

Special issue: Agent Technology and MAS

AAMAS'05

IJCAI'05

**European Championship
Robosoccer 2005**

Agents All Around

Editor-in-chief

This issue is dedicated to Agent Technology and Multi-Agent Systems. You will find seven reports from academic centres in The Netherlands and Belgium doing research in this area. Though not exhaustive we believe it will give the reader a good impression of the research and projects being done in agent technology and multi-agent systems within our community. Furthermore, a report by Virginia and Frank Dignum is included on the AAMAS'05 conference, the leading conference in agent technology, held recently in Utrecht. As you may read the conference was a great success. Moreover this issue contains a report on the IJCAI'05 conference (including many 'agent'-related sessions). Besides software agents you will also encounter "hardware agents", trying to score goals in teams of varying size when playing soccer. In a nice contribution Mannes Poel reports on the 8th FIRA European Championship Robosoccer, held recently at Universiteit Twente, and on Universiteit Twente's own MI20 team.

Curious about the frequency of the word 'agent' in this issue I did a quick wordcount. It appears that the word 'agent', either independent or as part of a composition, occurs a total number of 311 times in this issue, including the occurrences in this sentence. Truly agents all around!



The next issue will also be a special issue, then dedicated to computer games. Besides contributions on research in this field, we will have reports on several major computer-games events, such as the World Computer Chess Championship held recently in Reykjavik, the 10th Computer Olympiad and the 11th Advances in Computer Games conference, both at the moment of writing underway in Taipei, and the 4th International Conference on Entertainment Computing, to be held on September 19-21 in Sanda, Japan. Although invitations for contributions have meanwhile been sent, I wholeheartedly invite anyone else with relevant information on research or events related to computer games to send his/her contribution.

Finally, after Joris van Looveren stepped down as editor for Belgium after receiving his Ph.D., we are glad to have a successor in the person of Katja Verbeeck. Her research interests are (how apt!) in the field of multi-agent systems. She introduces herself on page 72 of this issue. Katja, welcome on board!

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The photographs in this issue are by courtesy of Femke de Jonge (pp. 83-84), Mannes Poel (pp. 86-88), Nico Roos (front cover and p. 70) and Hans Weigand (p. 75).

The deadline for the next issue is: **October 10, 2005.**

BNVKI-Board News

Han La Pourté

The summer has almost come to an end and we are facing a new academic year. Normally, the summer is a period of holidays and reduced activities, but nevertheless it can lead to interesting events and pleasant surprises.

During the summer at the IJCAI conference, the new ECCAI fellows were honoured. The ECCAI Fellows program has been started in 1999, to “recognize individuals who have made significant, sustained contributions to the field of artificial intelligence (AI) in Europe”. Every year, about 5 to 10 ECCAI fellows are elected from all the AI researchers in Europe: this year, there were nine new Fellows. John-Jules Meyer and Luc de Raedt were nominated by the BNVKI Board to the ECCAI, and we are happy to announce that both were elected for an ECCAI fellowship. We like to congratulate both John-Jules and Luc with this honour! Since the start of the ECCAI Fellows program in 1999, eight ECCAI fellows coming from the Netherlands and Belgium have been elected in total. This shows that the research done in our small countries is of a high level and that our community and the BNVKI can certainly be proud of this.

Also during the summer, the submission and reviewing process of the BNAIC has taken place. This year’s BNAIC conference in Brussels seems to become larger than ever. The number of submissions has reached a level of way over one hundred, viz., the record amount of 118. Of these submissions, 94 were accepted. So, we not only face a program of substantial size, but probably a very large conference participation as well. The organisers are doing an excellent job, which promises an exciting happening and a memorable environment. So, all the ingredients are there for a very successful BNAIC conference. When you read this, you probably can register online right away. So, why wait any longer... See you in Brussels!

Katja Verbeeck New BNVKI Editor for Belgium

Last month I was asked to become the new Belgian editor for the *BNVKI Newsletter*, since Joris van Looveren decided it was time for him to do something else after his graduation. I did not have to think long about it, because it seems like a good opportunity to keep in contact with my Belgian

colleagues and their activities. The first job to do is to introduce myself. As I know myself for a while now, this should be fairly easy.

I am affiliated with the Computational Modeling Lab (COMO) of the Vrije Universiteit Brussel, which is headed by prof. Bernard Manderick and prof. Ann Nowé. I was privileged to be part of the take-off of the group in 2000. As such I was one of the first teaching assistants (actually I was the second) of COMO. Since October last year I became a doctor assistant. An important part of this job involves teaching, which by the way I like very much. I guide(d) exercises of courses as Machine Learning, Computability, Multi-Agent Systems, Structure of Computer Programs, Formal Methods and Algorithms and Data Structures.

My research interests are situated in the following areas: Reinforcement Learning in non-stationary environments, Multi-Agent Reinforcement Learning, Learning Automata, (Evolutionary) Game Theory, Multi-Agent Systems and Ant Algorithms. September 2004, I finished my Ph.D. dissertation entitled *Coordinated Exploration in Multi-Agent Reinforcement Learning*. Together with my supervisor, Ann Nowe, I investigated how a group of independent agents can learn to coordinate in systems with real-life limitations, such as distributivity, communication costs etc. Joris explained you all about my public defense in the October edition of the Newsletter last year. Currently, I am involved in the COMO research track on Multi-Agent Reinforcement Learning in multi-stage MAS problems.

So that is about all what myself is concerned. I will do my best in the future to report you on a lot of interesting, Belgian A.I. contributions. Since COMO is one of the local organizers of both the upcoming BNAIC conference and EUMAS workshop, more news will probably follow soon. And off course Joris, good luck!

Research on Agent-Based Systems at the IS Group of Utrecht University

John-Jules Meyer
Intelligent Systems Group, ICS, Utrecht University

Agent-related research has already been in the centre of interest at Utrecht University for over a decade, although in the early times only logical approaches to agents were investigated. This work led to the *KARO* (Knowledge, Abilities, Results, Opportunities) framework of Bernd van Linder,

Wiebe van der Hoek and myself. In this logical framework, a blend of *dynamic logic* and *epistemic logic*, enriched with modalities for, e.g., desires, goals and commitments, one can specify the behaviour of intelligent agents by describing how the mental attitudes of an agent such as beliefs and commitments change by the action performance of the agent.

After the logical investigations of agents, we turned to the question of how to *realize* agents. We chose for studying this issue from the perspective of *agent-oriented programming languages* and *agent communication languages*. Inspired by work by Rao on AgentSpeak, Koen Hindriks *et al.* developed the language *3APL*, a dedicated agent language with features of both the imperative and logic programming paradigms. It provides the possibility to program the agent's mental state (in the first instance expressed in *beliefs* and *procedural goals* [now called *plans*], but an extension of 3APL to cater for beliefs and procedural as well as *declarative goals* has by now been defined as well, albeit that there is currently not yet a stable implementation). Meanwhile Rogier van Eijk *et al.* worked on the issue of *agent communication*. Here a *process-algebraic* framework emerged to describe agent communication, which was later extended to a framework for *agent coordination* by Wieke de Vries, by employing techniques from constraint programming. Also mixes of logical and *game-theoretical* approaches to multi-agent systems were investigated in the CABS project together with the TU Delft (Paul Harrenstein).

With the advent of Frank Dignum to the group, interest was intensified in several aspects of multi-agent systems and *agent societies*, such as *normative behaviour* and *e-institutions* (Davide Grossi, Huib Aldewereld) and *ontologies* in multi-agent systems (Jurriaan van Diggelen), the latter in co-operation with the information science group. Also the theme of an *agent-oriented programming methodology* became an important research topic of the group (Mehdi Dastani, Joris Hulstijn, and particularly the thesis by Virginia Dignum on the OperA framework).

At the moment still much work is going on regarding the further development of the language 3APL, raising issues such as *declarative goals* and how to render the *deliberation cycle* of the language programmable (Mehdi Dastani, Birna van Riemsdijk). Also there is a great interest in the *formal semantics and verification* of agent-oriented (and object-oriented) systems (Birna van Riemsdijk, Cees Pierik, Frank de Boer). A 'lightweight' version of 3APL (3APL-M) is being developed for the use on mobile devices (Fernando Koch). The

investigation of the logical foundations such as the *modal logic of agency* is continued by Jan Broersen, and there is also ample expertise on multi-agent *argumentation* (Henry Prakken, Gerard Vreeswijk, Martin Caminada), and *agent learning* (Marco Wiering). I myself have recently taken a particular interest in the role of *emotions* in agent-based systems.

Finally there are a number of more practically oriented projects going on now, of which I mention:

1. *ANITA Administrative Normative Information Transaction Agents* (ANITA) with Universiteit Maastricht, University Groningen and University Leiden (Huib Aldewereld)
2. STW project *Distributed Model-Based Diagnosis and Repair* with TU Delft, NLR and Universiteit Maastricht (Geert Jonker)
3. BSIK/ICIS project *Adaptive Support Systems* with TNO (Bob van der Vecht)
4. NWO/Token2000 project *Making sense of evidence: software support for crime investigations* with University Groningen (Susan van den Braak, leader Henry Prakken)
5. EC-FP6 project *Argumentation Service Platform with Integrated Components (ASPIC)* (Martin Caminada, Henry Prakken, Gerard Vreeswijk)
6. Ph.D. project together with the company Emotional Brain in Almere and Radboud University Nijmegen on multi-agent expert systems (Henk Jan Lebbink)

Currently there are also far advanced plans to work on other applications of agent technology, such as *companion agents* (such as a toy robot) and integrating agent technology into *gaming*, partly in co-operation with the GIVE group of Mark Overmars in Utrecht, and other universities and companies in The Netherlands and abroad.

Agents@CWI: SEN4, Computational Intelligence and Multi-Agent Games

*Sander Bohte
CWI, Amsterdam*

In the CWI group Computational Intelligence and Multi-Agent Games, headed by Prof. Dr. Han La Poutré, competitive agents is the key word: research focuses on intelligent and adaptive multi-agent systems where parts of the systems may be owned by competing stakeholders (agents), and with potentially many such stakeholders.

Systems comprising of agents with competing interests spring up for instance when computational intelligence is merged with the field of E-business and economics: each participant in an economic setting tries to extract the most utility for itself from the e-commerce system, and the design and rules of the system must be so that as a whole, the system remains useful even when the participating agents behave selfish.

A key observation is that if participants let themselves be represented in a multi-agent system by smart autonomous software, or software agents, intelligent behaviour of the agents is paramount. Intelligent behaviour of the agents here is intelligent behaviour from their own point of view ('bounded rationality') and reactive on their dynamic environment.

Research in the group concerns the different levels of abstraction, from microscopic behaviour (the learning software of an agent, by, e.g., evolutionary algorithms or neural networks) to macroscopic behaviour (the functioning of markets consisting of adaptive agents).

The knowledge base of the group on competitive multi-agent systems is further broadened by many collaboration projects with industry and other academic partners. In the ASTA project (Autonomous Systems of Trade Agents in E-Commerce), we collaborated with ING, (then still) KPN Research and TNO to develop methods for dynamically pricing information for clients (with ING) and methods for personalized recommendation, with both applications based on agent systems.

Another project, DEAL (Distributed Engine for Advanced Logistics) is focused on strategies to increase the effectiveness of logistical decision making, with a number of partners like Vos Logistics, Post Kogeko and Almende. An example of work done within the DEAL project is the dynamic (re-)scheduling of trucking routes and truck loads. We developed a dynamic spot market where a software agent in each truck continually participates in auctions to increase, change and augment the loads the truck carries. To facilitate this, we developed bidding strategies for repeated auctions where the software agents compute which combination of loads they can acquire most profitably.

Another focus within the DEAL project is on the modeling of multi-agent market mechanisms applicable to logistics settings, with an emphasis on negotiation. A model we developed uses the concept of utility graphs (related to undirected

probabilistic graphical models), in order to efficiently navigate the complex, high-dimensional contract space.

A last example project is MIA — for Medical Information Agents. In this NWO TOKEN project we research the problem of patient treatment scheduling in hospitals. Scheduling the complex treatment plans of patients requires coordination between all the different autonomous departments involved. Due to the dynamic nature of a hospital, any approach must be efficient, online, and flexible. In cooperation with medical experts we are investigating the use of autonomous software agents negotiating with each other in order to make (or reschedule) appointments for patient treatment. Systems where many self-interested stakeholders interact pervade our society, and neglecting the strong incentive these stakeholders have to be selfish can be catastrophic for the functioning of any system that tries to bring these parties together electronically. At the same time this is also a great opportunity, since when we can rely on individual agents to maximize their own utility we can design the system such that this individual intelligent behaviour improves the workings of the system as a whole. Extracting the most from this opportunity is the challenge the group has set for itself.

The Computational Modeling Lab, COMO

*Bernard Manderick and Ann Nowé
Vrije Universiteit Brussel*

The Computational Modeling Lab, COMO, is headed by Prof. dr. Bernard Manderick and Prof. Dr. Ann Nowé. COMO focuses on the one hand on the modeling of natural phenomena, and on the other hand on developing algorithms for complex problem solving inspired by these natural phenomena. COMO has experience in a wide range of learning techniques such as Reinforcement Learning, Genetic Algorithms, Neural Networks, Support Vector Machines, Bayesian Networks, etc. Nowadays, research in COMO is organized around two research tracks:

- 1) machine-learning techniques for data mining applications, and
- 2) multi-agent systems (MAS).

The multi-agent research of COMO is based on Reinforcement Learning (RL). The overall goal is to develop a genuine multi-agent RL for multi-stage multi-player games. Meaning that agents are Reinforcement Learners who can, with as few communication as possible, solve complex decision

problems as a team. The ESRL approach, developed at COMO is based on Learning Automata (LA). LA are adaptive decision making devices suited for operation in unknown environments. Originally they were developed in the area of mathematical psychology and used for modeling observed behaviour. In its current form, LA are closely related to RL approaches and most popular in the area of engineering. Since LA combine fast and accurate convergence with low computational complexity, they are applied to a broad range of modeling and control problems. However, the intuitive, yet analytically tractable concept of a learning automaton makes them also very suitable as a theoretical framework for Multi-agent Reinforcement Learning, including ant algorithms and the multi-type variant, which has been developed at COMO.

An important issue in Multi-agent Learning is the definition of the solution concept; this is what we want the agents to learn. Very often the Nash equilibria are suggested as the solutions to look for, however other solutions such as Pareto optimal solutions, or combinations of them might be more interesting from a systems-performance perspective. The ESRL technique can both handle common-interest games and conflicting-interest games. The uniqueness of the approach lies in the fact that agents who only require private information do not have to know in which type of game they are involved, the games might have stochastic payoff, and come with delay. Currently the technique is extended to general multi-stage multi-player games. More information can be found in the Ph.D. of Katja Verbeeck, see <http://como.vub.ac.be>.

The experience of COMO in the application of reinforcement and evolutionary learning techniques has been adapted to several application domains, including telecom and GRID computing. The latter application is done together with the School of Computing and Informatics of the University of Nairobi.

Problems such as distributed load balancing is an interesting case study for learning in MAS. It possesses the important properties of a MAS because it is distributed, communication is delayed and not for free. Agents have to take autonomously decisions based on limited information, and the state-dependent non-stationarity is very apparent.

COMO participates in several European initiatives such as the NoE EvoNet. It is member of the ALAD SIG, the European Inter-Network Special Interest Group on Agents that Learn, Adapt & Discover. Also, COMO participates in different nationally funded research projects, some in close

collaboration with industry. COMO organises both this year's edition of BNAIC and the European Workshop on Multi-agent systems. More information is available at <http://como.vub.ac.be/bnaic2005>.

Recently several Ph.D.'s have been completed at COMO in the domain of Learning in Multi-agent systems. More information can be found at <http://como.vub.ac.be>. For those who want to learn more about the agent research at COMO, the tutorial *Learning Automata as a Basis for Multi-agent Reinforcement Learning* which will be given at ECML'05 might be an ideal occasion.

Agent Research at Infolab, Tilburg University

*Hans Weigand
Tilburg University*

Infolab is a small research group at the Faculty of Economics of Tilburg University that covers several CS areas including software engineering, information systems, e-business, lexicography and digital libraries. Although we have been looking at agents for quite some time, our efforts have necessarily been limited.



Egon Verharen.

COOPERATIVE INTELLIGENT AGENTS (CIA)

It is already more than ten years ago that Egon Verharen started to look at agents and Agent-Oriented Programming. This resulted in his dissertation of 1997 *A language/action perspective on the design of cooperative information agents*. Some elaboration on the different terms is useful as they give a characterization of the Infolab approach.

Information agent. Our primary interest is not in the AI aspect, but in using the agent metaphor for Information System design. At that time (and still), Information System (IS) design was assumed to be object-oriented. Object orientation is quite suitable

for modelling some Universe of Discourse and its behaviour. However, an IS does not just provide a passive model of the reality. The IS is also an organizational instrument to communicate and coordinate activities. The agent metaphor is therefore quite suitable: it can encompass OO modelling for representing the Universe of Discourse, and in addition can model the IS (or IS's) as software to which certain organizational tasks have been delegated. In our view, an agent is always an agent "of" some human subject (the principal, in agency theory). The domain of the agents and their interactions is called the Environment of Discourse.

Cooperative. Given our IS perspective, our primary interest is not the internal architecture of the agent (e.g., a BDI architecture), nor its special intelligence. Rather we are interested in the design and support of the interactions between agents, which reflects (and in the end, embodies) the interactions between actors within the organization or beyond the boundaries of the organization. At this point, the notion of agent autonomy becomes relevant. In our view, autonomy is not some intrinsic or emerging property of the software as such, but rooted in the autonomy of the organizational actors "behind" the agents. And this autonomy needs not be explained, but should be seen as a convention, a social rule: human actors and organizations respect each other's autonomy. It also means that actors can decide to not fulfil a commitment. This autonomy of organizational actors works through in the autonomy of their agents.

Design. We were especially interested in the design of the interactions, rather than the design of the internals of the agents. One idea worked out in Verharen's dissertation is to separate the specification of the functionality of the agent and the specification of the interactions. The former can be done, for example, by means of task descriptions. For the latter, we used the term "contract", as the interactions typically need to be agreed upon by the interacting parties together. With this separation, it is possible to keep the functionality of the agent constant over some time, whereas the way this functionality is used, may differ from one contract to another. The contract specifies the interaction protocol and highlights the commitments and authorizations that result from some communicative action (result because of the contract), as well as compensations in the case of non-fulfilment. Contract monitoring (not so much in an agent framework but in an e-business perspective) was investigated later by Lai Xu (2004). Furthermore, in joint work with Virginia Dignum and the Utrecht agent group, the design

approach was broadened to the level of agent societies. Within the agent societies, contracts between agents need not be fixed at one time, but can be stepwise developed using refinement (Weigand *et al.*, 2003).

Language/Action Perspective (LAP). LAP is a long-term research subject of our group and turned out to be quite useful in providing concepts and background theory for agent communication and coordination.

CURRENT RESEARCH

There are several lines of research that we want to pursue. One relevant line is the combination of agent research achievements with up-to-date technology, that is, Service-Oriented computing based on web service technology. Another topic is imitation between agents. Imitation is quite a powerful learning mechanism in human society, and automated imitation mechanisms may play a role in the development of self-adaptive systems.

For more information, please contact Dr. Hans Weigand, weigand@uvt.nl.

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Agent-Systems Research at Vrije Universiteit Amsterdam and the Radboud Universiteit Nijmegen

*Jan Treur, Vrije Universiteit Amsterdam
Catholijn Jonker, Universiteit van Nijmegen*

AIM OF THE AGENT SYSTEMS RESEARCH PROGRAMME

The goal of the research programme of the Agent Systems Research Group at Vrije Universiteit Amsterdam and the Cognitive Artificial Intelligence division of the Nijmegen Institute for Cognition and Information is to develop agent-oriented modelling

techniques and support engines for research in other scientific disciplines such as Biology, Cognitive Science, and Organisation Theory. Specifically, AI and Agent Systems techniques are used for the analysis and simulation of the dynamics of complex processes in these disciplines, while the research also generates new questions and formalisms that affect fundamental research into Agent Systems within AI.

Through using agent-based modelling strategies, synergies between agent-based modelling and sciences concerned with complex processes are exploited. As such complex processes often can be described naturally by agent-based modelling approaches, human interaction in tuning the systems can be optimised to gain fundamental insight. The scientific areas of Biology, Cognitive Science and Organisation Theory will provide ample scope for the exploitations of these synergies, because these disciplines all involve complex sets of interactions that can be described at different scales and grains of analysis. Tackling the complex processes in each of these sciences imposes an additional level of synergy, since developing a model for one discipline will mutually benefit the others.

The aim of the agent systems research is to develop an agent-based methodology for analysis and simulation of dynamic patterns occurring in complex biological, cognitive, and organizational processes. The resulting models will formalise the dynamics of the target processes' behaviour in such a way that (i) high-level explanation and (ii) simulation of behaviour are feasible, and (iii) identification and specification of dynamic properties of parts or components and their relationship to the overall behaviour is supported. An example of the intended cross-discipline interaction is a cognitive model for the dynamics of beliefs, desires and intentions that provided a high-level model for simulation of intracellular processes of *E. coli*. Another example is an organisation modelling approach that proved useful to analyse and simulate part of the internal processes within biological organisms.

The research programme also aims at addressing a number of societal and business application areas of agent systems. In today's complex business processes, most often information, knowledge and other resources are inherently distributed. Distributed factory and office automation, computer supported co-operative work, intelligent information management, large scale transaction processing, and wide-area networking mandate flexible, distributed and scaleable IT support. Interaction and decentralised control are of crucial

importance to new emerging phenomena such as Electronic Commerce. To support these areas agent technology, the World Wide Web and Internet are indispensable ingredients. Information agents are useful tools to manage, in cooperation, the fast amount of information available on the Internet.

At the Radboud Universiteit Nijmegen, the emphasis will be on those agent concepts that are on the overlap between single- and multi-agent concerns, such as collaborative decision making, negotiation, and trust.

THE MODELLING PERSPECTIVE

The agent-oriented modelling perspective addresses dynamics of phenomena in artificial and natural systems. The inherent complexity of the dynamics of multiple, interacting active processes is made manageable by choosing an appropriate level of abstraction in describing them. The agent-based modelling perspective offers structuring and models of dynamics according to the following (aggregation) levels:

- *internal processes* within an agent;
- the (*externally observable*) *behaviour* of an agent, abstracting from what happens inside the agent;
- *organisations* of multiple agents.

For these levels, within the agent system research area, modelling languages and specific (e.g., agent or organisation) models have been developed recently that can be used for simulation or for formal analysis of the dynamics. For example, relations between models at different levels can be identified, such as "when is agent behaviour generated by a specific agent model for internal dynamics?" or, "which agent behaviour models fits in a certain organisation model?"

The methodology to be developed covers analysis and simulation. Within *analysis* for a *process as a whole* (e.g., an organisation):

- dynamic properties of the overall process can be identified and specified (in informal, semi-formal or formal manners);
- the same can be done (recursively) for dynamic properties for parts of the process (e.g., departments, roles or agents);
- relationships between the dynamic properties of the whole and dynamic properties of parts can be identified and specified; e.g., the dynamic properties of the parts imply the dynamic properties of the whole.

Furthermore, specifically for an *agent within a process*:

- dynamic properties of the agent-internal processes are identified and specified;

- and these can be related to dynamic properties for agent behaviour; e.g., specific types of dynamic properties of agent-internal concepts such as desires and intentions imply certain dynamic properties of the agent's behaviour.

Description of *relationships between dynamic properties* at different levels of aggregation

- provides a basis for formalised biological, cognitive, or organisational theories and their validation;
- enables evaluation of trajectories of dynamics (at any level of aggregation) against specified dynamic properties;
- allows diagnosis of malfunctioning;
- allows relating dynamic properties to empirical physical/chemical/physiological/neurological data.

To aid *simulation* of processes,

- languages for specification of high-level executable models
- are being developed, thus obtaining tractable dynamic models for phenomena that, at a physical level may be much more complex. *Software support* for the above aspects within analysis is provided, including *libraries of templates* of relevant dynamic properties, relationships, and simulation models, dedicated to the specific areas and disciplines covered.

Agent Technology in Maastricht

Nico Roos
IKAT, Maastricht

The Agent Technology group of the Maastricht University is one of the five research groups of the department of Computer Science. The other groups are: Neural Networks and Adaptive Behaviour, Search and Games, Knowledge Management, and Information-Technology Services. The Agent Technology group aims at the development of methods for *Coordination and Information Exchange between Agents*. In particular, research focuses on:

- Automatic ontology mapping
- Agent-based diagnosis of systems and of plan execution
- Distributed planning and plan repair
- Agents for health care

AUTOMATIC ONTOLOGY MAPPING

The use of different ontologies for knowledge representation hampers communication between agents. The research on automatic ontology mapping aims at developing methods that enable

agents to establish a mapping between their ontologies autonomously such that communication becomes possible. Floris Wiesman of University of Amsterdam and Nico Roos have developed a method that is capable of learning a 100% correct mapping between two ontologies provided that a few (5 to 10) instances of the concepts between which a mapping must be determined are represented in both ontologies.

AGENT-BASED DIAGNOSIS OF SYSTEMS AND OF PLAN EXECUTION

Finding causes of abnormally behaving systems and agents is important in many application areas where robustness is required. The research on agent-based diagnosis of systems and of plan execution aims at developing techniques that enable agents to handle these diagnostic problems in a collaborative way. Nico Roos, Cees Witteveen of the Delft University of Technology and Annette ten Teije of the Free University in Amsterdam have analyzed the complexity of classical model-based diagnosis in a multi-agent setting for different knowledge distributions over the agents, and we develop protocols for efficiently establishing a diagnosis. Together with Delft University of Technology, we are developing new methods for representing multi-agent plans that will enable us to apply distributed model-based diagnosis to plan-execution and the executing agents.

DISTRIBUTED PLANNING AND PLAN REPAIR

Planning is an important form of coordination in many multi-agent applications. Since in many application domains, it is impossible to foresee all possible contingencies, continuous adaptation of the plan is required. The research on distributed planning and plan repair aims at developing methods that enable (self-interested) agents to make robust plans and repair plans when necessary. This research is carried out in the STW project "Distributed Model-Based Diagnosis and Repair" in collaboration with the University of Utrecht, the Delft University of Technology and the Dutch National Aerospace Laboratory. In Maastricht, Femke de Jonge is doing her Ph.D. research within the project. The application domain that is used as a testbed is arrival, departure, taxi and gate planning of an airport.

In air traffic control, because of safety regulations, human operators must be responsible for all planning decisions. In the Casimir project "Human-Agent Networks" we address the issues of a distributed planning system consisting of human and computational agents. The project is carried out in collaboration with Delft University of Technology, the company Almende and the Dutch National Aerospace Laboratory. In Maastricht,

Xiaoyu Mao will do his Ph.D. research within the project.

AGENTS FOR HEALTH CARE

The health care domain can be characterized as consisting of a large number of autonomous parties that have to collaborate in order (1) to gather relevant knowledge for decision making, and (2) to implement and optimize the health care process. The research on agents for health care aims at the development of methods for optimizing patient logistics and for information support for physicians.

Part of this research is carried out in the ToKeN2000 project "Medical Information Agent" in collaboration with other departments of our university, the Amsterdam Academic Medical Center, the National Research Institute for Mathematics and Computer Science in the Netherlands, the Maastricht Academic Hospital and the Eindhoven Catharina Hospital. In the MIA project we investigate how software agents can aid hospital workers. Our goal is to provide agent support for three important directions: (a) automatic feedback to actions that are not in line with clinical-practice guidelines, (b) automatic retrieval of medical literature, and (c) scheduling patient treatment. These directions are addressed in three subprojects, each with its own agent. Each of the agents may improve its behaviour by taking into account results of the other two agents. In Maastricht Loes Braun is doing her Ph.D. research on automatic retrieval of medical literature.

In the Universiteit Maastricht Breedtestrategie project "Biology-inspired Robots and Agents for Resource Management and Logistics" we aim at developing techniques for handling resource management and logistic problems using agents and robots. In this project we initially focus the research on two topics, namely: resource management and resource distribution. As a controllable testbed for these topics we use resource management games. Steven de Jong will do this Ph.D. research within the project.

CABS

Cees Witteveen
Delft University of Technology

The Collective Agent Based Systems (CABS) group is a research group within the Department of Software Technology of Delft University of Technology concentrating on the specification, construction and implementation of algorithms for coordination in autonomous systems. The CABS

programme started in 1998 and its mission as stated then was:

to aim at the development of computational methods and implementations to deal with automatic planning, cooperation, competition and incident management in large-scale agent organizations.

The group consists of two staff members (Cees Witteveen (programme leader) and Mathijs de Weerd), 10 PhD students and 1 post-doc. There exist intensive research contacts with Dutch Universities and academic research institutes (Amsterdam, Utrecht, Nijmegen, Rotterdam and Maastricht) and with industry and national research institutes (NLR, TNO, Almende BV, Van der Luyt transportation).

The programme started with two Ph.D. projects concerning inter-organisational coordination in transportation funded by Delft University, two additional TNO-funded projects concerning incident management, and a project in cooperation with Utrecht University about the specification of coordination in agent systems. Since then, the CABS programme has been concentrated around three research themes:

- *task allocation and coordination methods for autonomous planning systems (pre-planning coordination);*

The main focus of this theme is the construction of coordination methods that guarantee the existence of a coordinated plan whatever choices are made by the participating agents in their planning phase. Currently, we have identified the complexity of this coordination problem and we have constructed some approximation algorithms (decoupling heuristics) that enable each agent to create a coordinated plan without taking into account the specific planning methods used and choices made by other agents.

The following research projects are carried out in this theme:

- *Task Coordination in Service Based Grids (Senter, Bsik [ICIS]). Ph.D.: Renze Steenhuisen;*
- *IT-architecture and Coordination in Transportation with Autonomous Actors (TNO). Ph.D.: Jeroen Valk;*
- *Distributed Task Coordination, (SenterNovem, Casimir). Ph.D.: Adriaan ter Mors;*
- *Task Coordination for Non-cooperative Agents (NWO Open competition). Ph.D.: vacancy;*
- *Hybrid Computing and Task Coordination (Thales). Ph.D.: Jeroen de Jong.*

- *efficient coordination of plans of autonomous agents (post-planning coordination);*

In this theme methods are developed that can be used by autonomous (and self-interested) planning agents to adapt their plans to the plans of other agents in the environment in order to increase their individual and/or joint performance. We have constructed some efficient plan-merging techniques for completely developed plans. Currently, these techniques are extended to deal with partially developed plans to apply these merging techniques also during the planning phase.

The following research projects are carried out in this theme:

- *Coordinated Multi-agent Planning (NWO-STW, VENI). Project leader: Mathijs de Weerdt;*
- *Distributed Logistics (Almende BV). Ph.D.: Tamás Máhr.*

- *diagnosis, plan repair and incident management techniques for multi-agent systems;*

While the previous themes aim at the development of methods to initiate or establish (regular) coordination processes, in this theme we focus on methods to maintain coordinated processes. Special attention is given to the prevention, identification and repair of coordination threatening and/or disturbing factors. Currently the focus is on the extension of the well-known model-based diagnosis approach to the diagnosis of multi-agent planning systems and the development of robust temporal planning methods and plan-repair methods for coordinated temporal planning systems.

The following projects participate in this theme:

- *Cybernetic Incident Management (SenterNovem). Researcher: Jonne Zut;*
- *Fault Detection and Recovery in Multimodal Transportation Networks with Autonomous Actors (TNO). Ph.D.: Jonne Zutt;*
- *Diagnostics and Incident Management Techniques in Transportation (TU-Delft). Ph.D.: Roman van der Krogt;*
- *Distributed Model-based Diagnosis and Repair (STW). Ph.D.: Pieter Buzing;*
- *Real-time Optimization of Motormanagement Systems (SenterNovem). Ph.D.: Sicco Verwer.*

The main application area for the research carried out is the transportation area, in particular freight and passenger transport

planning and air-traffic control. Future application areas such as health care, industrial manufacturing and processing and aerospace are in development.

More information can be obtained via the CABS web site: <http://cabs.ewi.tudelft.nl>.

Report on AAMAS'05

*Virginia and Frank Dignum
Utrecht University*

We were very happy with the opportunity to organize the fourth edition of the international conference on Autonomous Agents and Multi Agent Systems (AAMAS) in Utrecht this year. As it is the leading conference in the area of agent technology it shows both the standing of the Dutch community in this research area as well as providing an opportunity to give access to this research to a large group of people in The Netherlands.

One of the big disadvantages of organizing an event such as AAMAS (with 28 satellite workshops, 12 tutorials, 5 parallel tracks in the main conference, demos and exhibitions) is that one hardly gets to see any of the scientific sessions. A report of some participants of the conference on the actual contents and some highlights will therefore be given after this by some other people of our group that were still able to attend (at least some) of the sessions. We will suffice here with what we provided at the conference as well and that is the organizational part.

AAMAS'05 received 530 submissions for the main conference and poster tracks. Out of these 530 submissions 130 were selected as full paper and 119 for poster presentation. We were happy to see that one of the papers nominated for best student paper originated in Utrecht itself (with the first author being Birna van Riemsdijk). The total number of participants attending some part of the conference was 778. For the main conference this number was 669. This means that this year's edition was the largest AAMAS until now. This year's conference was the first one that included a special Industry Track meant to be used to get feedback from industry on the use of agent technology in practice. The sessions of this track were well attended such that a continuation of this track was recommended. The conference also spurred quite some attention from the media for agent technology. Hopefully this will also result in more interesting projects with industry in this exciting field!

SOME PERSONAL IMPRESSIONS OF AAMAS'05

Jurriaan van Diggelen:

As the date of AAMAS'05 approached, I sometimes wondered what I could expect at this conference. I knew that around 130 papers and 120 posters were going to be presented and that 25 workshops with around ten papers each were organized. Although these papers were all going to be about agents in some way, it was unclear to me what kind of common denominator to expect.

This question was not readily answered during the conference. A wealth of different ideas were exchanged, some of which I liked, some of which I disliked and some of which I never really thought about. The breaks and the workshops offered the opportunity to discuss these different ideas.

The workshop I attended dealt with agent mediated knowledge management. Some of the work presented here was driven by practice and some of it by theory. This combination gave rise to a lively discussion at the end. The different perspectives of different researchers also became apparent at the sessions of the main conference, the demos, and at the invited talks.

The invited talk by Dov Samet clearly approached multi-agent systems in a very theoretic way. Having a background in game theory, he dealt with unfavorable outcomes in strategic interactions of rational agents. After making sincere apologies to the theoretically educated part of the audience, he started by explaining the prisoner's dilemma. In a very accessible way, he continued his talk by explaining how to use commitments to circumvent undesirable situations in games. At the end, this led him to treat commitments as programs that take as input other commitments. The ideas presented throughout the whole talk had been very inspiring.

Another invited talk I particularly enjoyed was the one by Cynthia Breazeal on socially interactive robots. She demonstrated several robots from the MIT media lab. One of these robots was instructed to go to "the traffic cone" in the room. Although two traffic cones were present in the room, the robot recognized from the gaze direction of its instructor which traffic cone it was expected to go to. Her work represented a very practically oriented approach to agents. The end product of the research conducted in her group was a working system.

During the conference I did not give any more thought on the common denominator of an AAMAS'05 paper. I think I found the answer at the closing session, when the AAMAS participants were united by stressing their common goal, namely

to *put agents into practice*. Whether theoretically or practically oriented, every AAMAS'05 paper served to pursue this goal, in its own way, using its own methods, from its own perspective.

Geert Jonker:

My AAMAS started with the Agent-Mediated Electronic Commerce workshop. As this didn't prove to be as interesting as I expected, I secretly tried to make my way into another workshop, Creating Bonds with Humanoids. I wasn't able to get in secretly though, the volunteer on duty immediately noticed a new face among the attendants. After detailed explanation of the rules and how I was breaking them, she was willing to show mercy and let me in.

I immediately sensed the very different atmosphere in this room compared to the previous. As in AMEC it was all about symbols, formulas and prices, here it was all about feelings, friendship and human rights. Also, this appeared to be a tighter community than the previous, as people made a lot of jokes, used first names and referred to each other's scientific backgrounds as if it was common knowledge. I was treated to a lot of visual illustrations of the emotions and behaviours that were being built into the agents. I also very much enjoyed the talk of someone who argued that as male agents are generally conceived more believable than female agents, we should design female agents to be smarter than male agents as to make up for this unjust leeway. I don't say I agree, but I enjoyed it.

Another workshop I attended was the Agent and Peer-to-Peer Computing workshop. This workshop is very much about selfish agents, agents that will manipulate the system when they get the chance. It is very much about incentives, trust and reputation. One interesting paper was on a digital version of a virtual-currency system that can be used for trading. These virtual currencies are often designed with humanitarian goals in mind. This speaker showed the same spirit, as he explained how the system could be used to help tsunami victims. Quite inspiring.

The main conference provided us with a great number of talks on the various topics in multi-agent research. Here again with careful session hopping I managed to gain some ideas useful in my own research. The invited speakers proved to be very good speakers indeed. Whereas one managed to actually captivate us with the over-familiar prisoner's dilemma, another gave us the shivers with a thorough course on American warfare. The times in between sessions gave us an opportunity to meet in person those people you had until then only

referred to in your paper. All in all a very valuable week.

Birna van Riemsdijk:

As a member of the local organization, one would perhaps expect me to have been very busy organising things, pointing people to where they should be going, locating lost volunteers, etc. Fortunately (at least from a scientific perspective), none of this was the case (except for Monday morning when I had to fill in for a workshop volunteer who had not shown up); most of my tasks were done before the conference started. Consequently, I had a chance to follow many of the technical sessions, so I should be able to say something sensible about the contents of the presentations (which I will try to do in the sequel).

After going to parts of the workshops on norms and institutions (ANI@REM), and on declarative agent languages (DALT) on Monday, I participated in the workshop on programming multi-agent systems (ProMAS) on Tuesday. This workshop about programming languages and tools for the implementation of multi-agent systems featured many interesting talks. The invited talk was by Michael Fisher from Liverpool, who treated the modelling of groups of agents in the setting of executable temporal logic. Other presentations covered diverse topics such as the incorporation of social roles in object-oriented languages, coordination of team behaviour in RoboCup, modularity in the Jadex BDI (Belief Desire Intention) platform, and goal-oriented agent interactions.

In one of the first parallel sessions of the main conference, one on logical foundations, I presented work on semantics of goals (or desires) in agent programming. Other talks in this session concerned, among others, epistemic logic and model checking. Besides thought provoking, interesting, and (at times) entertaining invited talks by Dov Samet, Mark Greaves, and Johan van Benthem, one of the highlights of the conference was, as far as I am concerned, the session on norms, social laws and social structures. The presenters addressed issues such as how to implement norms to regulate the behaviour of (autonomous) agents in electronic institutions, the logical specifications of social laws, how agents can be enforced to abide by social laws, and the modelling of organisational structures and their relation with the obligations of the agents in the organisation.

Report on IJCAI'05

*Femke de Jonge, Steven de Jong,
Sander Bakkes, and Pieter Spronck
IKAT, Maastricht*

From the 30th of July to the 5th of August, the 19th International Joint Conference on Artificial Intelligence (IJCAI'05) was held in beautiful Edinburgh, Scotland. The conference was co-hosted by The British Computer Society Specialist Group on Artificial Intelligence, which was celebrating its 25th birthday at the same time.

The topics of the accepted papers at the IJCAI'05 ranged widely: from game search to vision, and from complexity and reasoning to ontologies.

WORKSHOPS

The technical programme of the conference was preceded by three days of workshops and tutorials, also with a large variety of subjects. This report's authors attended and participated in two workshops.

On Saturday, July 30, the workshop on Agents in Real-Time and Dynamic Environments was dominated by research contributions from the field of robotical soccer. Apparently, a lot of issues still need to be addressed more delicately before applying agents in *real* environments. Key topics that were discussed include grounding (mapping of sensor data onto symbolic representations), adjustable granularity for reasoning calculus, and tailoring of actions to their context.

The workshop on Reasoning, Representation, and Learning in Interactive Computer Games, organised by David Aha, was held on Sunday, July 31 in the presence of a mixed audience, including Stuart Russell (who admitted never to have played an interactive computer game), Jonathan Schaeffer, and Ian Davis (who represented the commercial game development company Mad Doc Software). There were two invited talks, ten presentations, eleven posters, three discussion periods, and a panel discussion in which the importance of research in the area of games was stressed. Several of the attendees decided that they were going to organise a competition between commercial game AIs, similar to RoboCup and the Computer Game Olympiad, to advance the state of the art. Currently, the plan is to have the first of these competitions at the AIIDE 2006.

MAIN EVENT

The welcome reception for the IJCAI'05 was held on Monday, August 1, in the stunning surroundings of Edinburgh Castle. Next to exchanging ideas, the

participants busied themselves with viewing the various places of interest within the castle (such as Scotland's Crown Jewels), and enjoying a marvellous sunset over the magical Scottish landscape. A more suitable start of the conference is difficult to envision.

The technical programme consisted of four days, each day containing two one-hour invited talks and two sessions of two hours in which 32 papers were presented in parallel. Moreover, poster presentations and demonstrations were provided. Of all these talks (adding up to approximately 140 hours of scientific entertainment), we highlight the following.



The Edinburgh International Conference Centre.

On Tuesday 2nd, the first invited speaker, famous psychologist prof. Alison Gopnik, showed (once again) that being able to attach significance to results is of vital importance. Studying 24 infants, Gopnik concluded that infants use Bayesian inference, since 50% of the test group were exhibiting behaviour that could be explained by Bayesian inference. We conclude that psychologists and computer scientists have a different opinion on what constitutes 'evidence'.

Later that day, Jonathan Schaeffer compressed 16 years of research into Checkers in a powerful half hour presentation titled *Solving Checkers*. He kindly asked us to donate 1000 top-of-the-line PCs so that

Checkers can be solved within the next two years. He concluded his talk on his ongoing quest for solving Checkers by sharing with us the opinion of his wife, who characterised his behaviour as "obsessive" and "compulsive", and gave him the heartfelt advice to "Get a life, Jonathan!" The paper of Schaeffer *et al.* was awarded an IJCAI'05 Distinguished Paper Award. (The two other awards went to D. Downey *et al.*, *A Probabilistic Model of Redundancy in Information Extraction*, and to Y. Guo *et al.*, *Learning Coordination Classifiers*.)

We were less enthusiastic about the invited speaker of Tuesday afternoon, but the invited speaker of Wednesday morning, prof. Nir Friedman of Hebrew University, Jerusalem, gave a highly interesting talk on using probabilistic graphical models to discover new mechanisms in molecular biology. While he covered a lot of ground and raced through many colourful sheets, he kept the audience captive and convinced us that bioinformatics is not just a fad.

The invited speaker of Wednesday afternoon, professor Adnan Darwiche of UCLA, gave an overview of the history of probabilistic inference. While it wasn't exactly a bad talk, it was rather dry, and a large part of the audience had obvious troubles staying awake (which might have been correlated with having enjoyed a good lunch).

In the evening of Wednesday 3rd, a demonstration of robot QRIO (developed by SONY Research Japan) was performed in front of a large crowd with high expectations. Although a bit shy because of the huge interest, QRIO showed able to dance, play soccer, detect and greet people, walk through a maze, ascend and descend stairs, and crawl underneath a table to finally reach its goal: stealing everyone's heart.

The invited speaker on Thursday morning, Daniel Wolpert, showed convincingly that the only reason we humans have a brain is to produce adaptable and complex movements. Therefore, in his research, he aims to derive how our brain processes actions by creating *Probabilistic Models of Human Sensorimotor Control*. Through very interesting and appealing experiments, Wolpert finds answers for questions such as: do humans make sensory predictions? Which performance criteria do humans use to generate actions? And, how do we choose which way to move?

The Thursday afternoon invited speaker obviously knew a lot about satisfaction problems, but his talk seemed to be aimed at researchers whose knowledge of this subject approached his own. Since an invited talk is given for a general audience,

we were not surprised that only a few short questions were asked after the talk was over.

Friday morning, Stephen Jacobsen gave an impressive overview on robots that 'his' company (Sarcos Research Corporation) implemented in diverse application fields. He showed us among others artificial arms, humanoids for Disneyland, and the Bellagio fountains in Las Vegas. He also presented SRC's latest project, exoskeletons; wearable robots that help enlighten carrying heavy loads (wounded soldiers and such). As all developed robots contain hardly no AI, it is our future challenge to combine this kind of low-level research with our, generally, high-level AI approaches.

The final invited speaker of IJCAI'05, Kevin Knight, gave a historical overview on statistical machine learning, including some recently applied techniques. Although the achievements of machine translations have highly improved last decade (mainly caused by the increase in available data), it was clear from the presented results that still a lot of work is needed in this field.



Stuart Russell (l) and Sander Bakkes (r) during the poster presentations.

REVIEW

The IJCAI is considered to be one of the major and important conferences on Artificial Intelligence. For all of us, this was the first time we visited one of

these events. Did we think the IJCAI was worth visiting?

Since the rejection rate of papers is pretty high for the IJCAI (more than 80 per cent of the submissions is rejected), the standard of papers and talks tends to be high. In that respect, the IJCAI fully deserves its status. However, since the IJCAI attempts to cover every nook and cranny of AI, for the average visitor most talks are simply so far diverged from their own line of research that very few sessions are worth attending.

The big chance for the IJCAI to be attractive to the diverse audience it gets are its invited speakers. Unfortunately, this year the quality of the invited speakers was rather mixed. Some of them were pretty good, while others were difficult to follow or even boring.

Added to this is the fact that the IJCAI is a quite expensive event, while the price of admission does not even cover proceedings, conference stationary, or lunch. Since lunches in town were much cheaper than in the cafeteria, many attendees left the conference hall during the break. The sad effect of that is that the lively discussions which normally take place during a conference break (which some argue are actually what conferences are about) often did not take place since it was more difficult to get into contact with the people one really wants to meet. Obviously, the scale of the event added to this effect.

From these points of view, in our opinion a young researcher is better off attending a conference that is focussed on his or her main interests. The workshops fulfilled this need, so that we considered our first days in Edinburgh the most interesting. Of course, getting a paper accepted for the IJCAI is still a big deal.

IJCAI'07

IJCAI'07 will be held in Hyberadad, India during January 6-12, 2007. Submission deadline is July 1, 2006. More information can be found on <http://www.ijcai-07.org>.

IJCAI'05 Workshop on Knowledge and Reasoning for Answering Questions

*Marie-Francine Moens
Katholieke Universiteit Leuven*

INTRODUCTION

On July 30th 2005 a workshop on *Knowledge and Reasoning for Answering Questions* (KRAQ'05)

was held in Edinburgh, UK at the *Nineteenth International Joint Conference on Artificial Intelligence*. The workshop organizers were Patrick Saint-Dizier and Farah Benamara from the Institut de Recherche en Informatique de Toulouse (IRIT), France and Marie-Francine Moens of the Katholieke Universiteit Leuven, Belgium. It was the idea of the organizers that current methodological and technological developments in knowledge representation, advanced reasoning forms and recent advances in human-language technology can lead to more accurate, cooperative and robust systems dedicated to answering questions from textual data.

PRESENTATIONS

In the morning session four full papers were presented. A first paper by Hong Yu (Columbia University, New York) and Carl Sable (Cooper Union, New York) showed that filtering questions, i.e., deciding whether or not a question is answerable from a certain domain corpus, is a valuable preprocessing step that leads to the further analysis of the question or to the analysis of the questioner's intention. Different machine-learning techniques (e.g., k-nearest neighbour, support vector machine, maximum entropy modeling) and different feature sets were tested in order to recognize question answerability. The second paper by Gosse Bouma, Jori Mur and Gertjan van Noord (Rijksuniversiteit Groningen) showed that the addition of equivalence rules over patterns of dependency relations, which capture cases where different syntactic patterns express the same semantic relationships, improved the performance of question answering systems (evaluation on 572 questions that were used in the Dutch monolingual task of the CLEF 2003 and 2004 question answering track). A lively presentation was given by Farida Aouladomar from IRIT, France, who studied the structure of French procedural texts and their relevant rhetorical relations. Procedural questions are a very common type of questions posed by humans and knowledge of a text's rhetorical structure is valuable when searching for their answers. This experimental work will certainly contribute to the advancement of the state of the art of question answering. The next paper by Yuval Marom and Ingrid Zukerman from Monash University, Australia studied multi-document summarization techniques and explained how help-desk responses can automatically be generated from responses previously given by human operators for answering common questions or common parts of questions. Before the lunch break there were a number of short paper and poster representations that focused on a variety of topics (e.g., question types, answer explanation and paraphrasing).

In the afternoon four full papers were presented. The first talk by Jon Curtis, Gavin Matthews and David Baxter discussed the use of Cyc in question answering. Cyc is the largest general-purpose knowledge base being developed since 1984. It contributes to a commercial question-answering system by offering knowledge for question type detection, conceptual expansion of the question words and generating natural-language answers. Rodrigo de Salvo Braz, Roxana Girju, Vasin Punyakanok, Dan Roth and Mark Sammons tackled the problem of semantic entailment in question answering. Semantic entailment focuses on determining whether the meaning of a given sentence entails the other. The authors developed an expressive knowledge representation that provides a hierarchical encoding of structural, relational and semantic properties of the text, which is populated by using a variety of machine-learning techniques. Semantic entailment is detected by means of an inference algorithm. Then followed another very interesting paper by Tiphaine Dalmas and Bonnie Webber from the University of Edinburgh in the UK. Their paper showed that incorrect, but related answers help to build a supportive network around the correct answer, and assist in interpreting and ranking the answers. A last paper by Ingrid Zukerman, Pawel Kowalczyk, Michael Niemann (Monash University, Australia) and Bhavani Raskutti (Telstra Research Laboratories, Australia) presented the results of using machine-learning components in question analysis, document retrieval and answer selection.

KEY NOTE SPEECHES AND PANEL DISCUSSION

The first keynote speech was by Johan Bos from the University of Edinburgh, UK who led the audience into the topic of representation and inference for natural language. He explained the breakthroughs and challenges of computational semantics in question answering. Johan discussed two show-cases for wide-coverage computational semantics and inference: open-domain question answering (in the context of the TREC and CLEF competitions), and textual entailment determination (in the context of the PASCAL challenge).

In the late afternoon Marie-Francine Moens of the Katholieke Universiteit Leuven, Belgium spoke on information synthesis, a task that humans perform routinely, and on the increasing need to have machines perform synthesis of information from text (and also cross different media) as the answer to an information question. She stressed the importance of the detection of relations between content such as coreference relations of entities and of events, and temporal and causal relations. Moreover, she showed that additive and cooperative integration of information based on found relations,

and the inference mechanisms needed in this integration have up till now received little research interest.

The workshop was closed by a panel discussion headed by Michael Minoock from the Umeå University, Sweden and Thierry Poibeau, Laboratoire d'Informatique de Paris-Nord, France. The discussion focused on open-domain question answering versus closed-domain answering of questions. A second interesting point of discussion was on how far users of question-answering systems want to go in trading latency for correctness and completeness of the answer (do we want to wait all night long for a good answer to our search query?). During the discussion on different question types and their automated discrimination, the point was raised that users would like to have the possibility to ask for an explanation of the answer that the system has generated.

CONCLUSION

The workshop was a success. There were more than 50 registrations. At some moments the room was too small for the audience. The lively discussions that followed the paper presentations, key notes speeches and the panel presentation showed that it was a good idea to bring together artificial intelligence, natural-language processing, human-language technology and information retrieval people. The presented papers will soon be published in a book.

8th FIRA European Championship Robosoccer

Mannes Poel
Universiteit Twente

Since 1998, Universities in Europe have organized the yearly European Championship Robosoccer on behalf of the FIRA (Federation of International Robosoccer Association). The Department of Computer Science of the Universiteit Twente and the ICT Study Association Inter-Actief are proud that they have jointly organized this year's championship.

The championship was held from June 6-10 on the University campus in Enschede. Nine teams from eight different countries, including MI20 from Twente, battled in three Mirosoft categories: 5-5, 7- and 11-11. Mirosoft stands for the category of small robots with a maximum width or height of 7.5 cm. Each team is also allowed a camera above the playing field.

THE PREPARATION

After a year of preparation which was mostly concerned with finding enough sponsors and a good location, things started to get serious around the 1st of June. There was a tight schedule for setting up the playing fields, the lighting etc., because the arena, the old Computer Science library, had been used for examinations which meant we had only three days for construction work.

Fortunately Show Equipment sponsored the event by equipping the hall as was necessary with light, sound and camera mounting constructions.

But as always there were the unavoidable drawbacks: the 11-11 playing field should have been transported from Vienna to Enschede for the amount of 200 Euro, but once the transporter (DHL) arrived in Vienna he called and claimed that the playing field was not packed correctly and now should be transferred by special transport for the amount of 1600 Euro.

The result was that the playing field arrived on Saturday for the price of constructing a new one.



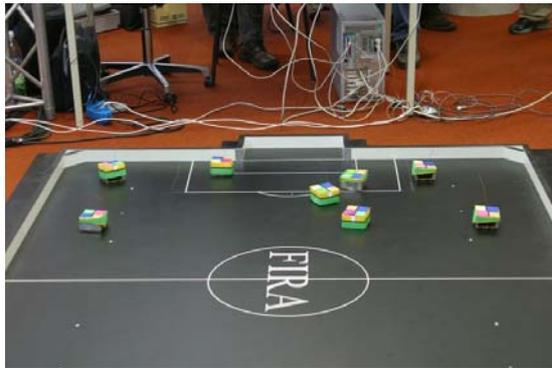
The Aibo zoo.

With support of the Telematica Institute we filled an Aibo zoo, containing five Aibos. In this zoo the visitors or participants could take a rest and could try to attract some attention and affection, if needed, from an Aibo dog.

THE OPENING CEREMONY

The opening ceremony took place on Monday morning, June 6th. Peter Apers, scientific director of the CTIT, performed the opening and welcomed all the participating teams. After pushing a button the robots of the AUSTRO team (Technical University of Vienna) performed an amazing samba dance. Their robot team resembled the Brazilian National Team in many aspects, such as ball handling, dribbling and shooting curved balls. It was then already clear that they were the main candidate for the title in all the three leagues. There were nine participants in the 5-5 who were divided into three pools and the 7-7 league had six participants who were divided into two pools. Since

there were only three competitors in the 11-11 league, no draw was needed. A small competition was sufficient to determine the finalists.



The Samba.

After this dance the draw was done by shooting balls into a goal. Each ball contained a name of a team and the order in which the balls were shot into the goal determined the pools.

THE PRELIMINARY ROUNDS

From Monday until Thursday the preliminary rounds, including the quarter and half finals were played. During the first day it already became clear that there were a few strong competitors; The LJUBLJANA DRAGONS, The DORTMUND DROIDS and ROBOHEMIA. There was one very strong competitor AUSTRO. The AUSTRO team scored 102 goals receiving only one against, in the six games in preliminary rounds (quarter and semi-finals not included). For the other teams, including the MI20 team from the UT, it soon became clear that they were only playing for fun.

THE FINALS

On Friday the finals took place. First was the final in the 5-5 league between AUSTRO and the LJUBLJANA DRAGONS. This game was a clear victory for the AUSTRO team: they won with 16-1 after an 11-0 score at half time. Also the 11-11 final was a clear victory for the Austro team: 6-0 after a half time score of 1-0. The most exciting final was the 7-7: The LJUBLJANA DRAGONS rose to the occasion and played a very good game against AUSTRO. At half time the LJUBLJANA DRAGONS had a lead of 2-1. In the second half they increased the lead to 3-1, but in the last three minutes of the game the AUSTRO team scored three goals, thereby pulling also the victory out of this game by 5-4. The final ranking in the three categories was as follows:

Ranking	5-5	7-7	11-11
1st	AUSTRO	AUSTRO	AUSTRO
2nd	LJUBLJANA DRAGONS	LJUBLJANA DRAGONS	LJUBLJANA DRAGONS
3rd	ROBOHEMIA	ROBOHEMIA	ROBOHEMIA

CLOSING CEREMONY

After the finals the closing ceremony took place. The first, second and third in the different leagues received their deserved award. The referees were all presented a bucket of beer and all participants received a small present, a travel watch with UT logo, so that the memory of this event remains.



Left: The AUSTRO team, winners of all the three leagues; the man in the middle is Nathan Hartwell from Merlin Systems.

THE UNIVERSITY OF TWENTE TEAM: MI20

After a while of programming C++ code for the mini robots playing soccer, it was finally Sunday, June 5th. For us the European Championship Robot soccer 2005 began. In spite of the many things we had to do, for playing robot soccer well, the time had come to set up the two Debian systems for controlling the robots. After a couple of tests we were quite satisfied with the way the robots drove across the field.

The next day it was 6:45 AM when some of us looked at the alarm clock and thought this is quite early for a student to wake up. But we had been invited to be in the Dutch Radio 2 program VROEGE VOGELS. After two interviews about playing soccer with 7.5 cm cubes with wheels, and a lot of coffee it was time for the Opening Ceremony.

During the Opening Ceremony the current world champion AUSTRO, the team from Austria, gave a nice demonstration.

This stimulated us for new ideas. Before the ceremony was finished the Dutch television *Twee Vandaag* had arrived, so again we had to tell an exciting story about robot soccer and our system. While we explained how the system was programmed to see the color patches at the top of the robots and the way we controlled the robots, the television crew was filming. Of course they were very interested when we informed them about the practical use in real life.

When on Monday the media world was updated about this event, we were in one go, very busy with

entertaining the world by giving a lot of interviews instead of preparing for the important matches to come. The MI20 was asked for so many interviews that we got our own PR woman who scheduled the interviews.



The MI20 team (left, in orange T-shirts) at the closing ceremony.

It was that week we learned a lot about giving interviews. Interviews were given for *BNN* on radio 3, the local *Radio Oost*, *Teleac Radio* and a live interview by *Radio 3FM*. As if it was not enough we were visited by the local newspaper, the national newspapers *NRC Handelsblad* and *Telegraaf*. We were even visited by a magazine for children, called *Taptoe*. As well as we could, we tried to tell about the calibration necessary for the camera, how the robots were recognized and that the robots were controlled by Bluetooth and radio frequencies. Of course they also asked about existing rules and the kind of leagues we were playing in.

After five busy days the AUSTRO team from Vienna (Austria) had won the event in all leagues as expected. The team LJUBLJANA DRAGONS from Slovenia got the meritoriously second price. The big difference between them and the rest is the preciseness with which they control the robots, plan a path, track a path and hit the ball at the interception point.

Because of the cooperation between the robots and the hardware, the team from Vienna could score a lot of points. For example they try to position three robots in front of the opponents goal and try to pass the orange golf ball from the side of the field and that with a top speed of 3.5 m/s while we are suffering with a speed of 1 m/s. At the end we lost some matches but were stimulated by the many ideas which came up that week.

Looking back we conclude that the FIRA EC Robosoccer was an exciting and entertaining event for both participants and visitors. Moreover the obstacles and challenges of Robosoccer, including the AI part, were explained to a large audience.

Curiosity-driven Research

Jaap van den Herik
IKAT, Maastricht

Some people distinguish between research and writing a Ph.D. thesis. They believe that research is equivalent to thinking, and producing a thesis is equivalent to writing. Obviously, they are wrong, but the area is grey and confusing. For experienced supervisors, it is clear that research embraces the whole traject, from the conception of the research idea to the completion of the thesis. In a previous issue I distinguished four phases, viz. (1) literature research, (2) development of ideas, (3) realisation of the ideas (i.e., design and implementation, or otherwise stated: the field work), and (4) the writing of the thesis (and many refereed journal articles in advance to this work).

This time I would like to look with other eyes to the definition of doing research, in particular Ph.D. research. Recently, I was facing the question: from whom the request came to investigate an interesting problem statement? Without a clear *initiator* (the requesting side for research) it was not clear, according to this view, whether the research could be qualified as valid Ph.D. research. The initiator was in particular important, again according to the view above, since it should then be defined who (which party) would *benefit* from the findings. So, in this view, Ph.D. research should have as necessary ingredients: (1) an initiator and (2) predefined benefits. Yes, we were talking about applied science. By the way, such a discussion may also emerge in Faculties of Law and Faculties of Health Sciences, since they perform many research projects for policy makers at the Ministeries or in other Governmental bodies.

Still, in my opinion this is not the single right view. I admit that there should be room for such research, it should be paid by the policy makers, and it should be considered as valid Ph.D. projects. However, in my opinion the pure *curiosity-driven* research projects are still the most challenging tasks (although they can be very frustrating). The researcher has to go deep, very deep with his thoughts. The imagination should be large (and great). If the project ends in a success, the satisfaction is great too.

Forty years ago, we saw curiosity-driven research in mathematics, for instance in Topology or Category Theory. Nowadays we see it in Computer Science, Language, Artificial Intelligence, Cognition, and even in Law.

The list of Ph.D. announcements published below provides a beautiful insight into the cohabitation of the curiosity-driven topics and the industrial (or policy makers)-guided topics. I leave it as a task to the reader to classify the theses listed below accordingly.

Whatever the case, I would like to wish all potential thesis defenders much success in the last phase of their Ph.D. project. May the completion of this milestone bring them what they expect from it.

Jeroen Eggermont (September 14, 2005). *Data Mining using Genetic Programming*. Universiteit Leiden. Promotor: prof.dr. J.N. Kok.

Boris Shishkov (September 26, 2005). *Software Specification Based on Re-usable Business Components*. Delft University. Promotor: Prof.dr.ir. J.L.G. Dietz.

Borys Omelayenko (October 12, 2005). *Web-Service Configuration on the Semantic Web; Exploring how semantics meets pragmatics*. Vrije Universiteit Amsterdam. Promotores: Prof.dr. A.Th. Schreiber, Prof.dr. J.M. Akkermans.

Joris Graaumanns (October 17, 2005). *Usability of XML Query Languages*. Universiteit Utrecht. Promotor: Prof.dr.ir. G.J. van der Steen. Assistant promotor: Dr. H. van Oostendorp.

Csaba Boer (October 21, 2005). *Distributed Simulation in Industry*. Erasmus Universiteit Rotterdam. Promotores: Prof.dr. A. de Bruin, Prof.dr.ir. A. Verbraeck (Delft University/ University of Maryland).

Iris Hendrickx (November 21, 2005). *Explorations of the k-Nearest Neighbour Algorithm*. Universiteit van Tilburg. Promotores: Prof.dr. W.P.M. Daelemans, Prof.dr. H.C. Bunt. Assistant promotor: Dr. A.P.J. van den Bosch.

Tibor Bosse (November 23, 2005). *Analysis of the Dynamics of Cognitive Processes*. Vrije Universiteit Amsterdam. Promotores: Prof.dr. J. Treur, Prof.dr. C.M. Jonker (RUN).

Fred Hamburg (November 24, 2005). *Een Computermodel voor het Ondersteunen van Euthanasiebeslissingen*. Universiteit Leiden. Promotores: Prof.dr. H.J. van den Herik, Prof.dr. H.M. Dupuis, Prof.dr. E.O. Postma (UM).

Martin Reynaert (December 2, 2005). *Text Induced Spelling Correction*. Universiteit van Tilburg. Promotores: Prof.dr. W.P.M. Daelemans,

Prof.dr. H.C. Bunt. Assistant promotor: Dr. A.P.J. van den Bosch.

Cristina Coteanu (December 20, 2005). *Cyber Consumer Law. State of the Art and Perspectives*. Universiteit Leiden. Promotores: Prof.dr. H.J. van den Herik, Prof.dr. G. Howells (University of Lancaster). Reviewer: Prof.dr. E. Hondius (Universiteit Utrecht).

Michel van Dartel (December 1, 2005). *Situated Representation*. Universiteit Maastricht. Promotores: Prof.dr. E.O. Postma, Prof.dr. H.J. van den Herik.



Roel Wieringa appointed scientific director SIKS

Prof.dr. R.J. (Roel) Wieringa (University of Twente) has been appointed as the new scientific director of SIKS. As of January 1, 2006 he steps into the shoes of prof.dr. J.-J. (John-Jules) Ch. Meyer (Utrecht University), who held this position for nearly a decade.

SIKS is the Dutch Research School for Information and Knowledge systems. It was founded in 1996 by researchers in the field of Artificial Intelligence, Databases & Information Systems and Software Engineering. SIKS is an interuniversity research school that comprises 12 research groups in which currently over 325 researchers are active, including 150 Ph.D. students. SIKS received its first accreditation by KNAW in 1998. In June 2003 SIKS was re-accredited by KNAW for a period of 6 years.

Roel Wieringa studied mathematics and philosophy and obtained his Ph.D. at the Vrije Universiteit in Amsterdam in 1990. His dissertation was entitled "Algebraic Foundations for Dynamic Conceptual Models". In 1998 he became a full professor at Twente University, where he currently holds the Chair "Information Systems" at the Faculty of Electrical Engineering, Mathematics and Computer

Science. He has been a member of the board of governors of SIKS as of 1998. Wieringa has accepted the appointment for a period of three years.

Advanced SIKS Course “Business Process Integration”

INTRODUCTION

On September 19 and 20, 2005 the School for Information and Knowledge Systems (SIKS) will organize an Advanced Course *Business Process Integration* in Enschede. The course takes two days, will be given in English and is part of the so-called Advanced Components Stage of the Educational Program for SIKS Ph.D. students. Although the course is primarily intended for SIKS Ph.D. students, other participants are not excluded. However, their number of passes will be restricted and depends on the number of students taking the course. The course is given by experienced lecturers from the Netherlands and abroad actively involved in the research areas related to the topics of the course. The course is connected to the EDOC’05 conference

LOCATION

Best Western Dish Hotel, Boulevard 1945, no. 2, Enschede 7511 AE Netherlands.

ABOUT THE COURSE

Business processes often span different organizational functions and increasingly cross organizational boundaries. The way business processes integrate different functions, or web services, and the way business processes interface with each other is receiving more and more interest from researchers and practitioners. Business Process Integration includes topics like data integration, web transactions, cross-organizational workflow, supply-chain integration, business-process management and contract-based coordination. In this course, the focus will be on the process and contract aspects. The 2-day course is an advanced course in the area of e-business systems, one of SIKS’ eight research foci (see <http://www.siks.nl/newfoci.html>).

PROGRAM (PROVISIONAL)

- *Business Process Integration - an overview*; Dr. Hans Weigand (UvT)
- *Service-Oriented Computing*; Prof.dr. Mike Papazoglou (UvT)
- *Presentation of the Cordys Tool and Vision*; Wiemer Kuijk (Cordys)
- *Contract-based Integration*; Dr. Heiko Ludwig (IBM)
- *Cross-organizational Workflow Management*; Prof.dr.ir. Paul Grefen (TUE)

- *Non-functional Aspects in BCL*; Dr. Peter Linington (Univ Kent)

REGISTRATION

For registration you are kindly requested to fill in the registration form at http://www.siks.nl/act/inschrijving_BPI.html.

SIKS-day 2005 in Utrecht

On November 11, 2005, the School for Information and Knowledge Systems organizes its annual SIKS-day. The location will be conference center Hoog Brabant in Utrecht (see <http://www.hoogbrabant.nl/>). The main aim of the event is to give SIKS members – participating in research groups all over the country – the opportunity to meet each other in an informal setting and to inform them about current developments and some new activities and plans for the coming year. This year a small scientific symposium will be organized at the SIKS-day, as well. Four guest speakers have agreed to participate:

- Prof.dr. Andrea Omicini (University of Bologna)
- Prof.dr. Frances Brazier (VU)
- Prof.dr. Han La Poutre (CWI/TUE)
- Prof.dr. John-Jules Meyer (UU)

Unlike the previous editions of the SIKS-day, this time we focus on one particular topic: (multi-)agent systems/agent technology. This is the personal choice of our scientific director, Prof.dr. John-Jules Meyer, who after a period of 10 years will step down as scientific director of SIKS at the end of this year. By inviting these researchers we hope to have selected the right ingredients for a memorable day. All members of our research school (research fellows, associated members and Ph.D. students) as well as the members of SIKS’ Advisory Board are invited to join the SIKS-day 2005. More details on program and registration will be made available soon.

Deadline for Registration: October 24, 2005

Basic SIKS Course “Research Methods and Methodology for IKS”

INTRODUCTION

On November 21-23, 2005, the School for Information and Knowledge Systems (SIKS) organizes the annual three-day course *Research Methods and Methodology for IKS*. The location will be Hotel Leusden in Leusden. The course will be given in English and is part of the new Educational Program for SIKS Ph.D. students, who started in 2003. Although the course is primarily

intended for SIKS Ph.D. students, other participants are not excluded. However, their number of passes will be restricted and depends on the number of SIKS Ph.D. students taking the course.

Research Methods and Methodology for IKS is relevant for all SIKS Ph.D. students (whether working in computer science or in information science). The primary goal of this hands-on course is to enable these Ph.D. students to make a good research design for their own research project. To this end, it provides an interactive training in various elements of research design, such as the conceptual design and the research planning. But the course also contains a general introduction to the philosophy of science (and particularly to the philosophy of mathematics, computer science and AI). And, it addresses such divergent topics as “the case-study method”, “elementary research methodology for the empirical sciences” and “empirical methods for computer science”.

PROGRAM

Not available yet.

COURSE COORDINATORS

Hans Weigand (UvT), Roel Wieringa (UT), John-Jules Meyer (UU), Richard Starmans(UU).

REGISTRATION

For registration you are kindly requested to fill in the registration form at the SIKS site.

Basic SIKS Courses: “Formal Methods for IKS” and “Agent Technology”

INTRODUCTION

From December 19-23, 2005, the School for Information and Knowledge Systems (SIKS) organizes two basic courses: *Formal Methods for IKS* and *Agent Technology*. The location will be Landgoed Huize Bergen in Vught (see <http://www.huizebergen.nl/>). Both courses will be given in English and are part of the Basic Course Program for SIKS-Ph.D. students. Although these courses are primarily intended for SIKS-Ph.D. students, other participants are not excluded. However, their number of passes will be restricted and depends on the number of SIKS-Ph.D. students taking the course.

SCIENTIFIC DIRECTORS

- prof.dr. J.-J.Ch. Meyer (UU), prof.dr. E.O.Postma (UM): Formal methods for IKS
- prof.dr. J.-J.Ch. Meyer (UU), prof.dr. C. Jonker (RUN): Agent Technology

PROGRAM

Not available yet.

REGISTRATION

For registration you are kindly requested to fill in the registration form at the SIKS site.

SECTION KNOWLEDGE SYSTEMS IN LAW AND COMPUTER SCIENCE

Section Editor
Marie-Francine Moens

Evaluation of Intelligent Information Retrieval Tools for Non-structured Police Case Reports

*Nishant Kumar, Jan De Beer, Jan Vanthienen and
Marie-Francine Moens
Katholieke Universiteit Leuven, Belgium*

ABSTRACT

Belgian Federal Police (BFP) already using an array of advanced and task-specific tools for collection, dispersal and exploitation of highly structured information, are now shifting attention towards novel technologies for exploiting vast amounts of unstructured information sources, from which further knowledge could be obtained for analysis purposes. The aim of the INFO-NS¹ research project is to provide an objective study of the applicability of mining and decision support tools for the BFP. More specifically, it is studied whether information-retrieval, extraction and classification tools might leverage intelligence and decision support while exploiting the information that is contained in vast amounts of free text material and linking it with any coexisting, structured data sets that are currently in use. This article provides an overview of the requirements of the BFP and the evaluation criteria designed for the evaluation purpose.

INTRODUCTION

The research project INFO-NS is an initiative of the Belgian Federal Police (BFP), commissioned by AGORA as part of the Belgian Science Policy, and carried out by the Katholieke Universiteit Leuven. It is part of the larger DOCMAN project of the BFP, which is aimed at storing the PV's (police case reports) and their base metadata in a central

¹ Visit AGORA at <http://www.belspo.be/belspo/fedra/prog.asp?l=en&COD=AG>

database and to make them accessible through the police's intranet.

Although the information contained in PV's is painstakingly structured into a relational and readily exploitable data format, the structuring process has its drawbacks. In particular, information that is often ambiguous and vague in nature is converted into a crisp and fragmented representation, with subtle yet important nuances being lost in the process, and the big picture becoming more difficult to grasp. Moreover, structuring millions of documents on a yearly basis is a massive undertaking, with even greater amounts of documents left unstructured. For these and other reasons, the use of search and text-mining tools might prove a viable solution. These tools enable to index and classify unstructured information and to annotate them with additional metadata. The better this information can be indexed, classified and labeled, the more accessible and useful this information becomes for the users.

These tools can support the retrieval, querying (searching), management, structuring, visualisation and extraction of relevant information from (electronically available) textual and multi-media documents, within the different services of the BFP. In addition, they allow searching complementary textual sources such as analysis reports, investigation notices, news stories, and WebPages.

Many of the text-mining and search tools available today are extremely fast, powerful, and easy to use, which makes them appropriate for live environments, such as task forces or operational planning sessions. As the number of text-mining software vendors increases, it has become more challenging to assess which of these tools are most effective for a given application. Such judgment is particularly useful for both purchasers of text-mining tools given the high investment (money and time) required in becoming proficient in their use, and developers who aim at producing better quality text-mining products. The main aim of the INFO-NS project is therefore to evaluate a number of text-mining tools with regard to their applicability, their performance and their capabilities of integration within the current BFP infrastructure. As a special concern, the multilingual and cross-lingual support for the three official languages in Belgium (Dutch, French, and German) constitutes an important consideration.

In the project we designed and applied evaluation methods for objective and reliable evaluation of the tools so that we have answer to the following questions:

- To what extent does each of the preselected tools (a short listing from market) answer the functional needs of a police administrator, investigator, operational and strategic analyst?
- To what extent does the tool perform at quality levels like capability, accuracy, flexibility, etc.?
- How efficiently are system resources (memory, disk space, network bandwidth) utilised, considering large document collections, and how well does the tool meet the other criteria like user-friendliness, the system/user interaction, the quality of documentation, etc.?

EVALUATION APPROACH

For the purpose of evaluation, we identified three major groups of evaluation criteria, capturing the applicability, the competence, and the practicality of the tools under study.

- **Applicability:** The extent to which each of the pre-selected tools (an initial market selection) answers the identified functional needs of the various user profiles.
- **Competence:** The extent to which each of the tools performs at quality measures like capability, accuracy, flexibility, scalability, etc. For this purpose, task-specific evaluation procedures and criteria are devised.
- **Practicality:** Includes performance, as the extent to which system resources (memory, disk space, network band width, ...) are efficiently utilised, considering extensive document collections and a large potential number of concurrent users, next to various, more subjective criteria, such as user-friendliness, user-system interaction, the quality of documentation, etc.

CONCLUSION

The development and deployment of new information technologies in a domain where digitalization has been slowly, seemingly hesitatingly, but nevertheless relentlessly introduced, provides many new opportunities, but remains a great challenge. Through our own project with the Belgian police, we encountered many interesting aspects that are not readily found or touched upon in literature on the subject, most noticeably on the issues of privacy, security, legal aspects such as the evidential value of generated results, data preprocessing and cleaning, integration, flexibility, adaptability, and performance of exploitation tools in practical settings. We hope our work may prove useful, inspire or ponder other field workers on these topics, as we believe the success and promising future of these tools heavily depends on their careful consideration.

ANNOUNCEMENTS

BNAIS2005: AIemotion!

*November 3, 2005
Radboud Universiteit Nijmegen*

On the 3rd of November 2005 the Belgium Dutch AI Symposium (BNAIS) will be organised by the students association Artificial Intelligence of the Radboud Universiteit Nijmegen. This symposium aims at informing students about the research in Artificial Intelligence in the Netherlands, Belgium, and elsewhere. This year's BNAIS is entitled *AIemotion* representing the content of the symposium: *AI in motion*, new developments in the domain of Artificial Intelligence and 'emotion', the union of computers and emotion. It will be an interesting symposium with national and international speakers.

More info: <http://www.ru.nl/bnais/>

The Third European Workshop on Multi-Agent Systems

*December 7-8, 2005
Brussels, Belgium*

INTRODUCTION

In the last 15 years we have seen a significant increase of interest in agent-oriented technology. This field is now set to become one of the key technologies in the 21st century and will underpin much of the next generation of computing that seeks to address issues in Ambient Intelligence, Pervasive and Ubiquitous Computing, Complex Systems, Grid Computing, Services Oriented Computing, Semantic Web and many other areas. It is therefore crucial that both academics and industrialists within Europe have access to a forum at which current research and application issues are presented and discussed.

The aim of this third European Workshop on Multi-Agent Systems is to encourage and support activity in the research and development of multi-agent systems, in academic and industrial European efforts.

TOPICS OF INTEREST

Multi-agent systems are computational systems in which agents cooperate or compete with others to achieve some collective task. Topics of interest for the workshop therefore include, but are not limited

to: research axis, action and planning, adaptation and learning, agents and complex systems, agent models and architectures, agent oriented software engineering, agent platforms, agent programming languages, artificial social systems: conventions, norms, institutions; trust and reputation; fraud, autonomy, cognitive models, communication, protocols, coalitions, cooperation, coordination, development tools, e-institutions, emotion, environment of MAS, models: logical, economic, game theory, multi-agent simulation and modeling, negotiation and argumentation, ontologies, reactivity, proactivity, robotics, standards, self-organising systems and emergent organizations, theories of agency.

MAS dedicated to: ambient intelligence, grid computing, pervasive computing, ubiquitous computing, P2P computing, semantic web, web services.

MAS applications: computational biology, e-commerce, e-government, healthcare, supply chaining, traffic management.

SUBMISSIONS AND ATTENDANCE

Those interested in participating in the workshop should submit a paper, of no more than 5000 words, describing relevant preliminary or completed work to be presented at the workshop. The workshop has no formal printed proceedings and EUMAS does not demand authors to sign over copyright to their works; it is intended primarily as a forum for interaction and discussion. Submissions may be of original work or work that has recently been published at relevant international conferences.

In addition to informal event working notes however, event proceedings will also be made available via a searchable electronic web-based archive (original works in full with the author retaining copyright or as an abstract with a link to the original publication for previously published works). A subset of papers may also be selected for a more formal publication such as a journal special issue or special volume.

All submissions should include: author's name(s), affiliation, (complete) mailing address, phone and fax number, and e-mail address. All paper submissions will be handled electronically (see the conference web page <http://como.vub.ac.be/eumas2005/> for details).

VENUE

This year's edition will be held in Belgium, Brussels. The workshop will take place at the Royal Flemish Academy of Belgium for Science and Arts in Brussels (<http://www.kvab.be/>). The Academy is

located at the centre of Brussels, close to the Royal Palais, the Belgian parliament and the central station. General information on Brussels can be found on <http://www.brussels-congress.be/>.

IMPORTANT DATES

Submission due:	September 23
Notification of acceptance:	October 25
Revised papers for Workshop notes:	November 11
Early Registration:	November 5
Late Registration:	December 3

INFORMATION

<http://como.vub.ac.be/eumas2005/>

Call for Papers AAMAS'06

*May 8-12, 2006
Hakodate, Japan*

INTRODUCTION

AAMAS is the premier scientific conference for research in autonomous agents and multi-agent systems. The AAMAS conference series was initiated in 2002 as a merger of three highly respected individual conferences: the International Conference on Autonomous Agents (AGENTS), the International Workshop on Agent Theories, Architectures, and Languages (ATAL), and the International Conference on Multi-Agent Systems (ICMAS). The aim of the joint conference is to provide a single, high-profile, internationally respected archival forum for scientific research in the theory and practice of autonomous agents and multi-agent systems. (See <http://www.aamas-conference.org/> for more information.) AAMAS-06 is the fifth conference in the AAMAS series, following enormously successful previous conferences at Bologna, Italy (2002), Melbourne, Australia (2003), New York City, USA (2004), and Utrecht, The Netherlands (2005). AAMAS-06 will be held at the Future University, Hakodate, Japan. Hakodate is a beautiful city located at the southern end of Japan's northern island, Hokkaido.

INFORMATION FOR AUTHORS

AAMAS-06 encourages the submission of theoretical, experimental, methodological, and applications papers. Theory papers should make clear the significance and relevance of their results to the AAMAS community.

Similarly, applied papers should make clear both their scientific and technical contributions, and are expected to demonstrate a thorough evaluation of their strengths and weaknesses in practice. Papers that address isolated agent capabilities (for example, planning or learning) are discouraged unless they

are placed in the overall context of autonomous agent architectures or multiagent system organization and performance. A thorough evaluation is considered an essential component of any submission. Authors are also requested to make clear the implications of any theoretical and empirical results, as well as how their work relates to the state of the art in autonomous agents and multi-agent systems research as evidenced in, for example, previous AAMAS conferences.

All submissions will be rigorously peer reviewed and evaluated on the basis of the quality of their technical contribution, originality, soundness, significance, presentation, understanding of the state of the art, and overall quality.

In addition to conventional conference papers, AAMAS-06 will also include a demonstrations track for work focusing on implemented systems, software, or robot prototypes; and an industry track for descriptions of industrial applications of agents. The submission processes for the demonstration and industry tracks will be separate from the main paper submission process.

TOPICS OF INTEREST

Topics of interest to AAMAS-06 include, but are not restricted to: agent and multi-agent architectures; agent communication: languages, semantics, pragmatics, protocols; agent programming languages; agent standardizations in industry and commerce; agents and adjustable autonomy; agents and ambient intelligence; agents and cognitive models; agents and novel computing paradigms (e.g., autonomic, grid, P2P, ubiquitous computing); agents, web services and semantic web; agent-based simulation and modeling; agent-mediated electronic commerce and trading agents; agent-oriented software engineering and agent-oriented methodologies; applications of autonomous agents and multi-agent systems; argumentation in agent systems; artificial social systems; auctions and electronic markets; autonomous robots and robot teams; coalition formation and teamwork; collective and emergent agent behaviour; computational complexity in agent systems; constraint processing in agent systems; conventions, commitments, norms, social laws; conversation and dialog in agent systems; cooperative distributed problem solving in agent systems; cooperation and coordination among agents; electronic institutions; formal models of agency; frameworks, infrastructures and environments for agent systems; game theoretic foundations of agent systems; humanoid and sociable robots; information agents, brokering and matchmaking; legal issues raised by autonomous agents; logics for agent systems; mobile agents;

(multi-)agent evolution, adaptation and learning; (multi-)agent planning; negotiation and conflict handling in agent systems; ontologies and agent systems; perception, action and planning in agents; performance evaluation of agent systems; privacy, safety and security in agent systems; scalability, robustness and dependability of agent systems; social choice mechanisms; social and organizational structures of agent systems; specification languages for agent systems; synthetic, embodied, emotional and believable agents; task and resource allocation in agent systems; computational autonomy; trust and reputation in agent systems; verification and validation of agent systems

IMPORTANT DATES

Please note that AAMAS 2006 has earlier submission deadlines than the previous AAMAS conferences:

October 15, 2005: electronic abstract submission

October 18, 2005: electronic paper submission

December 20, 2005: notification

FURTHER INFORMATION

Further information about, e.g., the submission and review process, the workshop and tutorial programs, student scholarships, the program committee, and the venue will be announced soon. Please monitor the conference web site for upcoming details: <http://www.fun.ac.jp/aamas2006/>

CONFERENCES, SYMPOSIA WORKSHOPS

SEPTEMBER 19-22, 2005

The 2005 IEEE/WIC/ACM International Joint Conference on Web Intelligence (WI'05) and Intelligent Agent Technology (IAT'05), Compiègne University of Technology, Compiègne, France.

<http://www.comp.hkbu.edu.hk/WI05/>

<http://www.hds.utc.fr/WI05>

<http://www.comp.hkbu.edu.hk/IAT05/>

SEPTEMBER 19-23, 2005

Ninth International IEEE EDOC Conference (EDOC 2005). Enschede, The Netherlands.

<http://www.edocconference.org>

SEPTEMBER 25-29, 2005

Natural Computing and Applications Workshop (NCA 2005), Timisoara, Romania.

Information: dzaharie@info.uvt.ro

OCTOBER 3, 2005

Linguistic Engineering Meets Cognitive Engineering in the Interface Design of Multimodal Systems (LECEMS 2005), Trento, Italy.

<http://icmi05.itc.it/wiki/ICMI.php/>

OCTOBER 6, 2005

SIREN: Scientific ICT Research Event Netherlands, Technische Universiteit Eindhoven.

http://w3.tue.nl/en/the_university/route_and_map/

OCTOBER 17-18, 2005

17th Belgian-Dutch Conference on Artificial Intelligence. Brussels, Belgium.

<http://como.vub.ac.be/bnaic2005>

OCTOBER 22-24, 2005

16th International Conference on Applications of Declarative Programming and Knowledge Management (INAP2005), Fukuoka, Japan.

<http://inap.dialogengines.com>

OCTOBER 31 – NOVEMBER 4, 2005

The 2nd International Workshop on Grid Computing and its Application to Data Analysis (GADA'05), Ayia Napa, Cyprus.

<http://www.cs.rmit.edu.au/fedconf/gada/2005/paper>

NOVEMBER 6-9, 2005

Fifth International Conference on Hybrid Intelligent Systems (HIS'05), Rio de Janeiro, Brazil.

<http://his05.hybridsystem.com>

<http://www.ica.ele.puc-rio.br/his05>

NOVEMBER 10-11, 2005

EADTU Working Conference 2005, Rome, Italy.

[http://www.eadtu.nl/conference-](http://www.eadtu.nl/conference-2005/files/first_announcement_conf2005.pdf)

[2005/files/first_announcement_conf2005.pdf](http://www.eadtu.nl/conference-2005/files/first_announcement_conf2005.pdf)

NOVEMBER 10-12, 2005

International Symposium on Health Informatics and Bioinformatics (HIBIT'05). Belek, Antalya, Turkey.

<http://hibit05.ii.metu.edu.tr>

NOVEMBER 14-18, 2005

4th Mexican International Conference on Artificial Intelligence (MICAI 2005). Monterrey, Mexico.

<http://www.MICAI.org/2005>

NOVEMBER 23-25, 2005

2005 International Conference on Cyberworlds. Nanyang Executive Centre, Singapore.

<http://www.ntu.edu.sg/sce/cw2005>

DECEMBER 7-8, 2005

The Third European Workshop on Multi-Agent Systems (EUMAS2005), Brussels, Belgium.

<http://como.vub.ac.be/eumas2005/>

DECEMBER 8-10, 2005

The 18th Annual Conference on legal Knowledge and Information Systems (JURIX 2005), Brussels, Belgium.

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