salvador Abreu. ProLDAP Api em Prolog para Directórios LDAP. In *IV Conferência de Redes de Computadores*. FCCN, November 2001. (in Portuguese).
- [53] Paulo Quaresma and Irene Rodrigues. Using logic programming to model multi-agent web legal systems an application report. In *Proceedings of the ICAIL'01 International Conference on Artificial Intelligence and Law*, St. Louis, USA, May 2001. ACM. 10 pages.

- [54] Paulo Quaresma and Irene Pimenta Rodrigues. An Interactive Graph Based Legal Information Retrieval System. In V. Matousek, P. Mautner, R. Moucek, and K. Tauser, editors, Proceedings of the 4th International Conference on Text, Speech and Dialogue—TSD 2001, Lecture Notes in Artificial Intelligence LNCS/LNAI 2166, Zelezna Ruda, Czech Republic, September 2001. Springer-Verlag.
- [55] Paulo Quaresma and Irene Pimenta Rodrigues. Pgr: Portuguese atorney general's office decisions on the web. In Osamu Yoshie, editor, Proceedings of the 14th International Conference on Applications of Prolog, University of Tokyo, Tokyo, Japan, October 2001. REN Associates, Inc. ISSN 1345-0980.
- [56] Luis Quintano, Irene Rodrigues, and Salvador Abreu. Relational information retrieval through natural lanaguage analysis. In *Proceedings of INAP'01*, Tokyo, Japan, October 2001. INAP.
- [57] António Ribeiro, Gael Dias, Gabriel Pereira Lopes, and Jo ao Mexia. Cognates alignment. In Bente Maegaard, editor, Proceedings of the Machine Translation Summit VIII (MT Summit VIII), pages 287–292, Santiago de Compostela, Spain, 18-22 September 2001. European Association of Machine Translation.
- [58] J.F. Silva, J. Mexia, C.A. Coelho, and J.G. P. Lopes. Document clustering and cluster topic extraction in multilingual corpora. In Xindong Wu Nick Cercone, T. Y. Lin, editor, *Proceedings of the IEEE 2001 International Conference on Data Mining (ICDM'01)*, pages 513–520, San Jose, California, 29 November -2 December 2001. IEEE Computer Society.
- [59] J.F. Silva, J. Mexia, C.A. Coelho, and J.G. P. Lopes. Multilingual document clustering, topic extraction and data transformations. In Pavel Brazdil and Alipio Jorge, editors, Progress in Artificial Intelligence: Knowledge Extraction, Multi-agent Systems, Logic Programming and Constraint Solving, 10th Portuguese Conference on Artificial Intelligence (EPIA'01), Lecture Notes in Artificial Intelligence LNCS/LNAI 2258, pages 74 87, Porto, Portugal, 2001. Berlin: Springer-Verlag.

#### 7 Missions

#### Carlos Viegas Damásio

• Vienna, September 2001

Purpose: Participation and presentation of a paper in LPNMR'01, 6th Int. Conference on Logic Programming and Non-Monotonic Reasoning.

#### Francisco Azevedo

 Paphos, Cyprus, November 2001
 Purpose: Participation in CP'2001, Principles and Practice of Constraint Programming, CP'2001.

#### Gabriel Pereira Lopes

• Luxemburgo, several months in 2001 Purpose: Collaboration with SYSTRAN under project TRADAUT-PT.

#### João Alexandre Leite

- Lisboa, Portugal, May 2001 Purpose: Participation in "Mind and Action III".
- Seatle, USA, July/August 2001
   Purpose: Participation, with paper presentation, in ATAL'01 Eighth International Workshop on Agent Theories, Architectures, and Languages.
- Vienna, Austria, September 2001
   Purpose: Participation, with paper presentation, in LPNMR'01 Sixth International Conference on Logic Programming and Nonmonotonic Reasoning.
- Évora, Portugal, September 2001 Purpose: Participation in the Joint Conference on Declarative Programming (AGP'01).
- Porto, Portugal, December 2001
   Purpose: Participation, with paper presentation, in the 10th Portuguese International Conference on Artificial Intelligence (EPIA'01).

#### Joaquim Francisco Ferreira da Silva

• San Jose, USA, 29 Nov-2 Dec in 2001 Purpose: IEEE International Conference on Data Mining (ICDM01).

#### Jorge Cruz

Porto, Portugal, December 2001
 Purpose: Participation in EPIA'2001, 10th Portuguese Conference on Artificial Intelligence, and Satellite workshop on Constraint Solving and Operations Research.

#### José Júlio Alferes

- University of California at Riverside, USA, 3 weeks in January/February 2001
   Purpose: Follow up on the collaboration with Professors Halina and Teodor Przymusinski on the subject of logic programming updates.
- Évora, Portugal, September 2001 Purpose: Participation in the Joint Conference on Declarative Programming (AGP'01), and present 1 paper there.
- Pisa, Italy, 1 week, November 2001 Purpose: Collaboration in a joint bilateral project.

- Brussels, Belgium, November 2001
   Purpose: Participation in an evaluation panel for "Future and Emerging Technologies" projects' of the european IST program.
- Porto, Portugal, December 2001
   Purpose: Participation in the 10th Portuguese International Conference on Artificial Intelligence (EPIA'01).

#### Ludwig Krippahl

Kent, UK, April 2001
 Purpose: Participation in CP-AI-OR 2001, Third International Workshop on Integration of AI and OR Techniques.

#### Luís Moniz Pereira

- University of California at Riverside, USA, 3 weeks in January/February 2001
   Purpose: Follow up on the collaboration with Professors Halina and Teodor Przymusinski on the subject of logic programming updates, and furthering of joint publications.
   Also to prepare jointly organized workshop on Updating Non-monotonic Knowledge Bases (UNKB'02) at ICLP'02.
- Évora, Portugal, September 2001 Purpose: Participation in the Joint Conference on Declarative Programming (AGP'01), and present 1 paper there.
- Toulouse, France, September 2001

  Purpose: Participation in the 6th European Conference on Symbolic and Quantitative Approaches to Reasoning with Uncertainty (ECSQARU'01) and present 1 paper there.
- University of Pisa, Italy, November 2001, Purpose: Ongoing collaboration and and preparation of joint publications in the area of rational and reactive agents, supported by a bilateral ICCTI-CNR project (RRA).
- Porto, Portugal, December 2001
   Purpose: Participation in the 10th Portuguese International Conference on Artificial Intelligence (EPIA'01) and presenting 3 accepted papers there.

#### Pablo Gamallo Otero

- Grenoble, France, 25-28 June in 2001
   Purpose: Participation in the Workshop A3TE, Applications Apprentissage, Acquisition des connaissances a partir de Textes Electroniques
- Plenz, CZ, 21-23 September in 2001
   Purpose: Participation in the Conference TSD, Text, Speech and Dialogue.

#### Paulo Quaresma

- St. Louis, USA, 21-28 Maio 2001 Purpose: Participation in ICAIL - International Conference on AI&Law.
- Porto Alegre, Brasil, 11-31 Agosto 2001
   Purpose: Lecture "Agentes Inteligentes para um sistema de pesquisa de informação" in Universities UNISINOS and PUCRS.
- Tokyo, Japan, 17-24 Outubro 2001
   Purpose: Participation in INAP'01 International Conference on Applications of Prolog.

#### Pedro Barahona

- Kent, UK, April 2001
  - Purpose: Participation in CP-AI-OR 2001, Third International Workshop on Integration of AI and OR Techniques.
- Cascais, Portugal, July 2001
  - Purpose: Chairing of AIME'01, 8th Conference on Artificial Intelligence in Medicine in Europe.
- Paphos, Cyprus, November 2001
  - Purpose: Participation in CPÝ2001, Principles and Practice of Constraint Programming, CP'2001.
- Porto, Portugal, December 2001
  - Purpose: Participation in EPIA'2001, 10th Portuguese Conference on Artificial Intelligence, and Chairing of the Satellite workshop on Constraint Solving and Operations Research.

#### Pierangelo Dell'Acqua

- Prague, Czech Republic, July 2001
  - Purpose: Participation in the ESAW'2001 Workshop on Engineering Societies in the Agents' World and presenting an accepted paper there.
- Porto, Portugal, December 2001
  - Purpose: Participation in the 10th Portuguese International Conference on Artificial Intelligence (EPIA'01) and presenting 2 accepted papers there.

#### Salvador Pinto Abreu

- Berlin, Germany, March 2001
  - Purpose: Participation in the 7<sup>th</sup> International Conference of European University Information Systems (EUNIS'01).
- Évora, Portugal, September 2001
  - Purpose: Participation in the APPIA-GULP-PRODE 2001 Joint Conference on Declarative Programming (AGP'01).
- Tokyo, Japan, October 2001
  - Purpose: Participation in the 14<sup>th</sup> International Conference of Applications of Prolog (INAP'01).
- Évora, Portugal, November 2001
  - Purpose: Participation in the  $2^{nd}$  Conference of the Portuguese Society for Information Systems (CAPSI'01).
- Covilhã, Portugal, November 2001
  - Purpose: Participation in the 4<sup>th</sup> Portuguese Conference on Computer Networking and Applications (CRC'01).
- Porto, Portugal, December 2001
  - Purpose: Participation in the 10<sup>th</sup> Portuguese Conference on Artificial Intelligence (EPIA'01).

#### Susana Nascimento

- Cascais, Portugal, July 2001
  - Purpose: Participation in 4th International Symposium on Intelligent Data Analysis (IDA 2001).
- Porto, Portugal, December 2001
  - Purpose: Participation in EPIA'2001, 10th Portuguese Conference on Artificial Intelligence.

#### Vitor Rocio

• INRIA-Rocquencourt, France, November 11 - December 11 2001 Purpose: To Work with Eric de la Clergerie in the framework of ORLISINROC project.

#### 8 Visitors

- Caroline Gasperi PUCRS, Portoalegre, Brasil, 15 January-15 February 2001. Colaboration in Syntactic-Based Methods for Measuring Word Similarity.
- **Daniel Diaz**, University of Paris I and INRIA, 3 weeks, August-September 2001. Collaboration on extensions to GNU Prolog for the OAR project and preparation for a 2-year bilateral cooperation programme with INRIA, to be funded by ICCTI.
- Eric de la Clergerie, Researcher, INRIA-Rocquencourt, France, September 5-12 (1 week). To Work in the framework of ORLISINROC project.
- **Fabrizio Riguzzi**, Assistant Professor, University of Ferrara, 1 week, October 2001. Ongoing collaboration and and preparation of joint publications in the theory and implementation of genetic learning and Bayesian methods in logic programming.
- Pierangelo Dell'Acqua, Senior Lecturer, Linköping University, 3 visits during 2001: 1 week, May; 1 month, July; 1 week, December. Collaboration on logic-based multi-agent systems and on an asynchronous architecture for logic-based agents. Preparation of an invited paper in The Association for Logic Programming Newsletter. Preparation of a Master Thesis proposal on an implementation of an agent architecture.
- Reinhard Kahle, Researcher, U. Tübingen, Germany 3 days, June 01. Preparation of an application for a postdoc position with CENTRIA (awarded to start April 02).
  2-17 June 2001. Collaboration in selection restrictions. Preparation of a bilateral project proposal submitted to ICCTI and CAPES.
- **Renata Vieira**, Professor, UNISINOS, Portoalegre, Brasil, 2-17 June 2001. Collaboration in selection restrictions. Preparation of a bilateral project proposal submitted to ICCTI and CAPES.
- Roman W. Swiniarski, Professor, San Diego State University Department of Mathematical and Computer Sciences, USA, 1-15 September 2001. Colaboration in the area of neural networks, data mining and knowledge discovery systems.
- Terrance Swift, Researcher, University of New York at Stony Brook, 3 weeks, October 2001. Ongoing collaboration and preparation of joint publications in the theory and implementation of abductive logic programming and applications. Development of a distributed strongly connected component detection algorithm, related to the activities of the TARDE project.
- **Tom Dietterich**, Professor, Oregon State University, USA, 1 week, February 2001. Collaboration on Learning Heuristic Functions for search in the context of determination of the spatial staructure of Proteins.
- Vera Strube de Lima, Professor, UNISINOS, Portoalegre Brasil, January 2001. Collaboration in anaphora resolution, dialogues and other work in natural language processing. Visit planning for other Brasilian researchers.

## 9 CENTRIA evolution graphics in 2001















