VOORBLAD

EDITORIAL

Editor-in-Chief

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BNVKI-Board News

Joost Kok

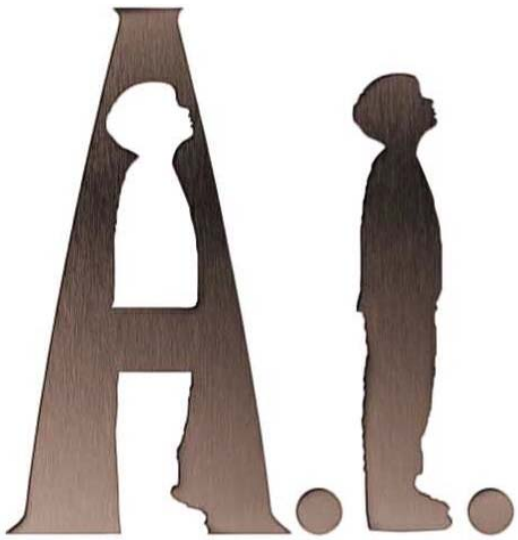
With the introduction of intelligent computer HAL in the 1968 movie *2001, A Space Odyssey*, Stanley Kubrick gave AI a tangible example of future promises (and dangers) of AI. His movie *AI* could have provided a new illustration, if not Kubrick had died in 1999 before he could start shooting the movie. Steven Spielberg decided to take over the project, and the result will be released in the United States June 29th, in the Netherlands October 4th, and in Belgium October 24th.

The plot of the movie is as follows: in the mid-21st century, the polar icecaps have melted and many of the world's coastal cities are now underwater. A new intelligence has been created: Artificial Intelligence. Humans must now deal with their creation of super machines that can think for themselves.

One may question whether such a creation will be possible around that time. At present, we do not yet see even the beginning of thinking machines. In contrast, the melting of icecaps has already started.

Whatever the content of the movie, it will surely raise an interest in Artificial Intelligence amongst the public. It is a bit like the national football team winning a major tournament and as a result many youngsters will start playing football in the next year. If the movie becomes a succes, it may lead to increased numbers of students for AI-related courses. And eventually, it could result in an increase of BNVKI membership. Yoy may think that I am carried away by my imagination, but isn't that what movies are all about?

AI: http://aimovie.warnerbros.com/
http://www.cloudmakers.org/



Retrieval of Ph.D. Theses

Jaap van den Herik
IKAT, Universiteit Maastricht

Mathematicians and computer scientists have some preference for recursion and interation as have philosophers. For the last group the question *Quis custodiet ipsos custodes?* is a brain teaser. Artificial Intelligence researchers usually restrict themselves to *Modelling Modelling* or *Research of Re-search*.

In this issue we have the pleasure to announce four Ph.D. defences and to publish three Ph.D. thesis reviews. The four defences are all on a different domain of our research agenda, namely on mapping, semantic structure, filtering, and face recognition. The reviews are on Programming Languages for Agent Communication, Language Models for Information Retrieval, and Lexicon Grounding on Mobile Robots. The first review is published immediately after this contribution. The last two reviews are part of the section *Computational Linguistics*.

The prominent characteristic of these seven Ph.D. thesis is the role of languages. While reading I went from language to language, and at the end I needed a filter to extract the essentials for the introduction of the announcement of the theses. Besides languages, another rising element of research is Information Retrieval. This topic is increasing in importance, especially after the wide-spread use of the Internet. Where is what? and Who is the "owner"of information? are nowadays important questions.

I believe that some of the researchers have investigated the subject of Information Retrieval with the aim of giving tools to the AI community in order to keep their own thesis accessible. As we all know some theses survive, other theses disappear. Every Ph.D. student has the high hope that her/his thesis will be the breakthrough to be cited over decades. Many of them disappointedly discover that their four-year work did not result in such a success. However, with the help of newly developed techniques on information retrieval and filtering, I am convinced that the percentage of the Ph.D. students that keep our attention and that thus remain in our thoughts and reach the citation index will increase. Congratulations to all, who made this possible. Well done!

P. Sidjanin (June 5, 2001) *A cognitive mapping design tool for analysis and control of the visual quality of the urban environment*. Universiteit Belgrado and Ontwerpersopleiding Delft University of Technology. Promotores: Prof. A. Tzonis and Prof.dr.ing.habil W. Gerhardt-Häckl.

P. van Eck (June 12, 2001) *A Compositional Semantic Structure for Multi-Agent Systems Dynamics*. VU Amsterdam. Promotores: Prof.dr. F.M.T. Brazier and Prof.dr. J. Treur.

A. Arampatzis (June 20, 2001). *Adaptive and Temporally-dependent Document Filtering.* KU Nijmegen. Promotor: Prof.dr. C.H.A. Koster. Co-promotor: Dr.ir. Th.P. van der Weide.

M. Pantic (October 15, 2001) *Facial Expression Analysis by Computational Intelligence Techniques*. Delft University of Technology. Promotor: Prof. dr. H. Koppelaar. Co-promotor: Dr. L.J.M. Rothkrantz.

Programming Languages for Agent Communication

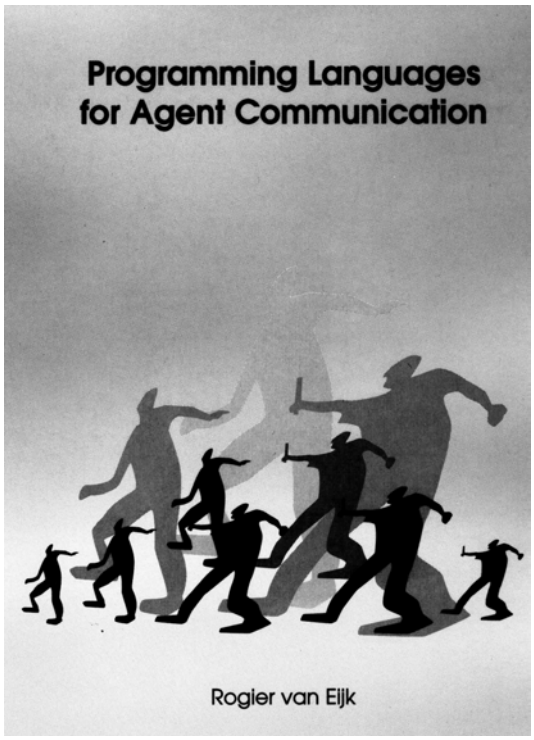
Rogier van Eijk
CTIT, Universiteit Utrecht

Thesis review by Hans Tonino
TI, TU Delft

According to the author of this thesis "there is a 'gap' between the theory of agents and the practice of building real agent systems". On the one hand, the field of agent theory deals with formalisms to reason about high-level properties of agents such as its beliefs, goals and capabilities. Examples of agent theories are the BDI (Beliefs, Desires, and Intentions) framework of Rao and Georgeff, and the KARO framework by Meyer, Hoek and Van Linder. These frameworks are based on epistemic logic, which enables formal reasoning about mental attitudes. In the KARO framework, well known in the BNVKI community, also dynamic logic is incorporated to reason about the relation between actions and the mental states of agents.

On the other hand, different implementations of agents in different programming languages exist, e.g., web-based information retrieval agents and personal assistants. Many of these agents are implemented in commonly used programming languages such as Java. The programming constructs offered by these languages do not reflect the concepts used in agent theories. However, when designing agents, it can be beneficial to think of these having beliefs, intentions and goals. The thesis *Agent Programming Languages – Programming with mental modes* by Koen Hindriks, reviewed to be in a forthcoming Newsletter, addresses the problem of designing agent programming languages that integrate agent theory and agent programming.

When the issue of designing multi-agent systems is considered, the "gap" is maybe even broader. There has been some progress in the field of agent communication languages, which yielded languages like KQML and FIPA-ACL based on *speech act theory*. The problem with these languages, however, is that their semantics is not fully understood. Moreover, an agent communication language is not an agent programming language yet. So, in case of multi-agent systems, there is the problem of integrating agent theory and agent programming with agent communication. In fact, one of the aims of the thesis is "the study and development of communication mechanisms that are suited for the exchange of information among distributed agents". In his thesis Van Eijk uses semantic tools, some of these borrowed from *concurrent constraint programming* (CCP) and *communicating sequential processes* (CSP), to study this mechanisms.



The thesis consists of 9 chapters. We will briefly overview the topics covered by these. After an introductory chapter, Van Eijk defines a basis agent programming language in Chapter 2. This language, called ACPL (Agent Communication Programming Language) is built around the basic communication primitives **`ask`**(φ) and **`tell`**(φ),

and familiar programming constructs like sequential composition, non-deterministic choice and recursion. Each agent is supposed to have a *constraint store* which acts like a database. To abstract from the actual structure of the constraint store it is defined to be a complete lattice. One could, e.g., think of constraints as formulas in a first-order language. Communication of information takes place via *channels*. For this language a *structural operational semantics* is presented via a transition system. The chapter ends with a discussion about belief updates: What happens if an agent acquires information conflicting with its information store?

In Chapter 3, a *fully abstract* compositional semantics is developed in a series of refinement steps. It is based on the observational behavior in terms of the *final information stores* of the agents involved. Full abstraction means that semantic distinctions are only made when these can be observed in suitable contexts. Technically speaking, the semantics is a modification of the *failure semantics* for CSP, which is based on failure sets containing actions, which lead to deadlock. This chapter is the most technical one of the thesis, and provides a nice, solid semantics for agent communication. It is probably also the first such semantics.

Chapter 4 provides even more semantics. Now, a compositional proof system for *partial correctness*, i.e., for terminating computations, is offered. By means of proof rules, expressions *P sat F* can be derived stating that, in case of termination, program P satisfies the specification denoted by formula *F*. This formula *F* not only expresses properties of the computed information stores of the agents, but also about their communication behavior. Again, inspiration was found in existing proof systems for CSP and CCP.

Chapter 5 describes a framework for multi-agent systems where agents do not speak the same language. The proposed mechanism generates *translator* formulas between the different used vocabularies in a dynamical way, i.e., during run time. In fact, here we have an *abduction problem*. Given the fact that abduction is NP-hard, even in the propositional case, it is doubtful whether such a dynamic translation mechanism can be implemented in a reasonably efficient way. Unfortunately, the author does not provide us with a complexity analysis at all.

In Chapter 6 the problem of the preceding chapter is considered from a model-theoretic point of view. The idea is that when an agent learns more about the vocabulary of another agent, it will extend its vocabulary and its store of possible models in a minimal way. New information, then, will lead to a decrease of the number of possible models, i.e., to an increase of knowledge. No discussion about how to implement these ideas is given, however.
Chapter 7 is about *open* multi-agent systems. The agent population may vary in such systems. One of the central issues studied in this chapter is how concepts from the object-oriented (OO) paradigm can be adapted for use in agent programming and communication. As an example, *question invocation* is treated just like *method invocation* in OO: a question from one agent to another triggers a method of the other agent to answer the question posed. For the purposes mentioned, ACPL is extended by new primitives, for which an operational semantics is provided.

How agents might negotiate is the subject of Chapter 8. As an example it is shown how the *Zeuthen Strategy*, a monotonic concession protocol, can be implemented in ACPL. This mechanism has the nice property that it converges to an optimal solution. Furthermore, a negotiation mechanism is studied in which, contrary to the Zeuthen Strategy, the agents are not required to have perfect knowledge of each other. To this end, a trusted third party is used. The chapter is concluded with a complex, real-life negotiation scenario in the realm of airline buying.

The thesis has been written in a nice style. The most important contribution of it, I believe, consists of the first 4 chapters where a firm basis has been laid for the formal study of agent communication. Chapters 5 and 6, which discuss the issue of translation, are sketchier, and I find them less convincing. Nevertheless, a lot of work has been done. But a lot of work remains to be done as well. In Chapter 9 Van Eijk mentions some possible subjects for future research like the problem of belief revision, the incorporation of motivational attitudes in the present framework, and the analysis of more complex interactions like auctions, conversations and negotiations between agents.

IK2001: science and pleasure of high variety and quality

Jelle Zuidema and Joachim de Beule,
Artificial Intelligence Laboratory, Brussel

Between March 2nd and 9th 2001, 186 students and lecturers combined brainpower for a sparkling week of study, discussion and (after-hours only)

entertainment at the Interdisziplinäres Kolleg (IK). IK is a yearly mix of artificial intelligence and cognitive neuroscience in Günne am Möhnesee in Sauerland (Germany). This year it was not only interdisciplinary but also international: the foreigners that were present, including 4 PhD students from Brussels, made this year's theme "communication" not only a theoretical, but also a practical issue. After some initial hesitation, they found a warm and *anglophone* welcome.

The spring school started with four "Grundkurse" that provided broad but thorough introductions in the fields of artificial intelligence, neural networks, cognitive science and neurobiology. The second part dealt with "communication" in its broadest interpretation: ranging from chemical communication between insects or brain cells, to communication between humans and machines.

Here, we touch briefly on a few of the scientific themes that caught our attention at IK2001. Keep in mind, however, that IK presented throughout the whole week remarkably good speakers and valuable lessons. Moreover, healthy food, bad coffee, cheap beer and a wonderful atmosphere were never lacking either.

SOUNDS AND BRAINS

IK2001 offered a unique opportunity to learn about techniques and insights from many different scientific fields. One could start the day wondering about the nature of sound, learn how it is produced by different animals in "How the brain analyses the acoustic environment" (Georg Klump), try to make sense out of it in "Automatische Spracherkennung", and eventually learn how to appreciate the many musical late-night performances of IK participants piano players use the hand-related part of their brains to "understand" music in "The neurobiology of music perception" (Eckart Altenmüller). The only thing missing was perhaps an attempt to relate the diverse topics in a plenary discussion.

Henning Scheich reported on research with gerbils (in Dutch: *woestijnratten*): little animals that have the same hearing range as humans and quite sophisticated learning abilities. The animals were trained to distinguish between rising and falling tones. Detailed recordings of the activity in the auditory cortex showed that these concepts were not represented by a specific region, but by a change in the dynamical properties of the whole auditory cortex.

Among our favorites was "Der präfrontale Cortex" (Onur Güntürkün). Güntürkün discussed the role of the prefrontal cortex as an amodal system between the sensoric and motoric systems of the brain. Especially interesting were the complex feed-back loops of the dopamine system, that receives its input from the prefrontal cortex, but in turn also activates and inhibits this brain area, and controls its learning rate.

GESTURES AND LANGUAGE

Perhaps most interesting about the diversity of presentations was that it showed how universal communication is in nature, but how little of all that fits the traditional way of studying human language, with its *arbitrary* words and *compositional* rules. Josep Call explained the ontogeny of primate gestures. The mechanically more-or-less effective behavior of chimpanzee infants that pull their mother to come and play, develops into a simple touch of the shoulder. These gestures are thus *conventional*, but there is a non-arbitrary relation between meaning and form.

Ethologists like Call were careful not to make claims about human language. Less careful observers might conclude that much of human communication is not radically different from animal communication. Karl Grammer and colleagues found a strong correlation between the way conversational partners move and how attractive they find one-another: flirting individuals move more and faster. Unfortunately, Grammer did not back-up his fascinating experimental findings with convincing statistics. Instead, he obscured his message with a vague theory on movement perception by our "mirror neurons" and advertising for his new company.

David McNeill and Francis Quek, in their work on human gestures, emphasized the individual and cultural differences. They are involved in a large-scale project that aims at computer analysis of gestures by video-taped subjects describing situations and retelling stories. It seemed a promising approach for unraveling the role of gestures in communication. Unfortunately, a concise formalization of the theory behind the work and statistically significant results from the experiments were still missing.

In sum, in natural communication there is a wealth of non-arbitrary and non-compositional information hidden in gestures and probably in other movements, in prosody and in smells as well. But it seems hard to investigate these issues in a thorough, scientific manner. Psycholinguists, such as Lars Konieczny and Barbara Hemforth, who study incremental interpretation in human language can do more thorough research, but the results might be less relevant for daily communication. Although...

What did Josep Call really mean when he explained that he thinks:

"the chimpanzee infant does not think the mother will think the innocent male attacked the little one and attack him and comfort the infant when he shrieks, but rather the mother will attack the innocent male and comfort him when he does so?"

A slightly different version already appeared in "KI - Zeitschrift Künstliche Intelligenz", the newsletter of Fachbereich 1 of the Gesellschaft für Informatik e.V.}

AIO-course 'Advanced issues in Neurocomputing' hampered by railway strikes

Ben Kröse,
IvI, University of Amsterdam

In a joint effort of the Foundation for Neural Networks (SNN) and the Intelligent Autonomous Systems Group of the University of Amsterdam, an AIO-course on "Advanced Issues in Neuro-computing" was organized in the week of 2-6 April 2001. In total about 50 Ph.D. students from a diversity of research schools and researchers from academia and industry registered for the course.

The organizers however had some bad luck: exactly that week was chosen by the employees of the Dutch Railway (NS) for their protests against the 'rondje om de kerk' plans of the NS management. Luckily there were no strikes on Monday and Tuesday, but Thursday and Friday there were hardly trains driving (Wednesday was a day off). This meant that the lectures on Monday and Tuesday had much more attendees than Thursday and Friday…

The first two days were given at the University of Nijmegen and started with two introductory lectures: on Bayesian learning and reasoning by Bert Kappen and on Graphical models by Wim Wiegerink. The first day there was also a lecture on Confidence estimation for neural networks by Tom Heskes.

The second day was definitely not introductory anymore: Wim Wiegerinck focussed on exact and approximate inference in graphical models, Bert Kappen on Bayesian learning and MCMC and Tom Heskes on approximate Bayesian learning. Both days there was a practicum to illustrate the material of the lectures. From the evaluations of the attendees the organizers learned that the practicum was judged as very good those first days, but that the lectures of the second day were somewhat too detailed for non-experts in the field. The last two days of the coures were given at the Univerity of Amsterdam. Ben Kröse started with an introduction to mixture modeling, followed by a lecture on greedy mixture learning by Nikos Vlassis. The comment of the attendees was that the introduction (where also EM was explained) should have been placed early in the program. The second day at the Universeit van Amsterdam was on linear feature extraction by Nikos Vlassis. Both days again had a practicum as illustration. The practicum at UvA was rated lower than at SNN (people had to share workstations and the computers were slow).

Despite the problems with the NS and the correct comments of the attendees I think that the course was a succes, the 'homework' which I saw was made with enthousiasm and there were also many positive comments. Hopefully the NS will cooperate the next time (early 2003) when such a course will be organized again.

Dutch Information Retrieval Workshop

Report by Ruud van der Pol
Thoughtwell

The second Dutch Information Retrieval Workshop (DIRW2), titled "User Interaction and Adaptive Methods in Information Retrieval" was held in Enschede, at the TU Twente, on January 18th 2001. This was the day before Djoerd Hiemstra (TU Twente) defended his PhD thesis (reviewed elsewhere in this issue). DIRW2 drew an audience of approximately 40 persons, from all over the Netherlands. The workshop focused on the increasingly important role of user interaction and adaptive methods in Information Retrieval. There were five presentations of work in progress (25 minutes each) and a keynote speech (45 minutes), which I summarise briefly.

Avgerino Arampatzis (KU Nijmegen, CSI; *Document Filtering as an Adaptive and Temporally-dependent Task*) discussed the dynamic nature of (1) the availability of information (i.e., the arrival of new documents), and (2), the user's information need. Of each thereof he made a topic classification and (statistical) criteria for classification. He explained how information about the occurrence pattern of a topic in time may be used for filtering. For the availability of information, he discussed some experiments.

Martijn Spitters (TNO-TPD; *Using language models for tracking events of interest over time*) presented a tracking system based on a language

modelling approach, for tracking events of interest over time (by tracking documents appearing on the subject of interest over time). In normal IR a document is considered relevant to the information need if it has a similarity value (matching value) over a given, constant threshold. In tracking tasks it becomes difficult to set the threshold. Spitters found that for different subjects different thresholds apply; he assumed a normally distributed score, and obtained good results.

Ruud van der Pol (Thoughtwell / Universiteit Maastricht, IKAT; *Dipe-D: a tool for knowledge-based query formulation*) tried to increase the precision of the IR process by improving the formulation of the initial query. His approach is two-stepped: first the user identifies the concepts of his information need, by specifying their features. Then the tool formulates a query with these concepts, thereby adding synonymous terms, spelling variants, etc. Experiments on the first step suggest that almost all the relevant concepts are identified, and no irrelevant ones. In the second step, the tool formulates a query as good as human beings do.

Jeroen Vendrig and Marcel Worring (IvI, Universiteit van Amsterdam; *Interaction for video structure detection*) detected video structure in large digital video archives. Vendrig and Worring detect scenes, being a series of shots that communicate a unified action with a common locale and time. The common approach concludes when two shots are visually similar and close in time, all shots in between are the same scene. Vendrig and Worring's approach uses different features for different parts of a movie. Their selection of features is done by human beings, in a process in which the computer suggests features. Experiments show this approach (with limited user interaction) works well.

Lloyd Rutledge (CWI; *Generation of hypermedia presentations from databases*) focused on how to communicate retrieved (selected) media to the user. To this end Rutledge presented the Cuypers interface to the Rijksmuseum art database. On a query, Cuypers returns content and generates from this well-structured multimedia presentations, taking into account user and system characteristics (e.g., display type and size). The approach was illustrated by an appealing example, which drew much attention of the audience.

Keynote speaker was Stephen Robertson (Microsoft Research / City University, London; *Relevance feedback - a perspective*). Review of his talk can be found right after this article.

The title of the discussion was *Interaction and test collections: How do they get along?*, but focussed mainly on the users' reluctance to provide relevance feedback. Various ways of *deriving* relevance feedback were mentioned, such as tracking a user's Web browsing behaviour. Also legal and moral aspects of using this potentially sensitive information were discussed.

DIRW2's schedule was relaxed and so was the atmosphere; the coffee breaks and the lunch showed lively discussions and extensive exchanging of experiences . I look forward to DIRW3!

Relevance Feedback - A Perspective

Stephen Robertson
Microsoft Research Cambridge

Report by Djoerd Hiemstra
CTIT, TU Twente

At the Second Dutch Information Retrieval Workshop (reported on in the article above) Stephen Robertson gave an overview of over 20 years of research he did at City University London and later at Microsoft Research Cambridge on relevance feedback for information retrieval. Relevance feedback gives the user the possibility to mark relevant and non-relevant documents in a retrieved list to improve the search.

Robertson developed several controlled laboratory experiments where users are not directly consulted to proof the usefulness of relevance feedback. In the so-called "retrospective" experiment, all previously identified relevant documents are used to derive the optimum query. This experiment is far from realistic, but it answers some important questions on how well an algorithm could do if all information was known to the system. In the "predictive" experiment, user judgements one half of the document collection are used to estimate a new query that is tested on the other half of the collection. This is still not a very realistic experiment, because it ignores the question how the user identified the relevant documents in the first half of the collection. This experiment measures how well algorithms generalise over unseen data.

Recently, more realistic experiments were developed in the adaptive filtering task of the Text Retrieval Conference of which Robertson is one of the organisers. An adaptive filtering system selects documents from a stream of e.g. news items or news wire data, and users can give feedback to control the system.

Now, how about the use of relevance feedback in practice? Here lies one of the problems with relevance feedback: studies show that users do not like this kind of feedback. They rather reformulate the query to keep "in control" of the system. However, users that are forced to give feedback tend to produce more accurate results than users that reformulate their query. Robertson spoke with some sentiment of the time when the Okapi retrieval system was implemented on a VT100 terminal. Users could only proceed by answering the question "is this document relevant (Y/N)?" Nowadays, they simply use the back button on their web browser to avoid these questions. Progress does not always mean improvement...

ANNOUNCEMENT

The 6th Computer Olympiad 18-23 August, 2001

The 6th Computer Olympiad is a multi-games event in which all of the participants are computer programs. The purpose is to find the strongest programs at each of the games, partly as an academic exercise and partly because the competitions are fun. This year the Computer Olympiad is organized by IKAT and takes place from August 18th to 23rd in the building of the FdEW, Ts 53. We are planning tournaments for at least 17 different games: Amazons, Awari, Backgammon, Bridge, Chess, Chinese Chess, 8×8 Draughts, 10×10 Draughts, Gipf, Go, Hex, Lines of Action, Othello, Poker, Renju, Scrabble and Shogi.

The Computerchess tournament will officially be the 18th World Microcomputer Chess Championship.

During the Olympiad Dr. J.W.H.M. Uiterwijk will organize a *Workshop on Computer-Games* with lectures on the latest developments in games-programming. The workshop will take place on August 20, 21 and 22 in the evenings from 20.00 hours.

We expect for the tournament and the workshop participants from The Netherlands, Belgium, Germany, France, England, Austria and European other countries, the United States, Canada and Japan.

More information can be found on http://www.cs.unimaas.nl/Olympiad

Section Editor
Richard Starmans

SIKS day 2001,
October 5, 2001 Amsterdam

On October 5, the School for Information and Knowledge Systems organizes its annual SIKS day. 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.

Location: Trippenhuis of the KNAW in Amsterdam (http://www.knaw.nl/uksite/uk_trip.htm)

Three guest speakers have agreed to participate:
Dr. Eric Postma (UM)
Prof. dr. ir. Jan Dietz (TUD)
Dr. Mark Ryan (Burmingham)

Titles and abstracts of the lectures will be available at the website soon.

All members of our research school (research fellows, associated members, and Ph.D. students) are invited to join the SIKS day 2001.

SIKS masterclass Intelligent Systems
October 24 2001, Amsterdam

On October 24, the day before the BNAIC 2001 Conference, a one day Masterclass on Intelligent Systems will be organized by SIKS (School for Information and Knowledge Systems) in Amsterdam.

The preliminary programme for this day is:

10.30-12.00 Joe Halpern (Cornell University, on sabattical at ILLC, University of Amsterdam): Using Multi-Agent Systems to Represent Uncertainty

13.00-15.00 Stuart Russell (University of Berkeley): Dynamic Bayesian Networks
15.30-17.00 Linda van der Gaag (Utrecht University): Building Systems with Probabilistic Networks

Scientific directors:
Dr. M. van Someren (UVA)
Dr. G. Schreiber (UVA)

Advanced Course Computational Intelligence

Utrecht, October 1 and 2, 2001

On October 1 and 2, 2001 the School for Information and Knowledge Systems (SIKS) organizes an Advanced Course on Computational Intelligence. The course 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 recommended to those researchers working in the field of artificial intelligence, machine learning, neural and evolutionary computing, intelligent data analysis, but also on such topics as operations research and decision making.

Location: Mitland Hotel, Utrecht
(http://www.mitland.nl/)

Scientific directors:
dr. J.C. Bioch (EUR)
dr. I.G. Sprinkhuizen-Kuyper (UM)

Advanced Course "Multi-Agent Systems", November 12 and 13 2001, Utrecht

On November 12 and 13, 2001 the School for Information and Knowledge Systems (SIKS) will organize an Advanced Course on Multi-Agent Systems. 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.

Location: Utrecht

Scientific directors:
Dr. C. Witteveen (TUD)
Prof. dr. J.-J. Ch. Meyer (UU)
Dr. W. van der Hoek (UU)

Program: not available yet, but the structure will be as follows:
First day: logical foundations of agent-based system
Second day: computational approaches of agent-based systems

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AI EDUCATION

AI Education

In the new section AI Education we publish articles on AI and Education in the broadest sense: developments in AI education, the use of AI for education, and the fruits of AI education. In this issue we have an article in the latter category: third-year Knowledge Engineering student Loes Braun presents the results of an educational project to illustrate project-centred learning at the Universiteit Maastricht and the Limburg Universitair Centrum (Diepenbeek).

As always, we look forward at receiving your contributions, at newsletter@cs.unimaas.nl

Automatic Recognition of Tintin Characters

Loes Braun,
Faculty of General Sciences,
Universiteit Maastricht

The educational programme Knowledge Engineering of the Universiteit Maastricht employs a Project-Based Learning (PBL) system. In the PBL system students acquire knowledge in a combination of traditional lectures and projects. In the projects teams of four to six students learn to apply the theories and associated techniques acquired in the lectures. A project involves approximately three weeks of fulltime workload and culminates in a product, a presentation, and a report. This contribution is based on a report written for the third-year project on intelligent systems by the project team 'Blobbie'[1]. The goal of the project was to develop and test an application for learning to recognize digital images on the basis of visual features.

Our team decided to take digitised *comic-book* images as a staring point for the project. Cartoon images have several advantages over natural images. We mention two advantages.

1. Comic-book images are characterised by a consistent use of a limited number of colours.
2. In comic-book images black contours are drawn around objects of interest.

The project team restricted its research to the classification of characters from the comic book 'Tintin' (in Dutch 'Kuifje'). The system to be developed should, given a comic book image, be able to learn to recognize the characters present in an image. In the remainder of this article, the system will be referred to as KISS (Kuifje Identification Subclass System). The outline of the remainder of this contribution is as follows. First, the theoretical foundations of KISS are outlined. Then, the implementation details are described. Next, test results of the recognition performance of KISS are described. Finally, we conclude that although KISS is a fully functional program, it may be further improved.

RECOGNITION BY BOTTOM-UP PERCEPTION

The KISS model is based on a bottom-up approach and consists of three different components: classifiers, localisers, and identifiers. Below, we discuss each of these components in more detail.

CLASSIFIERS

Within the model, one *classifier* is defined for each character that has to be recognized (e.g., "Tintin"). The task of the classifier is to cluster images containing one of the cartoon characters into a number of character subclasses according to their appearance, such as the pose or the clothes of the character. Examples of such subclasses are: "Tintin running" and "Tintin in pyjamas". For the purpose of classification, each image is represented as an *n*-bin colour histogram. The histogram is the input to the classifier. Hence the inputs can be treated as points in an *n*-dimensional feature space. The dissimilarity in colour composition of two images corresponds to the Euclidian distance between their points in the *n*-dimensional feature space. The classifier employs a clustering algorithm to subdivide the histogram representations into a number of character subclasses with similar colour distributions. Given an image, the output of the classifier is the character subclass to which the clustered image belongs.

LOCALISERS

For each of the classifiers (i.e., to be recognised characters), a number of adaptive *localisers* (one for each character subclass) are trained to determine whether or not a particular image belongs to a character subclass. More specifically, a localiser is used to locate regions of an image that are of interest to the identifier. These regions will be

[1] Beside the author, the team consisted of Xavier Gubbels, Femke de Jonge and Arjan Maas.

referred to as 'Regions of Interest' (ROIs). The input of a localiser is the colour histogram of the image divided into sub-images. The localiser finds ROIs by determining for all sub-images if they contain the character belonging to the subclass. The results are stored in a binary matrix, the elements of which represent the presence (1) or absence (0) of a ROI. The output of the localiser is the set of ROIs for the image.

IDENTIFIERS

For each localiser, an identifier determines the identity of the contents of the ROIs. The inputs of the identifier are the local colour histograms of the sub-images generated by the localiser. The identifier verifies whether the local histograms agree with the character subclass in the following way. If the local histogram (represented as a point in *n*-dimensional colour space) lies within a certain small distance ε of the centre of a subclass, it is identified as the character associated with the subclass.

The global operation of KISS is as follows. For each classifier (for each character to be recognized) all localisers are activated to find ROIs for their respective character subclass. Then, for each subclass, the identifier determines if the associated ROIs indeed contains the character. The operation of the KISS model is illustrated in Figure 1.

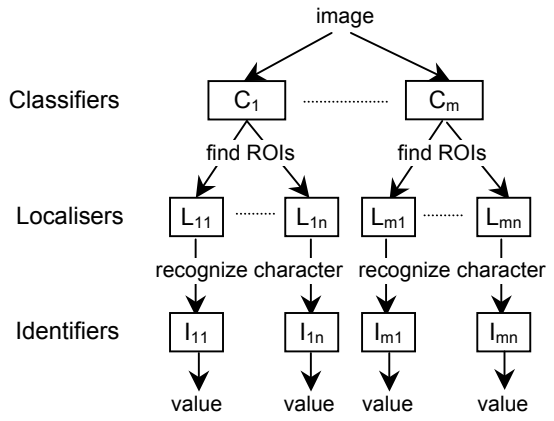


Figure 1. Schematic illustration of the operation of the KISS model.

IMPLEMENTATION

In PBL, in addition to a report, a product is developed during the project and presented at the end of the project. This section describes our implementation of the KISS model in terms of the classifier, localiser, and identifier.

IMPLEMENTATION OF THE CLASSIFIER

The classifier is responsible for optimally clustering the images into subclasses. As described above, the distance between two points (representing the colour histograms of the images) determines the degree to which two images are dissimilar. The problem can hence be seen as clustering the images into a number of subclasses, where the total distance between the images in each subclass is minimal. In the KISS model, the k-means clustering algorithm is used, producing a relatively good clustering result within a reasonable time.

IMPLEMENTATION OF THE LOCALISER

Part of the localiser is implemented as a multi-layer perceptron. The reason for using a neural network is their ability to learn from examples. Since comic books make consistent use of colours, we expected the neural network to be able to learn to localise ROIs.

The input of the network consists of a colour histogram of a 3 × 3 pixel sub-image. Taking into account that each pixel is a triplet of values representing red, green and blue, the *input* layer of the network consists of 27 neurons. The *hidden* layer consists of four neurons, which are all connected to all the input neurons. The *output* layer consists of one neuron. The output of this neuron is determined by a step function and indicates whether or not the sub-image (of 3 × 3 pixels) contains the character that the network was trained to recognize. The output layer is completely connected to the hidden layer. It is important to note that this network structure can be adapted to improve the quality of the classification. (This will be discussed later).

The training of the localiser proceeds by training the neural network on a set of 'training images'. Images submitted to the localiser were partitioned into pieces of 30 × 30 pixels, some of which contain (a part of) the character to be recognized and others that do *not* contain parts of characters. Figure 2 shows an example of a partitioned image. Subsequently, these pieces were downscaled to 3 × 3 pixel sub-images and the associated values were fed into the neural network. Depending on the output of the network, the sub-image is assigned as a ROI.

IMPLEMENTATION OF THE IDENTIFIER

The identifier is realised in a straightforward way by defining it as a step-function over the distance to the centre of the sub-class.

Figure 2. Illustration of an image partitioned into sub-images.

TEST RESULTS

To test KISS, a series of tests on individual components and on KISS as a whole have been conducted. The test results are discussed below.

The performance of the classifier is measured in terms of the average separation within clusters (which should be small) versus the average separation between clusters (which should be large). Regarding the classifier, the optimal number of subclasses was established. To do this, a series of tests have been conducted in which the number of subclasses varied from 1 to 10. The classifier was trained on 55 images. From the test results it became evident that the classifier's performance improved with the number of clusters (subclasses).

The localiser functions optimally when it produces ROIs that (a) are actually useful, (b) contain a character, and (c) contain as little noise as possible. We studied the effect of the size of the sub-images and the threshold on localisation performance.

The size of the partial images, on which the network was trained, was tested. Tests were conducted with partial images of the sizes 10 × 10, 15 × 15, 20 × 20, and 30 × 30 pixels. The other variables were kept constant at the values specified in table 1.

Variable	Value
# iterations	1000
learning rate	0.5
momentum	0.5
# subclasses	3
# hidden neurons	4
localiser threshold	0.9

Table 1. Parameter values for studying the localiser's sub-images size.

To determine the performance of the localiser, the false negatives (the character is present, but not recognized) and false positives (the character is recognized, but not present) were measured. From these tests it became clear that by increasing the size of the partial images, the number of false negatives increases, whereas the number of false positives decreases. Therefore, the optimal size is hard to establish.

The optimal value of the threshold was tested. To determine the performance of the localiser, the number of ROIs produced was measured. During these tests all the other variables were kept constant at the values shown in table 2.

Variable	Value
# iterations	1000
learning rate	0.5
Momentum	0.5
# subclasses	3
# hidden neurons	4
partial images' size	30 × 30 pixels

Table 2. Parameter values for evaluating the localiser's threshold.

From these tests, it could be concluded, as expected, that the number of ROIs produced decreases if the localiser threshold increased. No optimal value could be determined.

The functioning of KISS as a whole was tested on the number of subclasses the classifier produces and on the number of iterations on which the localiser was trained.

To test the influence of the number of subclasses on the performance of KISS, this number was varied from 2 to 6. The other variables were kept constant at the values listed in table 3.

Variable	Value
# iterations	750
learning rate	0.5
momentum	0.5
# hidden neurons	4
partial images' size	30 × 30 pixels
localiser threshold	0.7
identifier threshold	30.0

Table 3. Parameter values for testing the effect of the number of subclasses.

The neurons used a sigmoid function to determine their output. To determine the performance of KISS, the classification performance was measured. KISS was trained with 157 images (training set) and tested with 150 different images (test set).

From these tests it became clear that the number of subclasses has a strong influence on the false positive and false negative rates. With an increasing number of subclasses the number of false negatives increases, whereas the number of false positives decreases. The overall error is minimal for 4 subclasses.

CONCLUSIONS

From the project-based development and study of KISS, our team drew the following conclusions. The system does not work completely according to expectations. It was expected to correctly classify at least 95% of the images, yet KISS reached only a performance of 80%. The parameter settings turned out to have a strong influence on the performance of the system. As a result, the necessary optimisation and testing took considerable time. Given the limited time frame of the project, we were not able to further improve the performance of the KISS system. In particular, we lacked the time to optimise the localiser and classifier that would have resulted in a better performance of the system as a whole. We conclude that although KISS is a fully functional system, it can be further improved to reach a better recognition performance.

SECTION COMPUTATIONAL LINGUISTICS

Section-Editor
Antal van den Bosch

Using Language Models for Information Retrieval

Djoerd Hiemstra
CTIT, TU Twente

Thesis review by Martijn Spitters
TNO TPD

As the train left Enschede, it entered the countryside of Twente. I was surrounded by *cattle models*: vast meadows, mainly inhabited by grazing cows. One of the cattle models contained seven white cows with brown spots, four white cows with black spots, and two cows with a black fur. It goes without saying that the probability of selecting at random, from this particular meadow, a white cow with brown spots is 7/(7+4+2) = 0.538. Let us assume you are a farmer who is interested in buying a livestock which comparatively speaking exists of as much as possible brown spotted cows. The train had passed only one other meadow on which this type of cow grazed: that cattle model contained eight brown spotted and twenty black spotted cows. Because 0.538 is larger than 8/(8+20) = 0.286, the first mentioned stock meets your requirements best.

Earlier that day, on January 19th, 2001, I visited the University of Twente, where Djoerd Hiemstra successfully defended his dissertation Y*sing Language Models for Information Retrieval*. His promotor was Prof.dr. F.M.G. de Jong. The thesis introduces a new probabilistic model of information retrieval, based on statistical language models, in which the meadows are the documents, and the cows are the words. The farmer is a user who enters an information request (the query) in the retrieval system.

RESEARCH QUESTIONS

The introductory chapter of the thesis opens with a short trip through the basic notions and processes of information retrieval. Hiemstra goes on to present the three main research questions his thesis answers, concerning (1) the application of the theory of statistical language models to term weighting, relevance feedback and structured queries, (2) the application of that theory to automatic query formulation, and (3) the performance of the language modeling approach to information retrieval compared to the performance of well-established approaches.

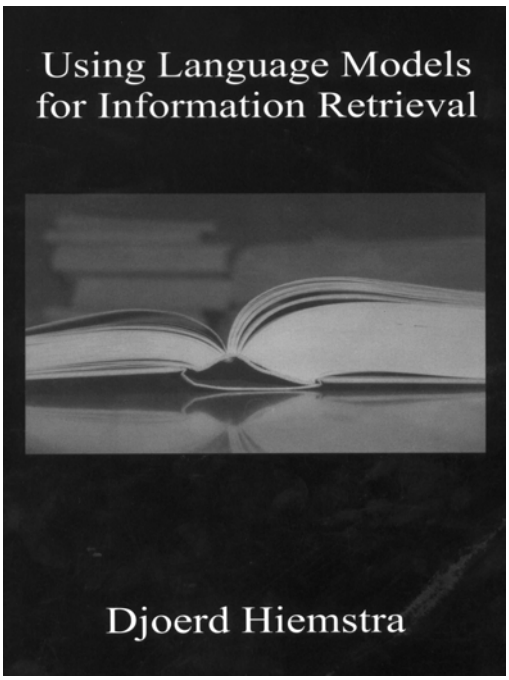
MODELS OF INFORMATION RETRIEVAL

The second chapter describes the highlights of the past four decades of information retrieval research. In order to provide the background of the first main research question addressed by the thesis, Hiemstra discusses the most influential mathematical models of information retrieval that attempt to solve one of the following problems: *term weighting and ranking*, *relevance feedback*, or *structured queries*. He states that none of the existent retrieval models addresses all three problems at the same time. One of the most important research contributions of the dissertation is the development of a model that *does* integrate term weighting, feedback, and structured queries.

The chapter is divided into four sections. The first section claims the importance of having mathematical models of information retrieval. In the following two sections, the author distinguishes two main types of retrieval: *exact match* (the Boolean model) and *ranked* retrieval. The Boolean model, the first model of information retrieval, is

based on the operators of George Boole's mathematical logic: AND, OR, and NOT. The main disadvantage of this model is that it does not provide a ranking of the retrieved documents: a document is either retrieved or not, given a certain Boolean query. However, because most ranked retrieval models are based on the ideas of the Boolean model, it appropriately got its own section in the chapter. The section on ranked retrieval is more bulky and describes seven models that use term and/or document statistics to compute a ranking of the retrieved documents. Hiemstra discusses the basics of the vector space model, the probabilistic model, fuzzy set models, the *p*-norm extended Boolean model, the 2-Poisson model, the extended probabilistic model, and Bayesian network models.

The final section provides an overview of algorithms for term weighting, a critical factor in the performance of text retrieval systems. Devoting a separate section to term weighting, results in a very readable chapter. Hiemstra describes the algorithms from a historical point of view, escorting the reader through thirty years of term weighting experiments.



QUERY FORMULATION

The third chapter of the dissertation is completely devoted to the query. Even though this chapter aims at providing the background to Hiemstra's second main research question, it might as well have been a section of chapter two. The chapter is divided into two parts. The first section describes the most important issues in automatic query formulation: tokenization, removing common words, reducing words to their stems, phrase extraction, splitting compound words, and conflation of synonyms.

The second section focuses on the functionality of the operators that can be used for more advanced manual query formulation, like the basic Boolean operators, the proximity search operators ADJ and NEAR, and wildcards. Because of the clear example queries and references to actual commercial retrieval systems, this chapter is very accessible to read and might provide users of retrieval systems with new insights on how to formulate their requests more accurately.

LANGUAGE MODEL-BASED IR

Chapter 4 is the core of the dissertation. It presents Hiemstra's language modeling approach to information retrieval. The introductory section globally describes how the system works and provides a short (in my opinion too short) historical background of the theory of statistical language models. A more detailed description of the application of language models to automatic speech recognition would have been interesting. Furthermore, the section that reports of previous research on the application of language models to information retrieval might have been more elaborate.

In Hiemstra's system, documents are ranked according to the probability of generating the user request. This probability is defined by a two-step statistical model. First, the *query formulation model* transforms the user request to a structured query representing all queries that might have generated the request. In a second step, the system uses the *matching model* of each document to calculate the probability that any of these queries was sampled from the document. Besides this basic retrieval model, the author introduces an extended model, which integrates statistical translation of words. This extension makes it possible to perform cross-language information retrieval, the subject to which Hiemstra dedicated the sixth chapter of his dissertation.

One of the most interesting concepts discussed in the dissertation is the estimation of term importance using the Expectation Maximization (EM) learning algorithm. This algorithm maximizes the probability of a query given a number of relevant documents by iteratively computing the expected importance of each term independently.

In the remainder of the fourth chapter Hiemstra clarifies his retrieval model by presenting it in terms of hidden Markov models and Bayesian

networks, and by showing that the language modeling approach can be interpreted as a *tf.idf* term weighting algorithm.

Chapter 5 reports on experiments in which the performance of the language model-based retrieval system was evaluated against the performance of systems based on the vector space model, the probabilistic model, and the *p*-norm model. Hiemstra tested different aspects of his system using three different tasks. The first task is an automatic ad-hoc experiment using TREC data (the REtrieval Conference is an annually organized benchmarking conference for the evaluation of state-of-the-art IR systems). This is a basic retrieval task in which there is no relevance information available. The second experiment uses examples of relevant documents to estimate optimal term weights. Finally, the third experiment measures the system's ability to handle Boolean-structured queries. On the used test collections and queries, the language model-based system performed (in most cases significantly) better than the traditional models.

TWO PROTOTYPE LM-BASED SYSTEMS

Chapters 6 and 7 of the dissertation report on the evaluations of two language model-based prototype systems: a *cross-language information retrieval* (CLIR) system and an *adaptive filtering* system. In his cross-language IR experiments, Hiemstra focuses on the question whether it is possible to improve upon a system that uses serious methods to disambiguate word translations by using structured queries which simply reflect all possible translations of the source language query. A remarkable result of these experiments is that using manually disambiguated translations does not yield better retrieval performance than using the structured queries.

As one of the focal points of my own research is concerned with the application of language models to topic tracking and detection, the seventh chapter especially excited my interest. In that chapter, Hiemstra reports on the evaluation of a prototype system for the adaptive filtering of documents. Just like topic tracking, filtering is in fact a binary classification task. A document is either relevant or irrelevant to the subject a user is interested in. One of the main differences is that adaptive filtering is based on feedback from the user, while this is not allowed in topic tracking. Hiemstra shows that a language model-based adaptive filtering system can be improved significantly by using the EM-algorithm to reestimate the importance weights of the words in the relevant documents, every time a new relevant document is signalled.

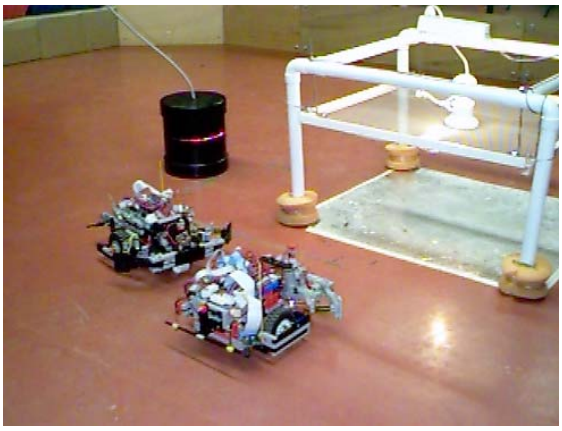
CONCLUSION

I have read this thesis with much interest and pleasure. Hiemstra's work has been one of the most important sources from which I learned the theory of language modeling and its application to information retrieval. This dissertation is the crown on that work and should be read by anyone who is interested in statistical approaches to text retrieval. Some subject matters embraced by this thesis might have been discussed in more detail, but on the whole it is a book that both answers important research questions and opens new research questions to embroider on. The dissertation describes the development of an elegant model of information retrieval, based on simple document-based unigram models. And it is really not much more complicated than counting cows from behind the window of a train...

Lexicon Grounding on Mobile Robots
Paul Vogt

Thesis review by Antal van den Bosch
ILK, KU Brabant

On November 10, 2000, Paul Vogt defended his thesis "Lexicon grounding on mobile robots" before his thesis committee in Brussels. The most exciting aspect of this interesting thesis, and this is a contagious aspect of most work done at Luc Steels' AI Lab at the VUB in Brussels, is the magnitude of the problem it attacks -- the evolution of language use in agents thrown in a world pretty much as tabulae rasae. All of the complexity of this world comes to the perceiver as analogical signals over all



wavelengths, and can only be sampled as such by limited, often cranky sensors. How to deal with this incoming chaos? In the real world we can see groups of successfully surviving agents treat analogical phenomena as discrete things, segmented out from their context, and use simple,

efficient symbols to denote these discretised concepts among each other. Working from the apparent causal relation between symbol use and intelligent behaviour, Vogt demonstrates that it is possible to have agents (two mobile robots) develop, through co-evolution of forms of words and meaning within and among themselves, this type of intelligent discretization as a mere result of trying to get something done in the world: training themselves in language games. He argues that success in doing so unveils, as a spin-off, a solution for this discretisation problem, best known as the symbol grounding problem.

For sure the thesis describes "experiments in a corral" where the real world is downsampled to an artificial world. The agents are very blank-slated and very flexible in how they embody their surroundings, but still in very specific ways. Because of these downsamplings from the real world, the thesis does not give definitive answers to the deep questions raised by researchers like Harnad or Varela. It does however, demonstrate, within well-controlled confines, how situated cognition can arise, or how agents can evolve to embody their environment.

In Vogt's corral, to summarize roughly, two mobile LEGO robots, one speaker and one listener, play language games about four lights. Each time they play a game, they both sense their surroundings through their sensors, and segment the different light sources they perceive. Then the speaker of the two chooses to talk about a segment, the topic, which it first categorizes and subsequently names. Talking involves transmitting the named word; the hearer couples this word to a category, and if the hearer attaches this category to the same topic that the speaker talked about, the language game has been successful. Success and failure both steer changes in the speaker and the hearer. Success generally strengthens associations between words and categories. Failures trigger adaptations in the list of wordforms, the lexicons, that each agent can utter and relate to categories. Starting out empty, lexicons in both robots grow to capture the complexity of the world around them.

Although the experiment needs some technical wizardry and good clear thinking, for the reader it comes as no surprise that the first question, whether symbol grounding can happen in this setting, is answered positively. Interestingly, grounding was usually not one-to-one; the robots tended to evolve many meanings for one topic, but at the same time only had a few names for different meanings, cancelling out the communicative dangers of polysemy and synonymy.

An interesting discussion from a different dimension that Vogt opens, is how his results can be related to human language learning. His reasoning is that psycholinguistics is inconclusive about a single language learning strategy; it is more likely that infants adopt a combination of strategies. Vogt then notes that in his experiments, he finds a causal relation between joint attention and the necessity of (negative) feedback: whenever the topic of conversation was established clearly through joint attention of both hearer and speaker before words were transmitted, feedback was not important. Whenever the topic of conversation was not established with sufficient confidence, feedback became necessary.

Ideally one would like to see that joint attention and feedback were also guided by the exchange of words in Vogt's experiments. However, this would have complicated the research beyond its practical scope; the robots would have needed to develop a language about their own internal state as well, next to the language about their environment. Instead, Vogt shortcuts both processes by giving the robots direct access to each other's internal state, and leaves this issue for future research. Vogt does argue, convincingly, that a complete linguistic solution appears impossible; a strong condition for successful joint attention lies in the physical co-ordination that the two agents can accomplish with their bodies.

In sum, the thesis offers a clear look at a nice set of well-designed experiments, and discusses the results in an open, self-critical way. As one hopes, there is more substance than speculation in the book. Where certain assumptions had to be introduced that were implausible from a real-world human perspective, this is always brought to the front. Consequently, the book contains a clear statement about fruitful directions for future research. All together this is all you can hope for in a Ph.D. thesis.

SECTION KNOWLEDGE SYSTEMS IN LAW AND COMPUTER SCIENCE

Section Editor
Radboud Winkels

Possible Applications of Argumentation Research

JURIX lecture by Henry Prakken, May 11 2001, Utrecht

Report by Bram Roth, Universiteit Maastricht

JURIX - the Dutch foundation for research in Law and Computer Science - held its latest meeting in Utrecht, the Netherlands. One academic speaker at the meeting was Henry Prakken, who currently works at the Institute of Information and Computing Sciences of the University of Utrecht. Prakken is a renowned researcher in the field of artificial intelligence and law, and he has many years of experience as a theoretician in the field.

The first remark Prakken made was that in the field of artificial intelligence and law there are roughly two types of researchers. One type is primarily interested in formal and computational models of legal reasoning, while the second type has a greater interest in ICT as an aid in legal practice. For obvious reasons, the latter group focuses much more on practical applications. In this connection Prakken referred to a recent article by Karl Branting in *AI&Law News*, entitled 'Legal AI Systems Enter the Marketplace'. In that article, Branting says that practical applications are increasingly becoming common features of the legal systems in the industrialised world, and he supports this by pointing out some of the most promising recent developments. This had led Prakken to wonder to what extent the theoretical research on legal argumentation had paid off for practical purposes, and what new research may still be required to arrive at viable applications. These were the main questions addressed by this presentation, which is discussed next.

CURRENT RESEARCH IN LEGAL ARGUMENT

Prakken's presentation consisted of two parts. One part contained the discussion proper, while in the other part a visualised demonstration was given of Prakken's own recent work. Prakken started with an overview of (rule-based) legal knowledge-based systems, which according to him had turned out to be very successful. This success is apparent in the application of these systems in, e.g., social security. It is generally acknowledged that knowledge-based systems are not well suited for modelling legal argumentation in its full complexity, however. The reason for this is that legal argumentation exhibits many subtleties in cases 'where the normal rules run out', such as reasoning by analogy or reasoning with values.

The theoretical research carried out so far has led to much knowledge of these subtleties in legal argument, and many 'proof of concept' systems have moreover been realised. In the United States a number of working prototypes of reasoning systems have been built (e.g., HYPO, CATO, and CABARET), while European researchers have traditionally focused on logical formalisation (e.g., Hage, Prakken, and Verheij). According to the speaker, hardly any practical applications have as yet resulted from these research efforts, however. As a possible explanation for this one could put forward that the required knowledge is too ambiguous to be easily formalisable, or that legal reasoning itself is hard to automate. As a possible solution one may come up with machines that can 'learn' knowledge from sources in natural language, and an example application of this is Brüninghaus and Ashley's research on automated case representation. An alternative approach is to have the user supply the required legal knowledge, and in line with this some researchers have worked on the formal modelling of legal procedures (Gordon, Hage, Leenes, Lodder, Bench-Capon, and Prakken). This has led to systems which have no knowledge of (substantive) law at all, but which merely provide structural assistance to ensure an orderly conducted discussion and to support dispute resolution. The systems emerging from this still had the drawback that the users had to input their information in a formal language, however, for which reason attempts have been made to leave the content of the input information (almost) unstructured (Gordon's Zeno, and Loui's Room5). Recently, systems for online dispute resolution have also been developed (e.g., Lodder) for the purpose of mediation, negotiation or (binding) arbitration. Finally, Verheij's ArguMed system is an example of a mediation system for one single user.

JUDGES AND CASE MANAGEMENT

At this point Prakken challenged the audience to suggest improvements over these existing approaches, but he got no response. He then

demonstrated his own most recent work, in which there is a role for a third party – the judge – to allocate burden of proof to the litigants and to evaluate their moves with regard to admissibility and soundness.

After this the speaker discussed the way legal practitioners deal with case management. As it turns out, workflow management and document management are key processes in legal practice (perhaps a little more so in the US). Besides this, systems which offer the possibility to structure legal information (e.g., CaseMap) turn out to be commercially viable. This suggests that there are prospects for knowledge management systems in legal practice.

THE FUTURE OF ARGUMENTATION RESEARCH

This led Prakken to the conclusion that more empirically oriented research is needed to arrive at practical applications. For instance, according to Prakken more must be known about the structure of legal argumentation as it actually takes place between people, and more knowledge is required of the structure of case management in legal practice. Besides this, more empirical research may be needed on how to *visualise* legal argument. Moreover, as new practical tools are developed, evaluation criteria should be formulated to test empirically their effectiveness. But even then one may still have to cope with the more general problem that commercial companies are simply ignorant of recent scientific advances.

Prakken's final conclusion was optimistic. He thinks that research on legal argumentation will result in practical applications, as is indicated by recent developments like online dispute resolution and knowledge management for litigation. According to Prakken, in the nearby future more empirical research is needed, however, and in the longer run results are to be expected from technology that can process natural language.

The slides of the presentation are to be found at http://www.cs.uu.nl/people/henry/

Juridisch Kennismanagement in de Praktijk: advocatenkantoor Stibbe

Lecture atJurix by Marnix Weusten on May 11, 2001 in Utrecht

Report by M. Apistola, Instituut voor Informatica en Recht, VU Amsterdam

Het advocatenkantoor Stibbe behoort tot de meest toonaangevende internationale advocatenkantoren in Europa, met kantoren in Amsterdam, Brussel, Parijs, Londen en New York. Stibbe heeft internationaal georiënteerde praktijkgebieden waarbij de nadruk ligt op fusies en overnames, op bankrecht en financieel recht. Stibbe is één van de grotere advocatenkantoren en telt ca. 450 advocaten en notarissen, waaronder 110 partners.

Stibbe is een van de advocatenkantoren die de nadruk steeds meer hebben gelegd op het beheren van hun (juridische) kennis. De term die voor deze activiteit gebruikt wordt is juridisch kennis-management. Bij Stibbe heeft men een stafafdeling opgericht die zich bezighoudt met het juridisch kennismanagement binnen het kantoor. Deze afdeling wordt geleid door Marnix Weusten. Zijn taken behelzen onder meer projectmanagement, het aansturen van medewerkers en het budget besteden. De afdeling bestaat naast Weusten uit een juridisch documentalist die verantwoordelijk is voor het tijdig zoeken en vinden van de juiste juridische kennis, wetenschappelijke medewerkers die zich bezighouden met het ontwikkelen van diverse juridische modellen (bijvoorbeeld een aandelenkoopovereenkomst) en stafjuristen die zich bezighouden met het opstellen van juridische, veelal Engelstalige, memoranda. Onder de afdeling kennismanagement valt de juridische bibliotheek. Deze bibliotheek, het centrum van juridische informatie, voorziening blijkt een belangrijke spil te zijn bij het uitvoeren van juridisch kennismanagement. Opvallend is dat de traditionele bibliotheek steeds kleiner en minder bezocht wordt vanwege de toenemende digitale beschikbaarheid van boeken, tijdschriften en dergelijke.

EEN KLOOF TUSSEN THEORIE EN PRAKTIJK

Voordat Marnix Weusten aan deze functie begon heeft hij jarenlang onderzoek gedaan naar de mogelijkheden die de informatietechnologie te bieden heeft voor de ondersteuning van de juridische praktijk. Dit onderzoek wordt ook wel aangeduid met de term rechtsinformatica (RI). Voorbeelden van resultaten uit zijn onderzoek zijn een methode voor de ontwikkeling van juridische kennissystemen en enkele juridische

kennissystemen. Door zijn achtergrond als wetenschappelijk onderzoeker is Marnix Weusten in staat om eens te kijken in hoeverre het RI-onderzoek afwijkt van de wijze waarop de juridische praktijk omgaat met bijvoorbeeld het ontwikkelen en toepassen van juridische kennissystemen. Het blijkt dat de praktijk totaal anders is dan het RI-onderzoek. Een van de verschillen tussen de praktijk en het RI-onderzoek is dat er binnen de juridische praktijk nauwelijks zelf juridische systemen ontwikkeld worden vanwege de hoge kosten en de beperkte beschikbare tijd van juridische experts. Een ander verschil tussen het RI-onderzoek en de praktijk is dat er meer geld te besteden is voor bijvoorbeeld het ontwikkelen en toepassen van juridisch kennismanagement. Dit laatste brengt volgens Weusten echter wel een stuk meer verantwoording met zich mee dan het geval is bij het wetenschappelijk onderzoek.

DE PRAKTIJK BIJ STIBBE

Het onderwerp van de presentatie was dus juridisch kennismanagement bij Stibbe. Een van de punten die hierbij aan de orde kwamen is waarom juridisch kennismanagement nu zo in de aandacht staat. Het blijkt dat de laatste jaren de concurrentie tussen advocatenkantoren steeds groter is geworden en het aantal zelfstandige advocatenkantoren door toename van fusies kleiner wordt. Ook is er sprake van groot personeelsverloop bij advocatenkantoren. Verschillen tussen advocatenkantoren zijn vaak klein en om de concurrentie een stap voor te blijven moeten in ieder geval de belangrijkste elementen binnen het advocatenkantoor, namelijk juridische kennis en het juridisch personeel goed beheerd worden.

Maar hoe kan juridische kennis binnen het kantoor beheerd worden? Binnen de stafafdeling kennis-management gebeurt het beheren van juridische kennis binnen Stibbe door drie processen, te weten kennisontsluiting, kennisvastlegging (doorgaans speelt impliciete kennis hierbij een rol) en kennisontwikkeling (doorgaans speelt het pro-actief opdoen, dus bijvoorbeeld het kijken naar wat in de toekomstig aan kennis nodig is, hierbij een rol).

Deze processen spelen ook een rol bij de ondersteuning van juridisch kennismanagement in de vorm van juridische kennissystemen. Stibbe houdt zich echter zelf niet bezig met de ontwikkeling van dergelijke systemen. De redenen om dit niet te doen hebben te maken met de voor- en nadelen van de genoemde processen.

Een voordeel bij het uitvoeren van het eerste proces is volgens Weusten dat de benodigde kennis omtrent het recht al grotendeels geëxpliciteerd is en derhalve gemakkelijk te ontsluiten is. Voor wat betreft het veel complexere proces van het vastleggen van impliciete kennis, dus de kennis in de hoofden van de medewerkers, zal de inzet van kennistechnologie de juiste bijdrage moeten leveren. Knelpunten bij de toepassing van de processen zijn de beperkte tijd van experts en de hoge kosten van de experts.

Wanneer juridisch kennismanagement goed ondersteund wordt door kennistechnologieën, opleidingen en juiste kennis in systemen, dan kunnen volgens Weusten minder deskundige medewerkers ook bepaalde complexe juridische problemen oplossen.

KWALITEITVERBETERING

Uit het publiek kwam de vraag hoe de juistheid van ingevoerde kennis bepaald kon worden. Weusten antwoordde dat er onder meer een aantal hoogleraren aan Stibbe zijn verbonden die stukken snel kunnen scannen en beoordelen. Door deze werkwijze blijven zij ook goed op de hoogte van wat er binnen het kantoor plaatsvindt.

Voor Stibbe betekent juridisch kennismanagement het verhogen van de juridische kwaliteit, het up-to-date houden van kennis, tijdswinst boeken en een juiste uitstraling.

Om de juridische kwaliteit te verhogen zijn er een aantal initiatieven ontplooid. Een van deze initiatieven is de ontwikkeling van een ‘knowledge portal’. Dit portaal is een intranetpagina dat aanknopingspunten biedt voor antwoord op een vraag als ‘wie beschikt waar over welke juridische kennis?’. Deze aanknopingspunten zijn in de vorm van hyperlinks ondergebracht in relevante onderwerpen. Het portaal biedt een overzicht van eigen advocatenkantoren en partner-advocatenkantoren en wordt wekelijks ververst. Wanneer Stibbe bijvoorbeeld voor een bepaalde casus niet beschikt over de juiste expertise, verwijst Stibbe door naar een advocatenkantoor waarvan zij weet dat zij beschikken over gedegen expertise. Wanneer Stibbe een dergelijke doorverwijzing doet, verwacht zij van de vertegenwoordiger van dat kantoor een rapportage over opgedane ervaring en kennis. Deze kennis kan door Stibbe in hun databank up-to-date gehouden worden en mogelijk in de toekomst toegepast worden.

De portal beschikt ook over inhoudelijke kennis zoals wetgeving, tijdschriften en nieuwsartikelen. Deze bronnen kunnen full-text doorzocht worden. Veel van de kennis beschikbaar voor de medewerkers wordt ook beschikbaar gemaakt voor

de cliënten van Stibbe. Hiertoe worden er cd-rom's samengesteld die ook naar de cliënten verstuurd worden. Dit heeft tot gevolg dat de cliënt zich meer betrokken voelt bij Stibbe. De cd-rom's worden wekelijks ververst. Het risico van het uitdelen van deze cd-rom's bestaat daarin dat de kennis terechtkomt bij de concurrent. Volgens Weusten maakt dit niet zoveel uit; de kennis op de cd-rom is namelijk ook na een week verouderd.

Om de medewerkers te stimuleren om hun ervaringen en kennis te delen wordt er binnen Stibbe gebruik gemaakt van mogelijkheden zoals het 'achter de broek zitten' van medewerkers, en het noemen van medewerkers die kennis hebben gedeeld. Er wordt geen gebruik gemaakt van financiële prikkels om medewerkers aan te zetten tot het delen van kennis.

Teneinde kennis (gemakkelijker) up-to-date te houden streeft Stibbe ernaar om alle relevante en actuele kennis met een druk op de knop beschikbaar voor alle medewerkers te maken. Om tijdswinst te kunnen boeken is de inhoud van het portaal wereldwijd beschikbaar. Een juiste uitstraling tracht Stibbe onder meer te bereiken door levering van relevante kennis aan hun cliënten. Maar ook de vooruitstrevende toepassing van kennismanagement en kennistechnologieën binnen Stibbe draagt bij aan een goede uitstraling naar de arbeidsmarkt. Stibbe wordt hiermee aantrekkelijk voor bijvoorbeeld nieuwe advocaten die hun werkzaamheden goed ondersteund willen zien.

BLIK OP DE TOEKOMST

Voor wat betreft de toekomst van juridisch kennismanagement en Stibbe voorzag Weusten met name de verdere ontwikkeling en toepassing van portalen, virtual dealrooms (dit zijn elektronische ruimtes met documenten om een deal rond te maken) en Application Service Providers (ASP's). Aan ASP's kunnen toepassingen zoals bijvoorbeeld het laten draaien van een internetportaal uitbesteed worden omdat het bijvoorbeeld te duur of te complex is om zelf te doen.

De presentatie van Marnix Weusten gaf aan dat ook de juridische praktijk zich steeds meer begint te ontfermen over abstracte onderzoeksvraagstukken zoals het (geautomatiseerd) werken met juridische kennis. Helaas wijkt de praktijk nogal af van de wetenschap, maar door onderzoekers zoals Weusten die zich binnen de praktijk gaan bewegen, zou de afstand tussen wetenschap en praktijk mogelijk kleiner gemaakt kunnen worden.

Keteninformatisering als Raakvlak tussen Recht en Informatica

Lecture at Jurix by Jan Grijpink
on May 11 2001 in Utrecht

Report by Dirk Keymis,
ICRI, K.U. Leuven

Jan Grijpink is werkzaam bij het Ministerie van Justitie. Hij hield een lezeing over keten-informatisering. Er zijn twee aspecten bij te onderscheiden, nl. het "stroomlijnen" van informatie-uitwisseling in ketens en het invoegen van structuren in de informatiehuishouding waardoor de privacy beter gegarandeerd wordt. Eerst hebben we het over het begrip keten-informatisering. Vervolgens volgt een illustratie van het begrip aan de hand van enkele voorbeelden.

Het begrip keteninformatisering bestaat uit twee delen, "keten" en "informatisering". Het begrip "keten" roept een aantal associaties op. Het omvat schakels die zelfstandig functioneren en in een bepaalde volgorde tot elkaar staan. Processen lopen door een keten heen. Een keten bevat meerdere actoren en objecten. Analoog met product-tracking kan in een keten gesproken worden van mensen-tracking: waar bevinden de verschillende objecten zich in de keten? In het algemeen zijn we eerder gewend te denken in bestuurlijke domeinen dan in ketens.

KETENS

Een keten is de bedding van een proces en wordt gedefinieerd door het dominante ketenprobleem dat er zich in voordoet en alleen door alle betrokken partijen samen kan worden opgelost. Het ketenbegrip heeft drie kenmerken. Vooreerst is het dynamisch: ketens zijn veranderlijk. Daarom is het belangrijk voldoende oog te hebben voor de levensduur van ketenproblemen alvorens over te gaan tot keteninformatisering. Het dynamisch karakter van een keten maakt ook alert op nieuwe kansen in het ketenproces. Verder is rationaliteit vaak niet het leidende principe binnen een keten. Als laatste kenmerk kunnen we de afwezigheid van gezagsverhoudingen binnen de keten (maar niet binnen de schakels) aanhalen. Er is geen alomvattende autoriteit die alle schakels in de keten controleert.

Een voorbeeld ter illustratie van het ketenbegrip. Een financiële instelling heeft een bepaalde "mission statement", een bepaalde taak die ze

willen volbrengen. Als hun taak slechts geldtransport is van punt A naar punt B, dan is er geen probleem - ze werken in een sterk hiërarchische organisatie en kunnen de receptuur voor dit transport volledig zelf bepalen (zoals een grootwarenhuis precies kan bepalen wat voor schortjes hun bedienden overal ter wereld moeten dragen). Stel nu dat ze hun taak zien als het garanderen van veilig financieel verkeer. Op dat moment bevinden ze zich midden in een keten, omdat ze onmogelijk hier zelf voor kunnen instaan. Veilig financieel verkeer hangt af van veel meer factoren (zoals wetgeving, politieprioriteiten en beursmaatregelen) dan de banken zelf onder controle hebben. Het garanderen van veilig financieel verkeer is een ketenprobleem.

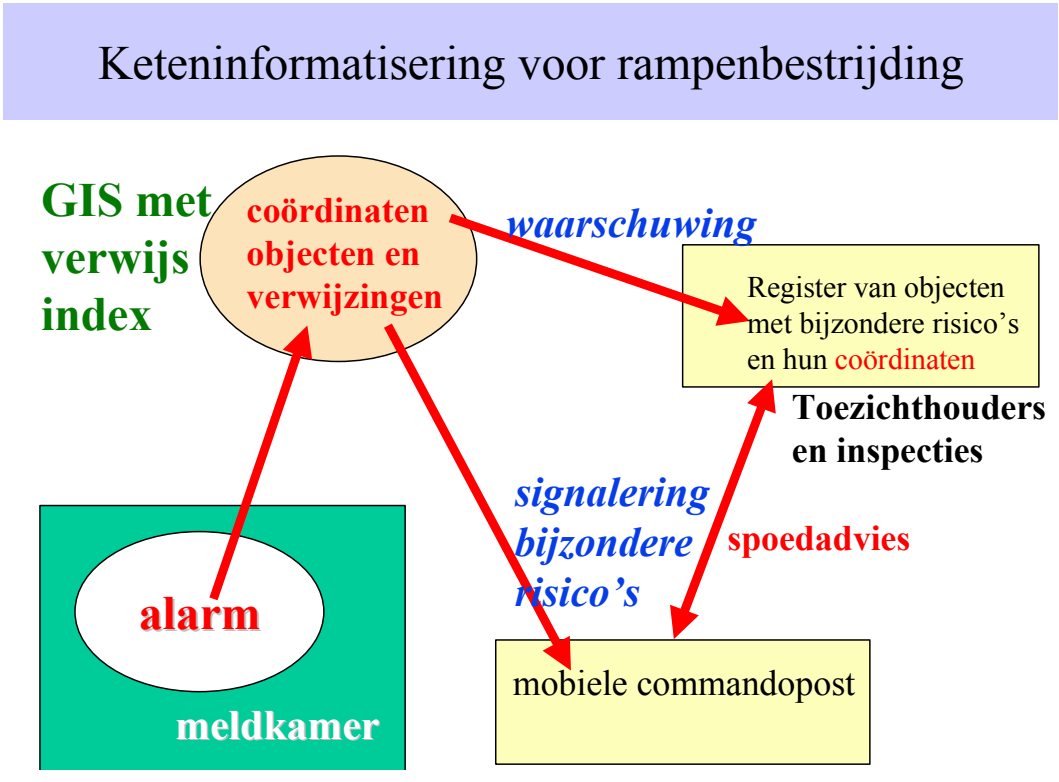
Op keten-niveau gelden in ketens andere wetten dan in het hiërarchische domein van een organisatie. Zij worden hier kort aangeduid. (1) In een keten is het probleem de baas. (2) Elke keten is anders, wegens het ketenspecifieke dominante ketenprobleem. (3) Ook is het draagvlak van een keten te klein voor grote oplossingen: informatiseren moet daarom op de draaggolf van het ketenprobleem gebeuren, daar heeft het de grootste kans van slagen. (4) Crisis creëert verandering binnen een keten. (5) In een keten geldt het non-interventie principe: verandering stuit op weerstand. (6) Het is aangeraden om bemoeienis in interne aangelegenheden tot een minimum te beperken. (7) De beste manier om verandering te bereiken is niet dwang, maar wel drang of beloning. (8) In een keten is het beter eerst te informatiseren en dan te reorganiseren. (9) Tenslotte is een kale infrastructuur beter dan een verrijkte infrastructuur. Het is minder complex een kale structuur te maken, waarvan de herbruikbaarheid hoog is. Bovendien is een verrijkte structuur minder flexibel, en loopt ze de kans te blokkeren bij een wijziging van het ketenprobleem.

KETENINFORMATISERING

Na de bespreking van het ketenbegrip is het nu tijd voor een definitie van keteninformatisering. Keteninformatisering richt zich op het keten-niveau, ter aanvulling van de bestaande methoden die zich lenen voor informatisering op het grondvlak van de keten.

Keteninformatisering is een nieuwe methodologie voor informatisering in maatschappelijke ketens. Ze beoogt gelijktijdig zowel de intelligentie van beslissingen op de werkvloer als de afscherming van persoonsgegevens te vergroten.

Keteninformatisering spitst zich toe op het brengen van samenhang in honderden losse organisaties, dus in die gevallen waar informatisering vereist is buiten een strakke hiërarchische organisatie. Keteninformatisering biedt een nieuwe informatiestrategie voor de informatiesamenleving die o.a. onmisbaar is voor de uitvoering van overheidsbeleid en voor het waarborgen van de rechtsorde.



Keteninformatisering is niet hetzelfde als workflow management. Keteninformatisering kan vergeleken worden met toegevoegde waardeketens van bedrijven, zgn. logistieke ketens, maar is echter ruimer omwille van zijn maatschappelijke dimensie.

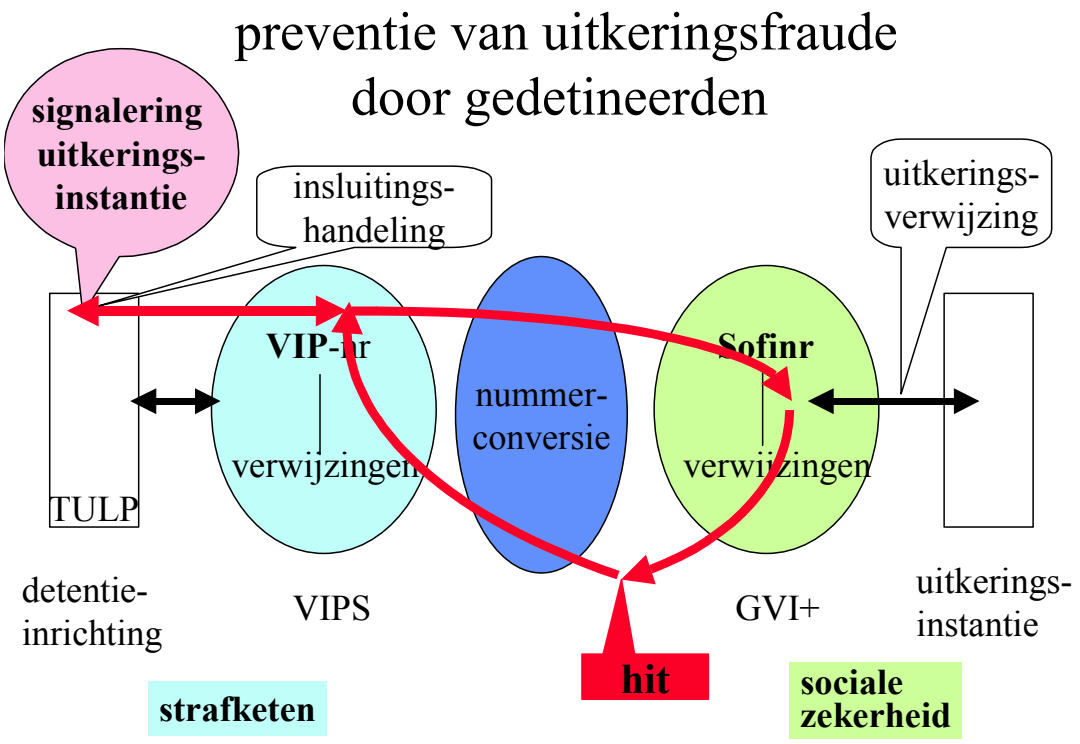
Keteninformatisering is in de eerste plaats een denkmodel waarin de keten het centrale concept is. Dit is het begripsaspect van keten-informatisering. Voor een bespreking van het begrip keten en zijn kenmerken verwijs ik naar bovenstaande paragrafen. In de tweede plaats is keteninformatisering een methodologie (het pragmatisch aspect), dat een toetsingskader biedt voor succesvolle ketenprojecten en een

sturingskader voor betere keteninterventies. Op de derde plaats is keteninformatisering een oplossingsrichting (het resultaatsaspect). Keten-informatiseringsoplossingen voor maatschap-pelijke vraagstukken worden gekenmerkt door kritische communicatie vervlochten met het proces en interne afscherming van persoons-gegevens. Daarvoor worden kale informatie-infrastructuren gebruikt, die ketenspecifiek zijn, omdat ze gerelateerd zijn aan de dominante problemen in de verschillende ketens.

RAMPEN EN FRAUDE

Om een keteninformatiseringsoplossing te illustreren werden twee voorbeelden aangehaald, nl. keteninformatisering voor rampenbestrijding en keteninformatisering ter preventie van uitkeringsfraude door gedetineerden. Deze twee voorbeelden werden wegens tijdsgebrek slechts gedeeltelijk behandeld. De beide onderstaande plaatjes brengen de twee keteninformatiserings-oplossingen in herinnering.

Als persoonlijke bedenking zou ik graag nog het volgende toevoegen. Het ketenbegrip is een goede manier om de problemen *tussen* organisaties in kaart te brengen. De ketenwetten sluiten voor een groot deel aan bij de eigen ervaring van de dagelijkse praktijk. Tot slot nog een kleine aanvulling bij de laatste ketenwet. Via het gebruik van een modulaire op-bouw kunnen er "kale" informatieinfrastructuren worden ingevoegd die potentieel sterk uit-breidbaar zijn. Keteninformatisering en verrijkte informatie-infrastructuren hoeven m.i. elkaar dus niet uit te sluiten.



BNAIC 2001 in Amsterdam

On 25 and 26 October the annual BNAIC Conference will be held in Amsterdam. The deadline for submissions has past and the reviewing process is underway. Interest for the event is high which can be seen from the number of submissions. In category A (original, regular contributions) 70 papers were submitted. In addition, 30 papers were submitted for category B (papers that were reviewed and published elsewhere). The programme committee makes a selection of these which is partly aimed at giving an overview of Artificial Intelligence in the Netherlands and Belgium. Finally, there were 10 submissions of demonstrations and applications that will be evaluated by relevance and quality.

Beside presentations and posters selected from the submissions, the programme will feature two invited speakers. Stuart Russell (University of Berkeley, California) will present a talk on "object identity" and Evert van Loenen (Philips Research Labs) on "Ambient Intelligence".

The conference will be held in the historical building De Rode Hoed, a 17th century former church on one of the canals in the old center of Amsterdam which is well-known in The Netherlands as a popular location for recording TV shows. The organisers expect that the characteristic Amsterdam combination of tradition, technology and a romantic setting will help to create an exciting event.

Make sure you take part in it! Register as participant at www.swi.psy.uva.nl/bnaic01/

CONFERENCES, SYMPOSIA WORKSHOPS

Below, the reader finds a list of conferences and web sites or email addresses for further information.

July 8-15, 2001
5th WSES/IEEE World Multiconference on Circuits, Systems, Communications & Computers (CSCC 2001). Rethymnon, Crete, Greece.
Information: ioannou@vip.gr or mbetini@italy mail.com

July 22-25, 2001
The Fifth Multi-Conference on Systemics, Cybernetics and Informatics. Orlando, Florida, USA.
Information: http://www.iiis.org/sci/

July 28-29, 2001
Fourth Pacific Rim International Workshop on Multi-Agents (PRIMA'2001). Grand Hotel Taipei, Taiwan.
Information: http://www.lab7.kuis.kyoto-u.ac.jp/ prima 2001/

July 29-August 3 2001
16th International Conference on Production Research. Prague, Czech Republic.
Information: http://www.icpr.cz/

August 5-11, 2001
Eighth International Conference on Composites Engineering (ICCE/8). Tenerife, Spain.
Information: http://www.uno.edu/~engr/composite/

August 18-23, 2001
The CMG 6th Computer Olympiad to be held in Maastricht, The Netherlands.
Information: http://www.cs.unimaas.nl/Olympiad/

August 18-23, 2001
The 18th World Microcomputer Chess Championship (WMCC). Maastricht, The Netherlands.
Information: http://www.cs.unimaas.nl/Olympiad/

August 20-22, 2001
Computer-Games Workshop 2001. Maastricht, The Netherlands.
Information: http://www.cs.unimaas.nl/Olympiad/

August 18-23, Maastricht, The Netherlands

August 20-24, 2001
Summerschool in Logic, Language and Information (ESSLLI XIII). Helsinki, Finland.
Information: http://www.helsinki.fi/ESSLLI/

September 3-7, 2001,
The Twelfth European Conference on Machine Learning (ECML'01) and The Fifth European Conference on Principles and Practice of Knowledge Discovery in Databases (PKDD'01). Freiburg, Germany.
http://www.informatik.uni-freiburg.de/~ml/ecmlpkdd/

September 4-7, 2001
IASTED International Conference: Artificial Intelligence and Applications. Marbella, Spain.
Information: http://www.iasted.com

September 5-7, 2001
IEEE Symposia on Human-Centric Computing Languages and Environments (HCC'01). Stresa, Italy.
Information: http://cuising.unige.ch/HCC01

September 6-8, 2001
The Fifth International Conference on Knowledge-Based Intelligent Information Engineering Systems & Allied Technologies (KES'2001). Osaka-Kyoika University, Osaka, Japan (Sept.6 & 7) Nara-Ken New Public Hall, Nara, Japan (Sept.8)
Information: http://www.brighton.ac.uk/kes/journal

September 10-13, 2001
An International Conference on Text, Speech and Dialogue (TSD 2001). Zelezna Ruda, Czech Republic.
Information: http://www-kiv.zcu.cz/events/tsd2001

September 11-14, 2001
27th International Conference on Very Large Data Bases. Roma, Italy.
Information: http://www.dia.uniroma3.it/vldb2001

September 25-28, 2001
Fifth East-European Conference on Advances in Databases and Information Systems (ADBIS'2001). Vilnius, Lithuania.
Information: http://www.science.mii.lt/ADBIS

September 26-28, 2001
The Fifth Asian Symposium on Computer Mathematics (ASCM 2001). Ehime University, Matsuyama, Japan.
Information: http://www.hpc.cs.ehime-u.ac.jp/~ascm

October 23-26, 2001
The Second Asia-Pacific Conference on Intelligent Agent Technology (IAT-2001). Maebashi Terrsa, Maebashi City, Japan.
Information: http://kis.maebashi-it.ac.jp/iat01

October 25-26, 2001
The 13th Belgian-Dutch Conference on Artificial Intelligence (BNAIC'01). De Rode Hoed, Amsterdam
nformation: http://www.swi.psy.uva.nl/bnaic01/

November 2-4, 2001AAAI Fall Symposium on Anchoring Symbols to Sensor Data in Single and Multiple Robot Systems. MA, USA (exact location TBA).
Information: http://www.aass.oru.se/Living/FSS01/

November 5-7, 2001
The 8th International Conference on Multimedia Modeling (MMM2001). CWI, Amsterdam, The Netherlands.
Information:
http://www.cwi.nl/conferences/MMM01/

November 18-21, 2001
The 7th Australian and New Zealand Intelligent Information Systems conference (ANZIIS), Perth, Australia.
Information: http://www.arcme.uwa.edu.au/~anziis/

November 29-December 2, 2001
The 2001 IEEE International Conference on Data Mining. ICDM '01. Silicon Valey, California.
Information:
http://kais.mines.edu/~xwu/icdm/icdm-01.html

December 10-12, 2001
ES2001: the twenty-first Annual International Conference of the British Computer Society's Specialist Group on Knowledge Based Systems and Applied Artificial Intelligence (SGES). Cambridge, England.
Information: http://www.bcs-sges.org/es2001/

March 1-8, 2001
Interdisziplinäres Kolleg 2002
Information: http://www.tzi.de/ik2002/

March 19-22, 2002
IFIP TC 6 / WG 6.1 The IFIP 14th International Conference on Testing of Communicating Systems. Berlin, Germany.
Information: http://www.fokus.gmd.de/events/

April 2-5, 2002
Sixteenth European Meeting on Cybernetics and Systems Research. Vienna, Austria.
More information: http://www.oefai.at/emcsr/

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Bolesian B.V.
Bolesian houdt zich voornamelijk bezig met innovatieve projecten op het gebied van kennistechnologie, kennismanagement en andere interessante onderwerpen op ICT-gebied. Hierbij kan gedacht worden aan: intelligente matching, bijvoorbeeld resource- en reisplanning, vraagbaaksystemen, beoordelingssystemen binnen financiële instellingen en intelligente planning en schedulingsystemen binnen industrie.
Bolesian is economisch gezien 100% dochter van Cap Gemini Ernst & Young N.V., maar heeft een eigen gezicht en een zelfstandige positie binnen de CGE&Y-groep. Wel wordt binnen een aantal projecten samengewerkt met CGE&Y.

Groeien op een goede voedingsbodem
'Bewust omgaan met kennis en kansen', dat is ons kenmerkend cultuurelement en een goede voedingsbodem voor uitdagende werkzaamheden. Daarom stimuleren we medewerkers om hun kennis verder uit te bouwen en daarna uit te dragen binnen bijvoorbeeld interne werkgroepen, de zogenaamde Special Interest Groups. Uitwisseling van kennis met universiteiten en hogescholen behoort tot onze dagelijkse praktijk. Medewerkers van Bolesian participeren actief in onderzoek en onderwijs. Uitdragen van kennis trekt nieuwe kennis aan en brengt Bolesian in contact met toonaangevende marktpartijen. Niet voor niets verwachten we van onze specialisten dat zij als spreker aanwezig zijn op congressen en dat zij publiceren in de vakbladen. Iedereen bij Bolesian, in welke functie dan ook, kan suggesties doen en initiatieven ontplooien die een verrijking vormen voor Bolesian en haar opdrachtgevers.

Verantwoordelijkheid dragen en doorgroeien
Werken bij Bolesian moet blijven boeien. Daarom zorgen we ervoor, dat binnen relatief kleinschalige projecten met een platte organisatiestructuur, professionals in een goede sfeer met elkaar samenwerken. Daarbij wordt van elke medewerker verwacht dat hij of zij verantwoordelijkheid draagt. Op die manier wordt doorgroeien een vanzelfsprekendheid. Maar ook buiten het eigen project worden medewerkers steeds op de hoogte gehouden. Daarvoor organiseren we bedrijfs- en projectpresentaties. De Sociale Commissie organiseert vier maal per jaar avontuurlijke activiteiten, waarbij collega's elkaar ook op een andere manier leren kennen. Zo zie je onze kennistechnologen ook eens waterskiën, karten of op survival.

Meer informatie
Kijk op: www.bolesian.nl of stuur een mailtje naar hrm@bolesian.nl
Bolesian werkt in heel Nederland, waarbij het accent ligt op de randstad. Naast onze hoofdvestiging in 's-Hertogenbosch beschikken we tevens over een vestiging in Nieuwegein.