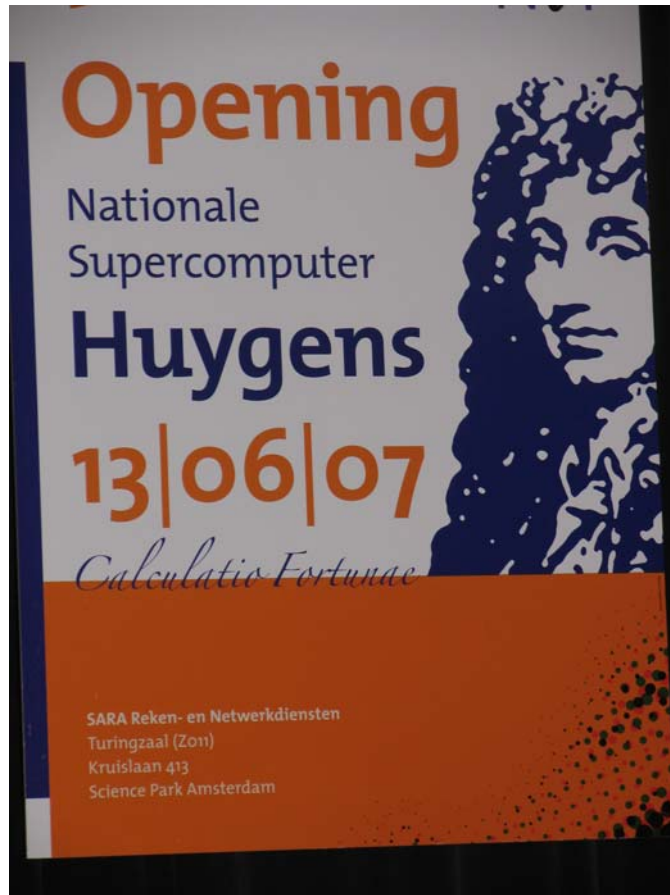


NEWSLETTER

BNVki
A I A B N

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The Culture Web

BeNeLearn 2007

Agents on the Beach

*News from the Belgium-
Netherlands Association
for Artificial Intelligence*

Super

Editor-in-Chief

On June 13, the new Dutch National Supercomputer *Huygens* was officially inaugurated by dr. Job Cohen, mayor of Amsterdam, and prof.dr. Ben de Kruijff, board member of NWO. For the official opening, an interesting program was offered to some 130 attendees. Speakers included dr.ir. Anwar Osseyran (director of SARA), Dave Turek (Vice President Deep Computing, IBM), dr.ir. Axel Berg (head High Performance Computing & Visualisation group, SARA), prof.dr. Vincent Icke (Leiden Observatory, Universiteit Leiden), dr. Patrick Aerts (director NCF), Harry van Dorenmalen M.Sc. (general director IBM Belgium, The Netherlands and Luxembourg), dr.ir. Peter Michielse ((NCF), prof.dr. Peter Slood (Computational Science, Universiteit van Amsterdam), prof.dr. H. Iida (Japan Advanced Institute of Science and Technology, JAIST), and, via a remote link, dr. Murray Campbell (IBM Research and former member of the DEEP BLUE team). For more information and presentations, see the link below.



Prof. Ben de Kruijff and dr. Job Cohen pushing the virtual button as part of the official opening.

At the moment of writing, one of the two previous supercomputers, the *Teras*, is already dismantled. The *Aster* is still operational (until October 2007). Its capacity is 2.2 TFlops and 832 GB memory. But let me give you some



The new National Supercomputer *Huygens*.

information on the new supercomputer. The *Huygens* is already operational, but still in its testing phase. In September 2007 it will become available for the end-users. It consists of 120 Power5+ nodes with 16 processor cores of 1.9 GHz with 4 GB shared memory each, yielding a total capacity of 1920 cores, with 14.6 TFlops and 7.68 TB memory. This means that it is more than 6 times faster than its predecessor with almost 10 times more memory. This system will only be operational until the 2nd quarter of 2008, when it will be upgraded to Power6 nodes, with an expected total capacity of more than 3000 cores, 60.2 TFlops and 15.6 TB memory. So a speed increase by a factor of almost 30 and a memory increase of almost 20 compared with today's capacity.

A little concerning is the knowledge that Computer Science and Mathematics together only make up a few per cent of the total usage of the supercomputer capacity today.¹ So an educated guess is that Artificial Intelligence researchers consume less than 1 per cent of the supercomputer's capacity. Something to think about. Maybe more and better proposals for supercomputer usage should be submitted to SARA/NCF/NWO. If you go on holidays soon, you could use some of your spare time to think about such new projects.

I wish you a happy and fruitful summer vacation!

Opening program: http://www.sara.nl/news/recent/opening_huygens/
Information on the *Huygens*: <http://huygens.supercomputer.nl/>

¹ Source: *Rekening*, Stichting Nationale Computerfaciliteiten NCF, April 2007, The Hague.

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The photographs in this issue are by Huib Aldewereld (p. 56), Dick van der Toorn (p. 58, left), Lise Pijl (pp. 58, right-59), and Jos Uiterwijk (front cover and p. 50).

Front cover: Announcement of the official inauguration of the new National Supercomputer *Huygens*.

The deadline for the next issue is: **August 1, 2007**.

BNVKI-Board News

Antal van den Bosch

Right in the middle of a session of a conference I am attending, I am receiving the wonderful message that we can now celebrate three new Dutch and Belgian ECCAI Fellows: Linda van der Gaag, Marco Dorigo, and Frank van Harmelen. The board of the BNVKI extends its warmest congratulations to Linda, Marco, and Frank for this well-deserved recognition of their manifold contributions to AI!

The conference I am in as I am writing this contribution is ACL-2007, the 45th Annual Meeting of the Association for Computational Linguistics. CL is a community that is able to gather 1,100 people from all over the world, and offer a program with 131 oral presentations at an acceptance rate of 22.3%, and offer 15 workshops and two larger co-located conferences. A strong field, sponsored by pretty solid industrial partners as well.

Still, this field, which I deeply consider a part of AI (although sometimes considered a distant cousin, yet definitely wedded to machine learning these days), struggles with a public image that most of AI faces. We are considered cute, with high whiz-bang science-fiction potential, but we lack the public image that for example particle physics enjoys. Still, particle physicists use a fairly simple reasoning to reinforce their public image: “the world is made of particles, so particle physics is really important”. Mark Steedman, ACL’s current president, therefore proposed to unanimously voice from now on that ‘the world wide web is full of words, so computational linguistics is really important’.

What would be a good slogan for AI in general? “The world is full of problems, so AI is really important”? No, I guess. Our 25-year anniversary slogan was “Turning fiction into science”, which I think sounds more positive (also note the hidden “Turing” in the first word!). Any improvements and other suggestions are welcome in my email inbox.

In the mean time, the reviewing process of BNAIC-2007 (Utrecht, 5 and 6 November 2007) has begun. The program committee reports that submissions have been plentiful, including submissions from Master-level students, which is a development that the board heartily encourages.

The board wishes you a fine and relaxing summer vacation.

The Culture Web

*Michiel Hildebrand and Jacco van Ossenbruggen
CWI, Amsterdam*

Within the MultimediaN e-Culture project researchers from the VU, UVA and CWI and partners from the cultural institutions DEN and ICN are working together to make our cultural heritage accessible in unforeseen ways. The culture web that we envision brings collections from multiple institutions together in a single web application. More importantly, this web enables solutions to position the cultural artifacts, that formerly existed only in isolated databases, into their context.

In 2006 the first e-Culture prototype won the award for best research application at the International Semantic Web Conference. At the moment the application contains ethnographic data from the Rijksmuseum voor Volkenkunde and the Tropenmuseum in Amsterdam, paintings and objects from the Rijksmuseum in Amsterdam, the online collection from archive.com and the Bibliopolis collection about the history of the printed book in the Netherlands.

In our research we investigate how end users can effectively search, navigate and explore this large and heterogeneous data collection. Our approach is based on the structured nature of cultural heritage data and background knowledge. By converting the structured data to the web standard, RDF, we create a collection of linked data on the web.

The explicit structure of the data allows us to extend the search and navigation functionality currently available on the web. On the “document web” the hyperlinks only indicate that there is some relationship between documents. While for a human it is often easy to interpret the type of this relation, for a computer system all these links are the same. A similar argument holds for tags that are attached to web resources.

The links in the structured data are relationships that are described in common vocabularies. This allows a system, for example, to distinguish between the creation site of an artwork and the place that it depicts. Moreover, in the linked data the resources are described by controlled terms from the background knowledge, instead of simple text-based tags. This allows a system, for example, to distinguish between the place Paris in France from Paris in Texas.

In the cultural-heritage domain much work is already invested to carefully define the relevant

relations and terms in, so-called, thesauri. The project members at the VU are investigating how this knowledge can best be represented in RDF. A collection and the corresponding thesaurus are converted and extended with links to other collections and resources from our background knowledge. This involves knowledge engineering as well as linguistic and statistical techniques to create mappings between data sources.

At the UVA experimental techniques are developed to find even more relations between the resources. These relations are extracted from textual resources found on the web.

Combined all the linked data forms a giant graph that is stored in a semantic web framework built on top of SWI-Prolog. The Prolog libraries developed in this project by Jan Wielenmaker provide the low-level support for storage and access of millions of triples and literal indexing for fast text-based search. The current system contains about 10 million statements and we are aiming at 150 million in the near future. The Prolog semantic web libraries also provide the RDFS and OWL reasoning support that are used for the smart search and interaction functionality. Furthermore, we are investigating graph-traversal algorithms to find related nodes in the graph and compute their semantic distance.

At CWI interfaces are developed that bring all this potential to the end-users. The paths in the graph represent relations between resources that were often not available in the isolated collections. For example, the artworks of Pablo Picasso can now be related to the artworks that were made by his collaborators or artists with a similar style.

In text-based search the semantic reasoning is used to go beyond syntactic matching. For example, a search on Paris will also find the paintings that are made in Montparnasse, because it is stated in a place hierarchy that Montparnasse is a district within Paris. In a similar fashion synonym relations between words and associative relations between terms are used to find resources based on semantic similarity.

To support browsing-oriented search behavior we are developing interfaces that make all resources accessible from a single navigation structure. The typed links in the data form the facets from which the collections can be viewed and navigated. A facet can, for example, show all artists that have created artworks, or all styles of these artists. The interface allows users to construct complex queries by simply navigating through the interface and selecting values from different facets.

A research challenge lays in the design of such novel interfaces. There is often too much data that can be presented and typically the structure of the data was not designed for navigation. We are performing several user studies to acquire more insight into these issues.

Recently, we also started research and development on annotation functionalities for a wider audience. Our aim is to create an interface for the construction of structured annotations that is as easy to use as the current tag-based systems.

More information and the prototype are available at <http://e-culture.multimediam.nl/>.

BeNeLearn 2007 Conference

Amsterdam, May 14-15, 2007

Leander Schietgat
Katholieke Universiteit Leuven –
Declarative Languages and Artificial Intelligence
Research Group

The 17th edition of the BeNeLearn conference took place on May 14th and 15th in the Science Park of Amsterdam. It was organised by the Adaptive Information Management group of the Human-Computer Studies Laboratory of the University of Amsterdam. Like every year, BeNeLearn is a perfect meeting place for Belgian and Dutch researchers in machine learning, data mining and related fields to exchange ideas and discuss recent work. This year, approximately 65 participants could be counted.

The conference's main activity remains of course the presentation of the selected papers, which are published together with the poster abstracts in the annual proceedings. In total, 17 papers and 12 posters were accepted, in the fields of biomedicine/bioinformatics, text classification, theoretical machine learning, and many more.

The conference was opened by Maarten van Someren (member of the organising team) on Monday morning. He introduced the first invited speaker, Peter Grünwald, a professor from the Center for Computer Science and Mathematics (CWI, Amsterdam). In his talk, called *The Momentum Phenomenon*, he discussed model-selection methods. There exist two types of model-selection methods: AIC-type methods and BIC-type methods, each having their own particular advantages. The question Peter Grünwald asked himself is whether there exists a method which

performs like the AIC-type methods whenever the AIC-types are better, and like the BIC-type methods whenever the BIC-types are better. It was claimed before that developing such a method is impossible. Still, together with Tim van Ervan and Steven de Rooij, he came up with a technique called “switch code”, based on a novel analysis of BIC-type methods, which shows that they exhibit inertia in changing their outputs when new data become available.

Before lunch, there were two presentations: Siegfried Nijssen proposed *How to Learn Optimal Decision Trees* and Stijn Prompers talked about *Alternative Representations for Web Page Classification*. Lunch was followed by a poster session, during which the participants had the opportunity to learn more about people’s work.

The afternoon session included talks by Goele Hollanders (*Learning Sparse Networks From Poor Data*), Leander Schietgat (*A Polynomial-time Metric for Outerplanar Graphs*), Yvan Saeys (*Distribution Based Algorithms for Feature Weighting, Ranking, and Selection*), Antal van den Bosch (*Superlinear Parallelisation of the k-nearest Neighbor Classifier*), Evgueni Smirnov (*Constructing Reliable Classifiers for Road Side Assistance*) and Michaël Rademaker (*Improved Monotone Relabeling of Partially Non-monotone Data*). After a very interesting (but quite long) day of presentations, we were all invited to have dinner at the restaurant Frankendael. Not only could we enjoy a very tasty buffet, it was a nice opportunity to get to know some of the participants a bit more.

On Tuesday morning, Maarten van Someren introduced the second invited speaker, Marko Grobelnik, from the Jozef Stefan Institute in Ljubljana (Slovenia). In his talk entitled *Text-analytics: using structured or flat representation?* he focused on text mining, and in particular on the different kinds of approaches that exist (i.e., lexical, syntactic and semantic) and how text can be analysed at these different levels.

The rest of the morning was filled with presentations by Sander Canisius (*Learning to Segment and Label Semi-Structured Documents with Little or No Supervision*), Tudor Toma (*Temporal Patterns: Discovery and Use in Predictive Models. Case Study in the Intensive Care*), Linda Peelen (*Stratified Analysis of Multivariate State Changes in Critically Ill Patients*) and Wojtek Kowalczyk (*Predicting Web User Behavior with Mixture Models*).

The Tuesday afternoon session was chaired by Sophia Katrenko, one of the organisers. There were

presentations of Joaquin Vanschoren (*Meta-learning from Experiment Databases: An Illustration*), Snezhana Dubrovskaya (*Learning Resistance Mutation Pathways of HIV*) and Martijn Kagie (*A Graphical Shopping Interface Based on Product Attributes*). After the break, Höskuldur Hlynsson (*Transfer Learning using MDL and a Decision Tree Application*) and Sicco Verwer (*An Algorithm for Learning Real-time Automata*) had the honour of concluding the conference.

From this year’s conference, it can be noticed that statistical approaches are gaining importance and that applications of machine learning and data mining in biomedicine and bioinformatics are still very popular, as well as applications in text classification. During the conference, there was some discussion about the possible collocation of BeneLearn with BNAIC. Just to have an idea of the common opinion, a short survey was done with the following three options: (1) collocate BeNeLearn with BNAIC, (2) integrate BeNeLearn with BNAIC or (3) leave things the way they are. The majority of the participants preferred the last option, since they want the special atmosphere around BeneLearn to be preserved.

Finally, I would like to thank the editors (Maarten van Someren, Sophia Katrenko and Pieter Adriaans) and all the collaborators from The Human-Computer Studies Laboratory who helped this year’s conference become possible. The next edition of BeNeLearn in 2008 will be held by the University of Liège.

Joint VOC and BNVKI Meeting on Data Mining

Utrecht, April 27, 2007

*Laurence Frank
Treasurer VOC*

The scientific interests of the VOC and BNVKI members have a large overlap. Therefore, both societies organized a joint meeting in Utrecht on Friday, April 27, 2007. The meeting included six presentations around the broad theme of data mining and was attended by researchers with diverse scientific background, mainly from the Netherlands and Belgium.

Patrick Groenen started the meeting with his talk *Minimization for Support Vector Machines by Iterative Majorization*. He is full professor in statistics at the Econometric Institute (Erasmus University Rotterdam) and, until this meeting, the

chairman of the VOC. After a very clear introduction to support vector machines (SVM), especially for those who are not familiar with this methodology, Patrick Groenen showed that SVM is closely related to optimal scaling. To solve the SVM, he introduced a new iterative algorithm, based on iterative majorization.

Christophe Croux, professor of statistics and econometrics at the Catholic University Leuven (Belgium), continued the meeting with the talk *Robust Discrimination: an influence function approach*. Robust discriminant rules have been developed to deal with classification rules that are constructed from a training sample where outliers might be present. For the setting of discriminant analysis, Christophe Croux showed that the second-order influence function of the error rate can be used to compute the classification efficiency.

Bernard De Baets is professor in Applied Mathematics at Ghent University, where he is leading the research unit Knowledge-based Systems (KERMIT) at the Faculty of Bioscience Engineering. His talk *Monotone Distribution Classifiers* presented a general framework from which several instance-based supervised ranking algorithms (a specific type of supervised classification), such as the Ordinal Stochastic Dominance Learner.

After the lunch, which was held in the historical building of Utrecht University (Academiegebouw), Koen Vanhoof, head of the Data Mining research group at Hasselt University in Belgium, continued the meeting with the talk *Aggregation Operators' Measures* and showed that AGOP's can be of great importance to practitioners, especially when these behavioural parameters seem to be proxies for domain-specific concepts that are difficult to measure directly or to derive statistically. Case studies provided support for the basic assumption that aggregation-operator measures yield superior consumer information with substantial managerial relevance.

Professor Lambert Schomaker is research director of the Department of Artificial Intelligence at Groningen University. His talk with the title *Machine Learning or Pattern Recognition? On classification methods in writer identification and handwritten manuscript retrieval* convinced the audience that the automatic recognition of handwriting and writer identification constitutes a considerable challenge to science and engineering. He showed that traditional pattern recognition yields better results than the widely used machine-learning methods, as follows from the results of his

research group on handwriting biometrics that belong to the best achievable results to date.

Paul Eilers, associate professor at the Department of Methodology and Statistics, Universiteit Utrecht, concluded the meeting with the talk *Statistical Classification for Reliable High-volume Genetic Measurements* in the context of single nucleotide polymorphisms (SNPs). Modern technology allows the measurement of (hundreds of) thousands of SNPs at the same time, but unfortunately, the measurements are not perfect. He showed an application of mixtures of regression models to determine the genotypes and to quantify reliability.

ABOUT VOC

The VOC (founded in 1989 as the "Nederlands-Vlaamse Vereniging voor Ordinatatie en Classificatie") promotes the communication and collaboration of those who are scientifically interested in the use, development, and application of ordination and classification methods. Examples of ordination methods are principal components analysis and multidimensional scaling. Classification is mainly related to (un)supervised clustering. Both types of methods are widely used, as is reflected in the diverse scientific disciplines of the approximately 100 VOC-members: psychometrics, biology, economy, sociometrics, chemometrics, sensometrics, etc. The VOC is a member of the International Federation of Classification Societies (IFCS).

Twice a year, the VOC organizes a one-day meeting to advance the knowledge on ordination and classification techniques. Usually, the meetings are organized around a specific theme and often one or two prominent speakers from abroad are invited. These meetings are accessible for non-members as well. Through the Newsletter, the VOC-members receive information about conferences and workshops, references to important publications, and reviews of recently published books.

The current chairman of the VOC is Ron Wehrens, associate professor at the Institute for Molecules and Materials Analytical Chemistry, Chemometrics Research Department, Radboud Universiteit Nijmegen. More information about the VOC is available at <http://www.voc.ac>.

Agents on the Beach

AAMAS 2007, Hawaii, May 14-18, 2007

Huib Aldewereld
MICC-IKAT, Universiteit Maastricht

After Bologna, Melbourne, New York, Utrecht, and Hakodate, the sixth international joint conference on Autonomous Agents and Multiagent Systems was held this year in Hawaii, USA. Housed in the exotic Hawaii Conference Centre under the warm Hawaiian sun and near the shiny beaches of Waikiki, over 300 researchers from all over the world gathered to talk about Agents, Multiagent systems and related research subjects.



Agents on the beach?

The program of the conference was diverse as always. There were this year 19 collocated workshops, 8 tutorials, several demo sessions, 4 invited keynote talks, poster presentations and, of course, presentation sessions for the accepted papers. In total there were over 400 accepted papers and short papers this year, spanning subjects from logical aspects of (BDI) agents to agent programming, learning, negotiation, game theory, mechanism design and social aspects of norms.

The keynote talks were both business related as well as academic. The first keynote, a talk on *Using Agents and Autonomic Computing to Build Next Generation Seamless Mobility Services* by dr. Strassner from the Autonomic Research Motorola Labs, described a novel autonomic architecture that uses a variety of different types of agents to integrate wide-area and local-area wireless and wired systems in order to provide seamless services to the end users.

The second keynote, given by dr. Kephart from IBM Research, on the topic of *Multiagent Systems for Autonomic Computing*, explained that building autonomic complexity systems might be the only way to avert a looming systems-management complexity crisis. Their approach exploits agent concepts and principles to achieve autonomic behaviour in small datacenter prototypes involving a few dozen servers.

The two academic keynotes were by dr. Gal Kaminka and prof. dr. Sarit Kraus of the Bar-Ilan University (Israel). Dr. Kaminka gave a talk titled *Robots Are Agents, Too!* about applying the results of agent research to robotics, with a main interest in the challenges related to the separation of taskwork (task-directed aspects of agent teams) versus teamwork (interaction-directed aspects of agent teams).

The talk by ACM/SIGART winner prof.dr. Sarit Kraus, titled *Automated Negotiation in Open Environments*, was an overview of all the work that has been done on the subject of negotiation over the last few years at the Bar-Ilan University. The self-interested agents are to operate in open environments such as online markets, patient care-delivery systems, virtual reality and simulation systems, and IT systems administration. Moreover, algorithms were discussed for representing and learning agents' goals and capabilities, which are algorithms that have been evaluated under diverse settings varying in the extent to which agents are co-operative or competitive.



Professor Sarit Kraus giving her keynote lecture.

All in all with an apparent low attendance this year, combined with the rather large convention centre, some of the less populated sessions gave the conference a bit of a minor workshop feeling. Unlike previous years where the conference was booming with people, even crowded at times, this year gave the impression that there were more people on the beaches than at the sessions (while this is not true, it was the low overall attendance that was the problem). I suppose the long (and expensive) trip to Hawaii was not worth it for most people that normally would have come to the AAMAS conference.

Next year, the AAMAS will be held in Estoril, Portugal. The deadline for submissions is currently set at October 26, 2007.

ToKeN Symposium

June 22, 2007

*Christiane Klöditz
NWO Physical Sciences*

Since its launch in 1999 ToKeN¹ became a well-known NWO research programme with a considerable steady research community. Every year a one-day ToKeN event is organised to bring together the researchers of various universities in the Netherlands and potential users of the research results. This year's ToKeN symposium convened on June 22, 2007 at the Academic Medical Center Amsterdam, one of the sites where ToKeN research is carried out.

The programme of the day consisted of three parallel workshops in the morning and a plenary session in the afternoon with an extensive poster session in between. All twenty ongoing ToKeN projects were presented either by posters or by oral

presentations during the workshops or during the plenary session.

The day was opened by Professor Jaap van den Herik (University Maastricht and chair of the programme committee ToKeN). He welcomed the participants and drew the attention to the ToKeN-highlights of the last year including five recent Ph.D. theses, many scientific publications, a special issue about ToKeN-research in *Pattern Recognition Letters* and considerable media attention for the research.

The morning workshops on the three areas of application of the ToKeN programme (Healthcare, Education & Culture, and Law enforcement & the Judicial system) offered a forum for a lively discussion of questions like: What are the highlights of the projects? What are the lessons learned? What are we proud of? What could have been done better? What are our future plans? Quite a few projects are in their final phase. Therefore, the workshops were a good opportunity to meet colleagues, to swap ideas, or simply to exchange the "ToKeN experience". Part of the Healthcare-workshop was a tutorial by Professor Jeremy Wyatt, the keynote speaker of the afternoon session.

According to the tradition of the ToKeN events, the lunch break was accompanied by a lunch concert, this year with oboist Rik Sonneveld.

An important element of the symposium was a poster session which provided researchers with a unique opportunity to make their work highly visible, and to discuss their work one-on-one with other participants in an informal and interactive fashion. The poster session was held after the lunch. Reproductions of the posters are included in a booklet which can be ordered from the programme office (email: token@nwo.nl).

The plenary session in the afternoon was opened by the exciting keynote lecture by Professor Jeremy Wyatt (University of Dundee). His talk entitled *Knowledge – a token of success?* explored the chain of knowledge from the crystallisation of tacit knowledge as explicit knowledge through research to three key methods for promoting professional uptake and use of explicit knowledge. Wyatt, since 2005 Professor of Health Informatics and Director of the Health Informatics Centre, University of Dundee, illustrated his statements with examples from medicine, in which Evidence-based Medicine and practice guidelines provide useful innovation case studies.

¹ **ToKeN** – Access **To Knowledge** and its enhancement Netherlands – is a multidisciplinary NWO research programme involving specialists in both cognitive and computer science as well as three fields of application, namely Healthcare, Education & Culture, and Law enforcement & the Judicial system. The programme focuses on the ability of individuals to retrieve relevant knowledge and information from computer systems and to derive implicit knowledge from raw data. The overall aim is to develop methods and techniques to optimise the interaction between human users and advanced multimedia information systems.



Professor Jeremy Wyatt.

Following, three ToKeN Ph.D. students, one out of each field of application, presented their research.

Drs. Leendert van Maanen (Department of Artificial Intelligence, University of Groningen) presented his work in the ToKeN/I2RP project on *Mediating Expert Knowledge and User Interest in Art Work Recommendation*. In his presentation, he discussed how the visitor's interests can be served, while taking the relationships between art works in the museum's collection into account. He proposed to represent these relationships using a spreading activation network, in which the nodes represent art works from the collection, and the edges represent a measure of similarity between the art works based on expert knowledge provided by the museum staff.

In her lecture entitled *Sense-making Software for Crime Investigation: How to combine stories and arguments?* drs. Susan van den Braak (Department of Information and Computing Sciences, Utrecht University) presented an architecture for a sense-making system for crime investigation named AVERs (Argument Visualization for Evidential Reasoning based on stories) which is developed in the ToKeN/EVIDENCE project. This is a graphical representation software that allows human crime investigators to visualize their thinking about a case and link it with available supporting or attacking evidence.

Drs. Stefan Visscher of the ToKeN/TIMEBAYES project (Department of Infectious Diseases, University Medical Center Utrecht) put in his talk *Using Temporal Context-specific Independence Information in the Exploratory Analysis of Disease Processes* the emphasis on the fact that in order to obtain insight into the evolution of disease processes, it is not merely necessary to explicitly model time, but also to consider context-specific independence information. He presented the use of dynamic Bayesian networks to model these

processes as such models can be used for temporal reasoning in clinical decision-support systems. Concluding thoughts at the end of the day were given by Dr. Hans van Eekelen, Chair Users Committee ToKeN. And finally the chairperson Professor Arie Hasman (AMC and member programme committee ToKeN) took the opportunity to thank the keynote speaker, the ToKeN speakers and all sixty-five participants for yet another interesting and inspiring ToKeN symposium.

For more information on ToKeN please visit the website www.nwo.nl/token.

The 1st NSVKI Student Conference

Nijmegen, June 22, 2007

Joris Janssen and Twan Goosen

On Friday the 22nd of June the 1st NSVKI Student Conference was held in Nijmegen. The intention of this conference was to give students the opportunity to present their own work (thesis, projects) to their peers from the entire country. For the students presenting their work this is a very useful experience with lecturing at a conference and submitting a paper for publication. For the audience it is very interesting to see what AI research might mean for them, and hopefully they feel some of the enthusiasm of the speakers.



In total, we received six papers from three different universities. The topics of these papers were very versatile, ranging from multi-agent systems to cognitive modeling. The papers turned out to be of good quality, and were all selected for publication in the proceedings and for oral presentation.

On the conference day there were mostly students from Groningen, Utrecht, and Nijmegen. The afternoon started with Pim Haselager giving an introduction on conference behaviour, in which he

shared a number of funny anecdotes, and motivated the audience to engage in discussions and ask questions. After that we continued with two sessions, each consisting of three presentations of twenty minutes followed by about five minutes of discussion. The first presentation was given by Hylke Buisman, Gijs Kruitbosch, and Nadya Peek (Universiteit van Amsterdam) and was about the simulation platform for studying multiagent resource allocation they developed. Next, Frank Leoné (Radboud University Nijmegen) talked about his research on the simulation of parts of the parietal cortex involved in visual perception during eye and body movements. The first session was concluded with a presentation by Twan Goosen (Radboud University Nijmegen) about improving artificial evolution of robot controllers by interleaving evolution in simulation and the real world.

After a short coffee break we continued with Joris Janssen (Radboud University Nijmegen). He talked about modelling certain aspects of the origin of cerebral organization using evolutionary robotics. The fifth speaker was Chris Janssen (University of Groningen), talking about user modelling used in a game for depression prevention. Our final lecturer was Vivian Blankers (Radboud University Nijmegen) who talked about her research on writer identification through automated comparison of handwritten letters. The day ended with some drinks and later a barbecue.



We were very happy about the active discussion sessions, in which a lot of students participated. Furthermore, it has to be said that all speakers had an interesting story of high quality. From the audience we received very positive reactions. People found it very nice to see examples of research of the kind they might do themselves. We heard from a lot of people that they preferred this to a symposium with senior scientists. It was easier to understand the speakers and to participate in the discussions.

To conclude, we could say that it was a very successful initiative and we hope this conference becomes an annual event with even more participants next year. If you are interested you can find the proceedings on the conference website (through <http://www.nsvki.nl>) and maybe you will see some of the speakers at the BNAIC 2007.

Computer Games Workshop 2007

Amsterdam, June 15-17, 2007

*Tristan Cazenave², Clyde Kruskal³,
and Bruno Bouzy⁴*

During the 15th World Computer Chess Championship and the 12th Computer Olympiad in Amsterdam, a workshop on computer games was held. Out of 24 submitted papers, 22 were selected for presentation and publication. The workshop was held over three days. The reports below are by Tristan Cazenave, Clyde Kruskal, and Bruno Bouzy, respectively.

DAY 1

The first day of the workshop started with a presentation by Dr. Anwar Osseyran of the Dutch supercomputer *Huygens* located at SARA. This IBM computer is currently capable of 14 Teraflops/sec and has 7 Terabytes of memory. It should increase to more than 60 Teraflops/sec and provide 15 Terabytes of main memory in 2008. It will be used to investigate climate, materials, bio-molecular, astronomy and medical issues. The second presentation was a recorded talk of Murray Campbell on DEEP BLUE and the history of computer chess.

It was followed by a session chaired by Jaap van den Herik that started with a paper on chess entitled *How Trustworthy is CRAFTY's Analysis of Chess Champions* by Matej Guid, Artiz Pérez, and Ivan Bratko, showing chess champions can be ranked by a program with a lower rating than the players it ranks. The rankings of players are surprisingly stable over a large interval of search depths, and over a large variation of sample positions.

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The second presentation, *Context Killer Heuristic and its Application to Computer Shogi* by Junichi Hashimoto, Tsuyoshi Hashimoto, and Hiroyuki Iida was about the use of the sequence of moves leading to the current position to select the context-killer moves. The technique proved efficient in a Shogi program based on realization probability search. The Shogi program used a mixture of 1-ply and 2-ply context-killer moves for the dynamic move-ordering in the search.

The third presentation *On the Parallelization of UCT* by Tristan Cazenave and Nicolas Jouandeau introduced three algorithms to parallelize the UCT Monte-Carlo tree search on a network of computers. The algorithms were successfully applied to Go.

The fourth presentation, *Monte-Carlo Go with Knowledge Guided Simulations* by Keh-Hsun Chen and Peigang Zhang proposed to improve simulations in Monte-Carlo Go using fast pseudo ladders and matching patterns. They show that knowledge-guided simulations improve their 9×9 UCT Go program against GNU GO 3.6, CRAZYSTONE0006 and GO INTELLECT 2005.

The next two presentations were about video games. *Predicting Success in an Imperfect-Information Game* by Sander Bakkes, Pieter Spronck, Jaap van den Herik, and Philip Kerbusch proposes to automatically generate an evaluation function in RTS games. They used TD-learning to find a unit-based evaluation term. Using only the comparison of material they can predict the result of a game 76% of the time. For the evaluation of tactical positions they obtain 97%. However, it only predicts accurately in the final phase of the game when the comparison of material is accurate relatively early.

The last presentation of the day was *Inducing and Measuring Emotion through a Multiplayer First-person Shooter Computer Game* by Paul Merx, Khiet Truong, and Mark Neerinx. They recorded facial and vocal expressions of emotions while participants were playing a video game. The participants then labeled their own emotions. The video game proved to be a good elicitation tool for emotion, with a lot of different and intense emotions. They found that a very negative or very positive emotion is automatically accompanied by a high level of arousal. They plan to use the collected data for research on automatic recognition of emotions.

DAY 2

Factors Affecting Diminishing Returns for Searching Deeper, by Matej Guid and Ivan Bratko

As chess programs search deeper into the game tree, their play improves but there are diminishing returns. This can be seen by how often a program changes its mind about what is the best move, which can be measured in a variety of ways (best change, fresh best, $(d-2)$ best, or $(d-3)$ best). The deeper the search the less often the program changes its mind. Using a large number of positions on two chess programs, CRAFTY and RYBKA, the authors show that following factors affect how often the program changes its mind. (1) The value of the position. (The more equal the position, the more often.) (2) The quality of the evaluation function. (The better evaluation function, the less often.) (3) To a lesser extent on the phase of the game and the amount of material on the board. (The more material, the more often.)

Moving in the Dark: Progress through Uncertainty in Kriegspiel by Andrea Bolognesi and Paolo Ciancarini

Kriegspiel is a variant of chess, where each player knows only the positions of his own pieces. There is a referee, who tells a player when an attempted move is illegal, which turns out to be important information that the player must exploit to play well. Kriegspiel is an interesting game to study because a player has little information about the opponent's position. The authors implemented a search-based approach to play endgames (while previous approaches were rule-based). They find this approach is much better. For example, in King and Rook vs. King endgames the search-based approach took an average of 25 moves, compared to 35 moves for the rule-based approach. The program plays reasonably well against a fair opponent.

Introducing Playing Style to Computer Go by Esa Seuranen

Computers now play most classic, perfect-information games (chess, checkers, Chinese chess, shogi, etc.) as well as the best humans. In contrast, in the game of Go, the best programs are not even as good as the average tournament player. The author argues that the biggest bottleneck for computer programs is the middle game, which has received the least attention. Their approach is to handle the game with subgames, which have a list of local purposes. The choice of moves can be picked according to a playing style. This approach can incorporate self-learning.

Checking Life & Death Problems in Go. I: The Program SCANLD by Thomas Wolf and Lei Shen

The authors introduce a program that can check life-and-death problems in the game of Go. Problems can be wrong for quite a variety of reasons. The obvious reason is that the first move is wrong. Other reasons include that the winning

move is not unique (a minor problem), or the winning move is correct but that the given sequence of play is incorrect. (There are a number of other reasons.) The author uses the program to check the problems in a Chinese Tsume-Go book. A small percentage of the problems could not be checked by the program. The authors find the problem book quite accurate (an error rate of less than 1% for each move). The main point of the article is to argue that books of life-and-death problems should now be checked by computer program (just as writers now use spell checkers).

A Retrograde Approximation Algorithm for Two-Player Can't Stop by James Glenn, Haw-ren Fang, and Clyde Kruskal

The game of Can't Stop has the property that a player rolls dice a number of times to make progress on a turn. A player can end a turn fixing the current progress, or continue rolling the dice to try to progress further. If a player ever "misses" all of the progress for that turn is lost, and it becomes the other player's turn. The game is analyzed using standard retrograde-analysis techniques, where one has already analyzed all simpler positions, except there is the possibility that the position returns to itself. The idea is to look for a fixed point using a 2-dimensional Newton's method (for the two-player version). Small versions of the game are analyzed.

Monte-Carlo Tree Search in Backgammon by François Van Lishout, Guillaume Chaslot, and Jos Uiterwijk

Monte-Carlo Tree Search is becoming popular for game programs. The authors use it on backgammon, which is interesting because it is a two-player, perfect-information game, with chance. This has not been done before for such a game. Preliminary results on opening moves show that the program finds the expert move at least some of the time. It is hard to compete with the top programs, which are extremely strong. An intriguing idea, suggested in the paper, is to couple the current strong evaluators with the Monte-Carlo Tree Search.

Extended General Gaming Model by Michel Quenault and Tristan Cazenave

The idea of General Gaming is to have a program that can play games of a general type. The user must specify the exact rules. Previous efforts have been largely restricted to complete-information board games. The authors propose a functional model that, with a single engine, can handle card games and board games, complete- and incomplete-information games, and deterministic and chance games. The general gaming program has been implemented in the Python programming

language. It has been used to define the games: tic-tac-toe, go-moku, and Chinese-poker.

GTQL: A Query Language for Game Trees by Yngvi Björnsson and Jonheidur Ísleifsdóttir

Search engines for high-performance game-playing programs are extremely complicated. It is very easy to introduce bugs and very difficult to find them. The authors create a Game Tree Query Language (GTQL). For example, it is possible that the quiescence search expands too aggressively. This can be tested by producing a query that checks for quiescence root nodes with subtrees larger than size 50 (say). Another example is to search for places where the principle variation changes frequently. The language is expressive enough for game trees, and the implementation is efficient (using only one pass).

DAY 3

The third day of the 2007 Computer Games Workshop was chaired by Nicky Hekster. The programme consisted of 8 lectures of twenty minutes each. The contributions had a high quality, and the talks generated very interesting discussions.

The first talk *Selfish Search in Shogi* was given by Takeshi Ito. When playing intellectually demanding games, human players do not perform exhaustive and monotonous search as computers do. Instead, a human player selects a move from a set of candidate moves based on intuition and linear search. This kind of human thinking process is named "selfish search", and is investigated by this contribution.

The second talk *Extracting Important Features by Analyzing Game Records in Shogi* by Kosuke Tosaka, Asuka Takeuchi, Shunsuke Soeda, and Hitoshi Matsubara was given by Shunsuke Soeda. The authors proposed a game-record-based method to extract differences between two groups of Shogi players. They conducted a discriminant analysis on the game records, choosing the group of players as the explanatory variable, and simple features based on the game rules. Meaningful variables were selected, and the analysis enables the method to achieve high discriminant rates.

The third talk *The Monte-Carlo Approach in Amazons* by Julien Kloetzer, Hiroyuki Iida, and Bruno Bouzy was given by Julien Kloetzer. The talk presented how the Monte-Carlo Tree Search method can be adapted to the game of Amazons to obtain a good-level program. The talk dealt with splitting moves into two steps, adding knowledge into the random simulations, and calling an accessibility-based evaluation function before the end of the playout.

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June 11-18, 2007

Mark Winands
MICC-IKAT, Universiteit Maastricht

The fourth talk *Computing Elo Ratings of Move Patterns in the game of Go* was given by Rémi Coulom. He presented a new Bayesian technique for supervised learning of patterns extracted from game records. The method is based on a generalization of Elo ratings in which each sample move is considered as a victory of a team of pattern features. Despite a very small number of training games, the learning algorithm outperforms most previous approaches. CRAZY STONE was improved with the learnt patterns, and reached the level of the strongest classical programs.

The fifth talk *Reflexive Monte-Carlo Search* was given by Tristan Cazenave. Reflexive Monte-Carlo search consists in using the results of a Monte-Carlo search to improve move selection within the simulations of a Monte-Carlo search. An application of reflexive Monte-Carlo search to Morpion Solitaire was yielded. For the non-touching version, reflexive Monte-Carlo search established a new 78-move record.

The sixth talk *Grouping Nodes for Monte-Carlo Tree Search* by Jahn-Takeshi Saito, Mark Winands, Jos Uiterwijk, and Jaap van den Herik was given by Jahn-Takeshi Saito. So far, in standard Monte-Carlo Tree Search (MCTS) applied to Go, there is only one type of node: every node represents a single move. The authors proposed a second type of node representing groups of moves, and they documented how group nodes can be used for including domain knowledge to MCTS. A new technique, called Alternating-Layer UCT, was presented demonstrating that group nodes can improve the playing strength of a MCTS program.

The seventh talk *An Efficient Approach to Solve Mastermind Optimally* by Li-Te Huang, Shan-Tai Chen, Shih-Chieh Huang, and Shun-Shii Lin was presented by Shih-Chieh Huang. The talk introduced an efficient backtracking algorithm with branch-and-bound pruning for Mastermind. This novel approach may presumably be applied to other games.

The eighth talk *Solving 20×20 Puzzles* by Aleksander Sadikov and Ivan Bratko was presented by both authors. They reported that it is possible to solve random instances of the 399 Puzzle using real-time A* search (RTA*) in a reasonable amount of time. Previously, very few attempts were even made to go beyond the 5×5 puzzles. The discovery is based on a recent finding that RTA* works better with strictly pessimistic heuristics.

Finally, day 3 was closed by Jaap van den Herik who introduced next year events in Beijing, China.

The 15th World Computer Chess Championship and 12th Computer Olympiad were held from June 11 to 18 at the Science Park Amsterdam, The Netherlands. The organiser was the International Computer Games Association (ICGA). The events, together with the *Computer Games Workshop 2007*, were sponsored by IBM, SARA Computing and Networking Services and NCF (Foundation of National Computing Facilities). Both events are described in this report.

WORLD COMPUTER CHESS CHAMPIONSHIP

The World Computer Chess Championship (WCCC) is an annual event where computer chess engines compete against each other. The WCCC is open to all types of computers including microprocessors, supercomputers, and dedicated chess hardware. Twelve programs took part in the round-robin event this year. The well-known program FRITZ and last year's winner JUNIOR (from Israel) were absent. The authors of both programs preferred to play in the lucrative *the President's Cup*, in Elista and could not make it to the tournament in Amsterdam. But for most insiders the top-rated programs were present, being RYBKA (Vasik Rajlich, USA), ZAPPA (Anthony Cozzie, USA), SHREDDER (Stefan Meyer-Kahlen, Germany), LOOP (Fritz Reul, Germany) and GRIDCHESS (a combination of TOGA, FRUIT and CRAFTY). A curiosity was the participation of MICRO-MAX (Harm Geert Muller, The Netherlands), the smallest Chess program in the world. It consists of only about 100 lines of C code, less than 2,000 characters in total. It is the only engine in existence that has more Elo points than its code has characters.

After a week of interesting battles, the winner was RYBKA, which secured her victory by defeating convincingly two-times computer chess world champion SHREDDER in the last round. Although it was RYBKA's first world title and her performance was impressive (she scored 10 points out of 11 games), her tournament victory was not a big surprise. Since RYBKA's release on December 4, 2005, her smallest lead ever in any major rating list at any time control and on any hardware was 60 Elo points. In addition to this, she has competed in all eight major international tournaments held since her

first release and taken clear (unshared) first place in seven of them. Behind RYBKA, ZAPPA finished second and LOOP third. Finally, the German program SHREDDER won the blitz world championship for the fifth time.

COMPUTER OLYMPIAD

The Computer Olympiad is a multi-games event in which computer programs compete against each other. For many board games the Computer Olympiad is an opportunity to take the “world’s best computer player” title. This year a total of 40 programs participated from nine different countries. There were competitions in 10 games: Amazons, Backgammon, Chinese Chess, Connect6, Go, 9×9 Go, International Draughts, Phantom Go, Shogi, and Surakarta.

Go attracted most participation and interest. Recently, there has been a paradigm shift in Computer Go from selective searchers equipped with lots of domain knowledge to so called Monte-Carlo Tree Search (MCTS) programs. The Olympiad started with the 9×9 Go tournament. MCTS programs dominated clearly in this variant of Go. The tournament was won by the program STEENVRETER written by Erik van der Werf, who previously solved 5×5 Go. In the regular Go tournament (19×19) the MCTS programs MOGO (Gelly and Wang, France) and CRAZYSTONE (Coulom, France) took the first and second place, respectively. Despite all this Monte-Carlo violence, the classic (MCTS-free) program GNU GO was still able to snatch a bronze medal. The Go games were commented by professional player Guo Juan, who played a few demonstration games against the winner of the tournament. More Go was in the form of Phantom Go. This is a variety of Go, in which the players are not able to see the opponent stones. The tournament was won again by a MCTS program, this time GOLOIS (Cazanave, France).

On paper the game of Amazons would have been an interesting candidate for MCTS as well. Its branching factor is huge and its game theme has some similarity with Go. However, the MCTS-program CAMPYA was crushed by the alpha-beta searcher 8QP (De Koning, The Netherlands). For space reasons, I will briefly list the winners of the other tournaments. The Backgammon tournament was won for the third time by BGBLITZ (Berger, Germany). NEUCHESS (Wang, China) took the first place in the Chinese Chess tournament. In the relative new game Connect6 the program X6 (Liou and Yen, Taiwan) excelled. Good old draughts attracted 7 participants and was won by DAM 2.2 (Jetten, The Netherlands). After a play-off TACOS (Iida Lab, Japan) took the gold medal in Shogi. SIA

(Winands, The Netherlands) secured relative easily its tournament victory for Surakarta.

Next year the WCCC and Computer Olympiad will be held in Beijing (Peking), China. For more information visit <http://tournaments.icga.org>.

PH.D. THESIS ABSTRACTS

Complex Aggregates in Relational Learning

Ph.D. thesis abstract
Celine Vens

Promotor: dr. H. Blockeel
Date of defense: March 30, 2007



In relational learning one learns patterns from relational databases, which usually contain multiple tables that are interconnected via relations. These relations may be of one-to-many or many-to-many cardinality ratios. Thus, an example for which a prediction is to be given may be related to a set of objects that are possibly relevant for that prediction. Relational classifiers differ with respect to how they handle these sets: some use properties of the set as a whole (using aggregation), some refer to properties of specific individuals of the set, however, most classifiers do not combine both. This imposes an undesirable bias on these learners. This dissertation describes a learning approach that avoids this bias, by using complex aggregates, i.e., aggregates that impose selection conditions on the set to aggregate on.

This combination of aggregates and selections presents several difficulties. First, the search space is substantially increased, and second, the generality order of the hypotheses that is assumed by many

relational learners is violated. This implies that one either has to give up on efficiency or on completeness when searching the hypothesis space using classical refinement operators. We develop a general refinement framework that considers the complete search space, and traverses it in a general-to-specific, hence efficient, way.

Complex aggregates are included in an existing relational learner that constructs relational decision trees. We argue that in this context, the generality ordering can not be violated, and classical refinement operators can be applied. To improve efficiency, we present two techniques: an application of the developed refinement framework and an upgrade of the relational decision-tree algorithm to a relational random-forest inducer.

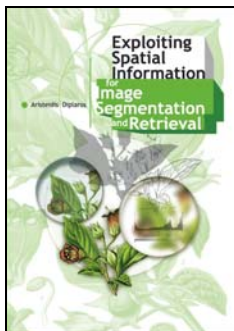
The use of complex aggregates is also studied in the consequent of a hypothesis. More precisely, we investigate the use of complex aggregates in the linear models built by a relational-model tree learner. This involves upgrading the relational-decision-tree algorithm to a relational-model-tree learning system. The main contribution in this work is the development of an efficient heuristic function suitable for learning model trees.

Finally, the use of complex aggregates is evaluated in two real-life applications.

Exploiting Spatial Information for Image Segmentation and Retrieval

Ph.D. thesis abstract
Aristeidis Diplaros

Promotor: prof.dr. A.W.M. Smeulders
Date of defense: April 19, 2007



In this thesis we look at the different levels of spatial information present in images which ranges from boundaries, to edges, to pixels. We then proposed novel approaches to exploit the spatial information for solving various computer vision tasks.

In chapter 2 we proposed an approach for shape matching and shape-similarity retrieval based on dynamic programming. Our approach treats open, noisy or distorted shapes and is independent of translation, scale, rotation and starting point selection. It operates implicitly at multiple scales by allowing the matching of merged sequences of consecutive segments in the shapes which are matched. This way our method maintains the advantages of previous methods (e.g., Mokhtarian (1995); Ueda and Suzuki (1993)) utilizing smoothed versions of the shapes at various levels of detail, while avoiding the expensive computation of explicit scale-space representations. We carried out extensive performance experiments on several datasets and our evaluations are based on human relevance judgments by 4 independent referees. The experiments indicate that our approach is well suited to shape matching and retrieval on shapes with moderate amounts of noise and distortion, achieving higher precision and recall than traditional shape matching and retrieval methods based on Fourier descriptors and moments. Our method performs better than our previous non-optimal method and SQUID, while being the only method capable of handling both open and closed shapes at the same time.

In chapter 3, computational models and techniques have been proposed to merge color- and shape-invariant information in the context of object recognition and image retrieval. A vector-based framework has been presented to index images on the basis of illumination (color) invariants and viewpoint (shape) invariants. The matching function of the color-shape context allows for fast recognition even in the presence of object occlusion and cluttering. From the experimental results it is shown that the method recognizes rigid objects with high accuracy in 3-D complex scene robust to changing illumination, camera viewpoint, object pose and noise.

In chapter 4 we proposed a graphical model and a novel EM algorithm for Markov-based image segmentation. The proposed model postulates that the unobserved pixel labels are generated by prior distributions that have similar parameters for neighboring pixels. The proposed EM algorithm performs iterative bound optimization of a penalized log-likelihood of this model. The derived EM equations are similar to the standard (unconstrained) EM algorithm, with the only difference that a *smoothing* step is interleaved between the E- and the M-step, that couples the posteriors of neighboring pixels in each iteration. Compared to other MRF-based algorithms for segmentation, we note that our algorithm enjoys a simple implementation and demonstrates

competitive performance in terms of speed and solution quality.

In chapter 5 we proposed an image inpainting technique that employs a probability-density function model for the input image based on the Fields of Experts (FoE) framework. The proposed model is a normalized product of multiple experts, each modeling the statistics of a pair of neighboring pixels. We showed how learning and inference can be efficiently carried out in our model, by resorting to approximate message-passing techniques like belief propagation. The proposed model is simpler than the original FoE model, and we believe that it can serve as a useful alternative modeling approach for inpainting problems. We have demonstrated our method in synthetic and real-world images, where encouraging results were obtained.

Applied Text Analytics for Blogs

Ph.D. thesis abstract
Gilad Mishne

Promotor: prof.dr. M. de Rijke
Date of defense: April 27, 2007



The World Wide Web affects numerous aspects of our lives: from the way we work to how we spend our free time and interact with others. In recent years, however, the web that we have become used to is changing. Advances in technology and easy access to the internet from everywhere, anytime, combined with a generation which grew up with the omnipresence of the web, have pushed forward a phenomenon known as user-generated content. This content is created by users of websites, rather than professional website maintainers: everyone can be a contributor, and, indeed, as of 2006, a third of internet users choose to produce content and not only consume it. A particular type of user-generated content is blogs, personal web pages containing periodic updates, which often serve as online diaries. Keeping a diary is nothing new by itself, but the blogging phenomenon is unique in that the diaries are publicly available, exposing the personal lives of millions of individuals worldwide. The

blogspace – the collection of all blogs – differs from other large collections of information on several levels, the most notable one being the personal nature of the content. The text found in blogs often contains descriptions of an individual's life and surroundings, as well as thoughts, emotions and commentary on various topics; this type of content is rare in other publicly accessible corpora.

The availability of such content poses new challenges in the field of text analytics – an interdisciplinary research area encompassing a set of methods for discovering knowledge in unstructured text, combining techniques from domains such as computational linguistics, information retrieval, and machine learning. This dissertation operates within the text analysis framework to identify knowledge found in blogs, using both established approaches and new ones which we develop. The main question that we seek to answer is this: how can the characteristics of blogs be utilized to effectively mine useful knowledge from the blogspace? In particular, we aim to computationally identify two types of information: the first is people-centric knowledge: an individual's interests, cultural preferences, and surroundings. The second type of information we search in blogs is non-factual content: emotions, opinions, and moods – information which is largely unique to the blogspace.

Using a range of methods, many of which involve statistical language models and text classification, we show that these two types of knowledge can indeed be effectively mined from blogs. We also show that aggregating information from large numbers of blogs reveals – again, through usage of text analytics – knowledge which is not present in single blogs, such as global emotional patterns or the type of topics raising public debates. A separate part of this dissertation investigates search in the blogspace: what users look for in blogs, and how to effectively respond to their needs. We find that users seek different information in blogs compared with other web domains, and, consequently, the methods used to answer their requirements differ. Finally, we refer to the work presented here as applied text analytics, as every algorithm proposed is put to the test in a real-life setting, with a concrete task, real data, and (where possible), compared to the state-of-the-art.

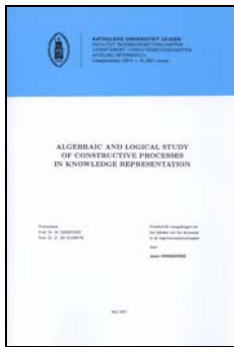
We believe that the user-generated phenomenon is a long-lasting one, and will continue to have a substantial effect on the web in the years to come. While blogs in their current form may change, many of the methods developed in this dissertation can be generalized to other types of user-generated content, and in particular to the type of social

networks that are becoming increasingly popular in recent years. As more and more personal-oriented information will become available online, the importance of text-analytics methods such as those we discuss in this work will only increase, assisting both the producers and the consumers of this information to organize and make available the knowledge hidden within it.

Algebraic and Logical Study of Constructive Processes in Knowledge Representation

Ph.D. thesis abstract
Joost Vennekens

Promotores: dr. M. Denecker and prof.dr. De Schreye
Date of defense: May 11, 2007



Constructive processes play an important role in knowledge representation. Indeed, there are many formal languages whose semantics can be characterized using fixpoint criteria, that simulate, for instance, human thought processes or mathematical construction principles. Such processes can be studied in an abstract, algebraic way. This allows common properties of such languages to be examined in general, without committing to any particular syntax or semantics. In a first part of this thesis, we examine two topics in this way: first, we look at modularity of theories and, second, we consider certain transformations that extend the vocabulary of a theory to simplify some of its formulas. In both cases, we find that a single algebraic theorem about constructive processes suffices to derive (partial) generalizations of a number of different existing results for logic programs, autoepistemic logic, and default logic.

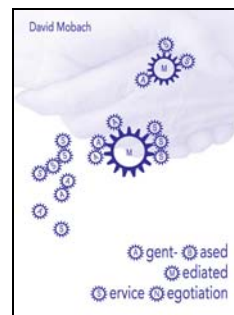
In a second part of the thesis we examine the link between constructive processes and the concept of causality. We observe that causality has an inherent dynamic aspect, i.e., that, in essence, causal information concerns the evolution of a domain over time. Motivated by this observation, we

construct a new representation language for causal knowledge, whose semantics is defined explicitly in terms of constructive processes. This is done in a probabilistic context, where the basic steps that make up the process are allowed to have non-deterministic effects. We then show that a theory in this language defines a unique probability distribution over the possible outcomes of such a process. This result offers an appealing explanation for the usefulness of causal information and links our explicitly dynamic approach to more static causal probabilistic modelling languages, such as Bayesian networks. We also show that this language, which we have constructed to be a natural formalization of a certain kind of causal statements, is closely related to logic programming. This result demonstrates that, under an appropriate formal semantics, a rule of a normal, a disjunctive or a certain kind of probabilistic logic program can be interpreted as a description of a causal event.

Agent-Based Mediated Service Negotiation

Ph.D. thesis abstract
David Mobach

Promotor: prof.dr. F.M.T. Brazier
Co-promotor: dr. B.J. Overeinder
Date of defense: May 21, 2007



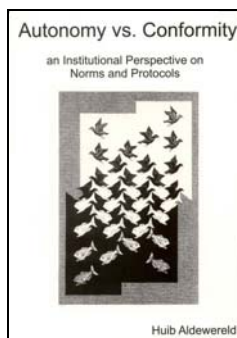
An agent-based negotiation framework is presented for consumers and providers of services to negotiate service agreements. The agreements specify guarantees and obligations concerning the use of services, and are used to manage service access. Negotiation is performed through third party intermediaries, called mediators. The negotiation framework is based in part on the WS-Agreement specification which provides a protocol and language for negotiating agreements between individual consumers and providers of services. The specification is extended to allow for mediated negotiation between consumers and service providers within agent-based environments, and explicit acceptance of agreements in the final stage of the negotiation process. The negotiation framework provides for a policy-based approach to

service-access management: The framework is modeled to allow the implementation of service-access policies into the negotiation model, at both individual service and group levels. The negotiation framework is implemented as part of the AgentScape agent middleware, and experiments and simulations are performed in the context of two application domains: Resource management within the AgentScape middleware, and Distributed Energy Management.

Autonomy vs. Conformity: An Institutional Perspective on Norms and Protocols

Ph.D. thesis abstract
Huib Aldewereld

Promotor: prof.dr. J.-J.Ch. Meyer
Co-promotor: dr. F.P.M. Dignum
Date of defense: June 4, 2007



The motivation for the research presented in this thesis is the ANITA project, which is a multidisciplinary joint venture of legal and artificial intelligence departments of four universities in the Netherlands (consisting of Rijksuniversiteit Groningen, Universiteit Leiden, Universiteit Maastricht and Universiteit Utrecht). ANITA stands for Administrative Normative Information Transaction Agents, and aims to provide a solution, based on multiagent technology, for the problem that exists in information exchange between the different police districts in the Netherlands. In this domain the main challenges concern both the shortage of information (not being able to find legally relevant data that should be available) as well as abundance of information (for example violating privacy rights). These issues are of great consequence in the domain of police and judicial intelligence. The ANITA framework is based on administrative agents that decide, based on norms, whether to allow transactions of information.

In the ANITA scenario, where agents autonomously decide whether or not to share (privacy sensitive)

information based on the applicability of (local) norms, a global frame for the enforcement of (global) norms was needed. Since all agents, though each bound to local procedures and rules, have to adhere to the global regulations as given by law (e.g. the police file act, and privacy laws), it has to be checked (at real-time) whether the information transactions are not in conflict with the global laws that hold for the domain. In most software and agent methodologies, such regulations are seen only as extra requirements in the analysis phase of the system, and are thus hard-coded into the software or the agents themselves. If, however, the regulations change it becomes very hard to track all changes to be done in the implementation, as there is no explicit representation of the norms (that is, since all norms are embedded in the agent's design and code, all the design steps have to be checked and all the code verified to ensure compliance to the new regulations). The alternative is to have an explicit representation of the norms, but this approach requires some form of enforcement to ensure the compliance instead.

This alternative can be found in the introduction of an electronic institution. An electronic institution, similar to their human counterparts, is an entity defining a set of norms over the behaviour of individuals inside the institution. Electronic institutions provide a safe environment mediating the interaction of agents, where the expected behaviour of the agents is expressed by means of an explicit specification of the norms. The introduction of an electronic institution in a highly-regulated domain such as the ANITA scenario requires us to solve issues related to the abstractness of human regulations, the lack of operational information and the implementation of norm enforcement from an institutional perspective. In this thesis we solve these problems by the introduction of a framework for making the connections between the norms and the agent practice explicit.

An electronic institution built based on a specification of norms taken from human laws and regulations is characterised by the normative specification and its procedures. Both the normative specification and the procedures, expressed in protocols that the agents can use to achieve common tasks, are derived from the laws and regulations that govern the domain. To ensure that none of these laws are broken by any of the agents participating in the institution, some form of enforcement is required. This can either be done by restricting the agents to specific procedures (that are known to be norm-compliant) or by monitoring the behaviour of the agents and punishing them in the case they violate a norm. We argue that the latter holds many benefits, since restricting agents to pre-

defined procedures severely reduces the autonomy of the agents participating in the institution (restricting agents to such protocols only allows them to act in the manners defined on forehand, thus making them unable to handle new and unforeseen situations). This does, however, signify the implementation of an active norm enforcement based on the detection of violations and reactions to violations, which has not been done before, and can be hard because of the abstractness of the norms and the lack of operational information in norms (norms do not explicitly define how they should be implemented). We solve this problem by introducing a formal representation of norms based on a representation in deontic logic which is annotated with fields that contain all the (operational) information necessary to implement the norms from an institutional perspective.

Even though the agents are not restricted to pre-defined procedures, the introduction of protocols for an institution still holds an advantage. Protocols can be used by the agents as a default manner to achieve certain (frequently done) tasks in the institution, without having to take the norms into notion (the norm compliance of the agent's actions should follow from the correct execution of the protocol). Designing protocols for highly-regulated domains is, however, a very hard task because of the gap that exists between the normative specification of the domain (in abstract and vague norms) and the procedural level of the agent practice. To bridge this gap, and allow for the design of protocols for electronic institutions, we introduced a (semi)automatic manner to translate the specifications given by the norms into a concrete pattern that can be used to create a practical protocol. This translation uses an idea based on the approach taken by human institutions, where the gap between the law and the practice is bridged by the introduction of regulations that, while still somewhat abstract, give a concrete meaning to some of the vague and abstract notions and actions expressed in the laws. With the introduction of an intermediate level of landmarks between the norms and the practice, where the landmarks express the important steps that any protocol created should contain, it becomes possible to create protocols based on the (vague and abstract) normative specification of the domain. In case, instead of designing protocols for the institution by the manner described above, protocols are taken from the human practice and translated to the electronic institution, it has to be guaranteed that the protocols do not break any of the norms themselves. That is, following a protocol by the letter should not make the agent violate any of the norms. To ensure that a protocol does not break any of the norms, its norm compliance has to be formally verified.

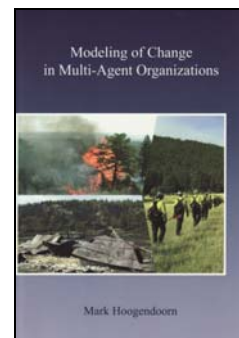
These elements, the implementation of active norm enforcement and the design of protocols for electronic institutions, form the basis of the framework that links the laws, expressed in a normative specification, to the agent practice. While the framework is not complete, it makes the first steps that are needed and tries to cover the most important aspects of institution design. The creation of this framework, however, gave us insight into the relations that exist between laws and electronic institutions, and helped us design methods for the design and verification of protocols. Furthermore, the implementation of norms, as proposed in this framework, by the creation of a mechanism of active norm enforcement ensures a good balance between autonomy and conformity of the agents participating in the electronic institution.

Modeling of Change in Multi-Agent Organizations

Ph.D. thesis abstract
Mark Hoogendoorn

Promotores: prof.dr. J. Treur and prof.dr. C.M. Donker

Date of defense: June 18, 2007



An organization is a systematic arrangement of elements that together aim at achieving a certain goal. The occurrence of organization is not limited to processes in human society. In biological systems and nowadays also in (software and hardware) computing systems organization occurs. Within the field of computational and mathematical organization theory, organization theories are developed and tested using computational and mathematical models. One of the disciplines within computational and mathematical organization theory is the discipline of multi-agent systems. A multi-agent system is a system that consists of various interacting agents that together aim for a particular process or goal. Such systems are mainly used to investigate the collective behavior of a system based on the individual behavior of agents. Hereby, these systems are mainly specified from an

abstract, organizational, perspective. The advantage of such an abstract way of representation is the ability to represent more complex systems.

An import aspect within organization is the change of such an organization. Research has shown that 70% of the changes within companies do not achieve the intended goal. Given the developments in computational and mathematical organization theory, and in particular in multi-agent systems, the question is whether these approaches can be used to describe organizational change processes, and possibly improve the success thereof. This is precisely what this thesis is about. The goal of the thesis is to analyze and model organizational change processes using the approaches within the field of multi-agent systems. Furthermore, a goal is to provide modelers of organization with blueprints and tools that enable them to model organizational change.

To achieve this goal, an existing multi-agent system approach has been used, which currently does not incorporate the modeling of change processes. This approach consists of two parts, namely a part with which the structure of an organization can be represented at different aggregation levels, and another part concerns the description of the behavior of an organization, including the possibility to specify such behavior on multiple aggregation levels as well. The method to describe the behavior of an organization is a formal, logical, method with which both quantitative as well as qualitative properties can be expressed.

In this thesis, a number of facets within organizational change are investigated using this method. First of all, one part focuses on the analysis phase within organizational change processes. In this part, approaches are presented to analyze an organization, to investigate whether the organization is function according to the desired properties. In case it is not, the cause of this dissatisfaction is determined, and the methods generate an improved organization. The second part of the thesis concerns the analysis and modeling of the change process itself, whereby an existing organization is transformed to a new organization. Such changes can take place in a centralized, decentralized or mixed manner. For all these different possibilities models are presented in the thesis that enable the analysis of change processes. The final part of the thesis introduces methods to evaluate organizational changes, enabling the investigation of the successfulness of the change.

Models, Agents, and Adaptivity

*Jaap van den Herik
MICC-IKAT, Maastricht*

The pinnacle of a scientific performance is the Ph.D. defence. In The Netherlands such a defence is a public affair. Colleagues, family, friends and sometimes (local) press are present to see how the candidate answers the questions. In ninety per cent of the defences, everything goes smoothly, in eight per cent of the cases there is real opposition, and in 1.9 per cent real obstacles have to be overcome. The remaining 0.1 per cent contain cases on which we do not publish. Let me hurry to communicate that the above figures are rough estimates of what I have seen, heard, and experienced in the last 20 years.

A Ph.D. defence is a real event. There is a multitude of relations, such as student-supervisor, student-committee members, etc. Of course the candidate may have all reason to be nervous, when standing in front of a select committee of professors. However, among the committee members there is sometimes tension too. For instance, when a fresh professor may act for the first time in such a committee then that professor may play a role of a firm criticaster, mostly to the abhorrence of the colleagues. Afterwards we have many times the procedure of self-justification. Sometimes, a correction takes places during the ceremony, when the next opponent opposes first his/her predecessor and then poses the relevant but easy questions.

A wonderful story is from the 1970s when a well-known Delft professor arrived in Twente for a Ph.D. defence. He was THE specialist. Unfortunately, at the very latest moment two colleague professors did not show up, whereas two others had withdrawn in an earlier stage. The supervisor with the help of the vice-chancellor had still recruited a set of replacement professors from other disciplines so that the Ph.D. requirement of attendance was fulfilled (quorum). After the Delft professor had entered the aula, he was told that he had to fill the full three quarters of an hour with questions, since no other professor was acquainted with the field. The public was ignorant and believed that this was a normal procedure. Of course, the candidate passed and the defence was quite relaxed. I do not know the title of the thesis, but a good suggestion would be Models, Agents, and Adaptivity, with emphasis on the last notion.

A special defence took place on June 29 in Rotterdam, where Ir. Piet van der Vlist defended this thesis. It was the crown on his performance, the missing pearl, since Piet has been a part-time

professor at the Eindhoven University of Technology for eleven years (1992-2003). Now he is Dr.ir. Piet van der Vlist. The BNVKI Editorial Board wholeheartedly congratulates the new doctor and establishes with pleasure that the title Doctor is the highest title in The Netherlands that can be achieved by study and performance. Obviously, all other candidates mentioned in the announcement listed below are also congratulated with their success. May it be a stepping stone in their further career.

The thesis abstracts of Celine Vens, Aristeidis Diplaros, Gilad Mishne, Joost Vennekens, David Mobach, Huib Aldewereld, and Mark Hoogendoorn are published elsewhere in this issue.

Huib Aldewereld (June 4, 2007). *Autonomy vs. Conformity: An Institutional Perspective on Norms and Protocols*. Universiteit Utrecht. Promotor: Prof.dr. J.-J.Ch. Meyer (UU). Co-promotor: Dr. F. Dignum (UU).

Mark Hoogendoorn (June 18, 2007). *Modeling of Change in Multi-Agent Organizations*. Vrije Universiteit. Promotors: Prof.dr. J. Treur (VU) and Prof.dr. C.M. Jonker (TUD).

Piet van der Vlist (June 29, 2007). *Synchronizing the Retail Supply Chain*. Erasmus Universiteit Rotterdam. Promotors: Prof.dr.ir. J.A.E.E. van Nunen (EUR), Prof.dr. A.G. de Kok (TU/e).

Natalia Stash (July 2, 2007). *Incorporating Cognitive/Learning Styles in a General-Purpose Adaptive Hypermedia System*. Technische Universiteit Eindhoven. Promotors: Prof.dr. P.M.E. De Bra (TU/e), Prof.dr. L. Hardman (CWI / TU/e). Co-promotor: dr. A.I. Cristea (University of Warwick).

Rutger Rienks (July 11, 2007). *Meetings in Smart Environments: Implications of Progressing Technology*. Universiteit Twente. Promotor: Prof.dr.ir. A. Nijholt (UT). Co-promotor: dr. D.K.J. Heylen (UT).

Joyca Lacroix (September 20, 2007). *NIM: a situated computational memory model*. Universiteit Maastricht. Promotors: Prof.dr. J.M.J. Murre (UM/UvA), Prof.dr. E.O. Postma (UM), Prof.dr. H.J. van den Herik (UM).

Niek Bergboer (October 10, 2007). *Context-based image analysis*. Universiteit Maastricht. Promotors: Prof. dr. H.J. van den Herik (UM), Prof.dr. E.O. Postma (UM).



150th SIKS Defense

On July 2, 2007 Mrs. Natalia Stash will defend her thesis "Incorporating Cognitive/Learning Styles in a General-Purpose Adaptive Hypermedia System" at TU/e. The project was supervised by Prof. Paul De Bra (TU/e), Prof. Lynda Hardman (CWI / TU/e) and Dr. Alexandra Cristea (University of Warwick, UK). This dissertation is the 150th Ph.D. thesis since the start of the Dissertation Series in 1998.

For SIKS it marks the second milestone in recent history: in March 2007 we celebrated that currently 200 Ph.D. students are doing their research in our School.

Summer Course "Data Mining" in Maastricht

From July 2-6, 2007 a 5-days course on Data Mining will be organized at the University of Maastricht. For all details on aims, course content, course material and location, please check <http://www.cs.unimaas.nl/datamining/>.

As a result of the cooperation between SIKS and the organizers of the course, SIKS-Ph.D. students can participate without paying fee.

Participating in this course is a part of the advanced components stage of SIKS' educational program. However, the number of places available is limited. SIKS has reserved a number of places, primarily intended for those Ph.D. students working in the field of Computational Intelligence (machine learning, neural and evolutionary computing, datamining / intelligent data analysis, adaptive / self-organizing / fuzzy systems, quantitative / statistical empirical research, probabilistic reasoning / Bayesian networks, pattern and image recognition / intelligent search algorithms/games). Other SIKS-Ph.D. students are not excluded, however if the number of applicants exceeds the number of places available, the students working on the course topics come first.

Tutorials on Information Retrieval for SIKS-Ph.D. Students at SIGIR 2007

From July 23-27, 2007 the 30th Annual International ACM SIGIR Conference on Information Retrieval takes place in Amsterdam. This year an extended tutorial program is part of the conference and will take place on Monday July 23 at the University of Amsterdam. As a result of the cooperation between SIKS and the organisers of the workshop, SIKS-Ph.D. students can participate without paying entrance fee. For details see the SIKS-website. The program includes the following tutorials:

- Conducting User-Centered IR System Evaluations
- Introduction to Web Retrieval and Advertising
- Introduction to Text Mining
- The Probabilistic Relevance Model: BM25 and beyond
- Cross-Language Information Access
- Supervised and Semi-supervised Learning for IR
- Introduction to Recommender Systems

Agent Summer School for SIKS-Ph.D. Students

From August 27-31, 2007 the ninth edition of the European Agent Systems Summer School (EASSS 2007) takes place in Durham UK. Details on program and location can be found at <http://www.dur.ac.uk/durham.agents007/EASSS07/>.

As a result of the cooperation between SIKS and the EASSS 2007 organisation, SIKS-Ph.D. students can participate without paying entrance fee. The summerschool is part of the advanced components stage of the school's educational program and therefore Ph.D. students working in the field of agent systems are strongly encouraged to participate. However, there is a fixed number of places available for SIKS-Ph.D. students at the summerschool, and therefore an early registration is required.

Advanced SIKS Course "Service-Oriented Computing"

On October 4-5, 2007 the School for Information and Knowledge Systems (SIKS) will organize an advanced course on Service-Oriented Computing.

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 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 students taking the course. The course is given by experienced lecturers actively involved in the research areas related to the topics of the course.

Service-oriented computing is the new emerging cross-disciplinary paradigm for distributed computing that is changing the way software applications are designed, architected, delivered and consumed. Services are autonomous, platform-independent computational elements that can be described, published, discovered, orchestrated and programmed using standard protocols for the purpose of building networks of collaborating applications distributed within and across organizational boundaries (Papazoglou, 2006).

The advanced course offers an overview of the rapidly expanding field of SOC and an insight into the latest developments in service discovery, dynamic service composition and adaptive services, among others. Lecturers include prof.dr. Mike Papazoglou (UvT), dr. Manfred Reichert (UT) and prof.dr. Frank van Harmelen (VU). Students will receive some reading material before the course to prepare themselves.

Location: Landgoed Huize Bergen in Vught
Scientific directors: dr. Hans Weigand (UvT), dr. Willem-Jan van den Heuvel (UvT)
Program: a provisionary program will be made available in due course.

CONFERENCES, SYMPOSIA WORKSHOPS

Below, the reader finds a list of conferences, symposia and workshops, and websites or addresses for further information.

SEPTEMBER 12-14, 2007

ACII 2007: Affective Computing and Intelligent Interaction, Lisbon, Portugal.
<http://gaips.inesc-id.pt/acii2007/index.html>

NOVEMBER 5-6, 2007

BNAIC 2007: The 19th Belgian-Dutch Conference on Artificial Intelligence Utrecht, The Netherlands.
<http://www.cs.uu.nl/bnaic2007>

OCTOBER 22-24, 2007

Workshop on Multi-Agent Systems and Simulation 2007 (during ESM'07), St. Julian's, Malta.
<http://lisdip.deis.unical.it/workshops/mass07/>

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