

PROGRAM

First International NAISO Congress on

Autonomous Intelligent System

At Waterfront Campus, Deakin University

Geelong, Australia

February 12-15, 2002

Editors:

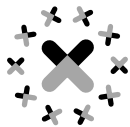
Prof. Dr. Saeid Nahavandi

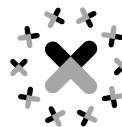


NAISO Interdisciplinary Research
Natural and Artificial Intelligence Systems Organization
Canada/ The Netherlands
<http://www.icsc-naiso.org>

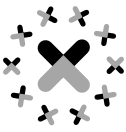
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Preface

Research on Autonomous intelligent systems normally includes disciplines spanning over almost every field in engineering and science. At present there is an enormously increasing interest and need to free more and more devices from being purely passive. Intelligence should be best illustrated by systems and devices that can directly sense and act in their own environment without demanding detailed supervision from humans.

The emergence of autonomous agents and multi-agent technology is one of the most exciting and important events to occur in computer science and engineering during the last decade. It is widely believed that this technology will play a central role in the development of complex distributed systems, networked information systems, and computer interfaces during the twenty-first century.

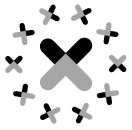
Currently a new generation of sensor rich, massively distributed, autonomous systems are being developed that have the potential for profound social, environmental, and economic change. The fundamental quest of constructively understanding intelligence can only be solved in the long run by investigating the combined aspects of the body, the mind, and social interactions.

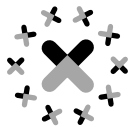
The concept of autonomous intelligent systems includes various aspects, which are so far only partially investigated from different scientific fields. This congress is a vehicle in facilitating the cross pollination of recently developed ideas and concepts.

Full papers were received from more than 38 countries around the globe and only 58 percent of the top quality papers were accepted for publication in the proceedings after going through a full peer review process by at least two reviewers from the international technical committee.

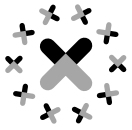
Prof. Dr. Saeid Nahavandi

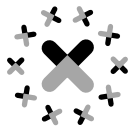
February 2002





General Information





General Information

Autonomous intelligent systems can be described as intelligent entities that are capable of independent action in dynamic, unpredictable environments. This is a very fast growing research area attracting the attention of many researchers around the globe. The aim of the International Congress on Autonomous Intelligent Systems (ICAIS) is to bring the researchers, system developers and users both from industry and academia together to exchange their views and receive the very latest information on the on-going research and development. This will be carried out through a series of keynote addresses, technical sessions, workshops and exhibitions.

The International Congress on Autonomous Intelligent Systems welcomes submissions of original and high quality papers. Accepted papers will be formerly published in the NAISO ICAIS proceedings.

ICAIS 2002 will include invited plenary talks, contributed sessions, invited sessions, workshops and tutorials. Updated information available on ICAIS web site.

Conference Location

Geelong

Located on Corio Bay, 75n Km south west of Melbourne, Geelong with a population of 191.000 is the largest city in Victoria. It is well known for its wool and vehicle industries and is the center for the popular Bellarine Peninsula, the scenic Surf Coast and the farming areas to the North and West. It is as well one of the first regions in Victoria that started producing wine. It is a deep-water port and such was the rivalry with Melbourne during the goldrush days of the 1850s that Geelong came close to being the state's capital.

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Dr. Charles R. Weisbin

Jet Propulsion Laboratory, NASA, USA

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Deakin University, Australia

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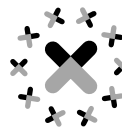
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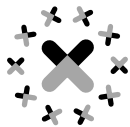
Dr. Uwe Zimmer
The Australian National University, Australia

Local organizing committee members

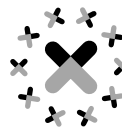
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Lingxue Kong
Abbas Kouzani
Saeid Nahavandi
Hieu Trinh
Jingxin Zhang

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Congress Organizer

NAISO Interdisciplinary Research
Natural and Artificial Intelligence Systems Organization

Who is NAISO?

The Natural and Artificial Intelligence Systems Organization (NAISO) Canada, a non-profit making multinational organization interested in interdisciplinary development of science and technology, was founded in June 1999, as the succeeding organization of ICSC International Computing Sciences Conventions.

Its mission statement: To serve the scientific community.

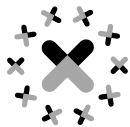
The long term overall objectives of NAISO are the encouragement of efficient communication infrastructure between scientists, researchers, engineers and practitioners in all sciences. Sharing the work with people in other, perhaps unrelated, fields, new thinking about their own work is generated. Fresh, lateral thinking is the aim of NAISO.

NAISO will meet these objectives by the arrangements of international conventions, conferences, mini-tracks, seminars and workshops in collaboration with universities and industries, supporting focused technology transfer activities to new potential application areas and strong interaction between research and industry. Participation in its activities is encouraged on a world-wide basis.

NAISO is represented by its International Academic Advisory Council (IAAC), designed as a source of academic guidance and active support for future projects. The Council is presided by Peter Anderson, RIT New York, USA.

Since January 1, 2001, NAISO's operating division has been out-sourced to ITS Transnational The Netherlands, to ensure the continuity of high quality within its future projects. ITS Transnational has offered a full range of professional services with regard to conference administration and management.

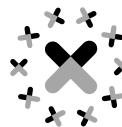
The synergy: increased effectiveness and achievement produced by combined action and cooperation.



International Academic Advisory Council

Congress Organizer

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Lotfi A. Zadeh (Honorary IAAC member), University of California, Berkeley, CA, USA
Uwe R. Zimmer, GMD - Japan Research Laboratory, Japan
Hans-Juergen Zimmermann, RWTH-Aachen, Germany



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Registration

Please note that all participants must contact the registration/hospitality desk upon arrival. Please register as early as possible to avoid rush prior to the opening session.

The desk will be staffed at the following times:

Tuesday, February 12th	13.00 – 18.00 hrs
Wednesday, February 13th	08.00 – 15.30 hrs
Thursday, February 14th	08.00 – 15.30 hrs
Friday, February 15th	08.00 - 15.30 hrs

Each participant will receive full documentation and proceedings, if ordered, at the conference.

Coffee breaks and lunches

All coffee breaks and the lunches will be held in the Costa Hall foyer at the Waterfront Campus.

For the lunches you will need your badge and voucher of that day. Signage throughout the conference area will guide you to the rooms. Please do not hesitate to ask the staff at the registration desk if you have any questions.

Welcome reception and dinner

The welcome reception will be held at the Royal Yacht club. Directions can be found on the welcome letter. For the congress dinner, buses will depart at 18:30 hrs to Spray Farm from Deakin University coach/car park (Gerinhap Street entrance) and return at 22:30 hrs.



Paper Presentations and Publications

Please note that the scheduling of the presentations is final and that changes cannot be made without affecting many other speakers and listeners. Thank you for your cooperation.

Each paper will be presented by one of the authors. The speakers are requested to report to the session chairman in the assigned conference room not later than 10 minutes before each session starts. The time assigned for each paper is 20 minutes (including 5 minutes for discussion). All speakers and session chairs must strictly adhere to the time schedule.

Conference language is English.

Each conference room is provided with an overhead projector for transparent films and a data projector (LCD). For any further requirements, please contact the organizers prior to the congress.

All papers presented at ICAIS 2002 are published in these proceedings.

Additional copies are available from ICSC Academic Press

Publication by ICSC Academic Press, Canada/ The Netherlands

Selected papers will be considered for publication in leading international journals.

Further Scientific Publications

A wide range of proceedings from other NAISO conferences is available.

Please consult the following website: <http://www.icsc-naiso.org>



Upcoming Events

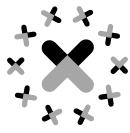
NL 2002

First International ICSC- NAISO Congress on
NETWORKED LEARNING IN A GLOBAL ENVIRONMENT
Challenges and Solutions for Virtual Education
1-4 May 2002
Berlin, Germany

EIS 2002

Third International ICSC- NAISO Symposium on
ENGINEERING OF INTELLIGENT SYSTEMS
24-27 September 2002
Malaga, Spain

All other information concerning coming events for the next few years can be found on the following website: <http://www.icsc-naiso.org>. The site is updated regularly.



Scientific Program

Upcoming Events

NAISO - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit Discard Size

Address Go Koppelingen

NAISO Natural & Artificial Intelligence Systems Organization
Interdisciplinary Research

NEWS

2008

- 2008**
 - AUTONOMOUS INTELLIGENT SYSTEMS**
- 2007**
 - WMP2007 POSTPONED**
 - WORLD MANUFACTURING CONGRESS**
- 2002**
 - NETWORKED LEARNING IN A GLOBAL ENVIRONMENT**
- 2002**
 - ENGINEERING OF INTELLIGENT SYSTEMS**

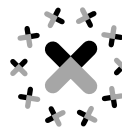
2008

- 2008**

Who are we? IAAC Administration Proceedings Upcoming Events Review Site Related Organizations Related Events Co-Sponsored Events Past Events

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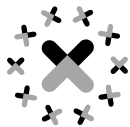
Congress Schedule

12 February 2002

- 13.00 – 18.00 Registration
- 14.00 – 15.00 Tutorial, Professor Helena Szczerbicka, (System Optimization Using Simulation Models), University of Hannover, Germany
(for details see page 23)
- 18.30 – 20.00 Welcome Cocktail

13 February 2002

- 8.00 – 9.00 Registration
- 9.00 – 9.15 Opening Session Speech - Professor Saeid Nahavandi
- 9.15 – 10.30 Plenary Speech - Dr. Charles R. Weisbin,
NASA Jet Propulsion Laboratory (A New Method to Evaluate, Optimize and Forecast Human and Robot Performance in 21st Century Space Operations)
(for details see page 25)
- 10.30 – 11.00 Coffee Break
- 11.00 – 13.00 Technical sessions
- 13.00 – 14.00 Lunch
- 14.00 – 15.00 Plenary Speech – Professor Ed Szczerbicki
University of Newcastle, Australia (Modelling Support for Information Management)
(for details see page 31)
- 15.00 – 15.30 Coffee Break
- 15.30 – 17.30 Technical Sessions



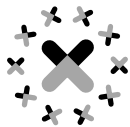
14 February 2002

- 8.00 – 9.00 Registration
- 9.15 – 10.30 Keynote Speech – Professor Lotfi A. Zadeh, University of California, Berkeley, USA (Capability to Search Engines -- The Concept of Protoform)
(for details see page 33)
- 10.30 – 11.00 Coffee Break with Poster Sessions
- 11.00 – 13.00 Technical sessions
- 13.00 – 14.00 Lunch
- 14.00 – 15.00 Plenary Speech Dr. Uwe R. Zimmer,
The Australian National University, Australia (Autonomous Physical Systems)
(for details see page 38)
- 15.00 – 15.30 Coffee Break with Poster Sessions
- 15.30 – 17.30 Technical sessions
- 19.00 – 22.00 Congress Banquet

15 February 2002

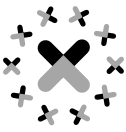
- 9.15 – 10.30 Keynote Speech – Professor Ray Jarvis,
Monash University, Australia (Autonomous, Tele-Autonomous and
Teleoperated Outdoor Mobile Robot Navigation)
(for details see page 43)
- 10.30 – 11.00 Coffee Break
- 11.00 – 13.00 Technical sessions/Invited Session
- 13.00 – 14.00 Lunch
- 14.00 – 15.00 Technical Sessions
- 15.00 – 15.30 Coffee Break
- 15.30 – 16.30 Panel discussion
- 16.30 – 17.30 Closing Session





Detailed Program





Detailed Program

Tuesday February 12th

TUTORIAL

'System Optimization Using Simulation Models'

by Professor Helena Szczerbicka, University of Hannover, Germany

Time: 14:00-15:00

Room: D2211

We consider how Simulation can be used to design a system to yield optimal expected behaviour. We assume that the specific measure of the system behaviour (goal function) depends on values of the parameters (input parameters) chosen for the system. We want to determine the values of these parameters yielding the optimal value of this measure, possibly subject to some constraints. The underlying system is so complex, that there is no mathematical closed expression for the goal function and it is necessary to use simulation to evaluate it for every set of input parameter values.

The technique used for optimisation is expected to be able to locate the global optimum, to be robust in converging, not sensitive to noise in evaluations of single values of the goal function and efficient.

In the tutorial we present an introduction to simulation optimisation techniques.

We briefly review gradient techniques and focus on random search techniques.

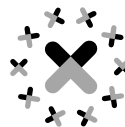
The aim is to provide an introduction to major developments in the field of simulation optimisation, rather than a survey of the current status of optimisation or providing description of algorithms ready to work.

First we present a method for using simulation to estimate a gradient of the expected goal function with respect to input parameters values. Then we discuss stochastic approximation and sample path optimisation.

Finally we present two techniques based on random search: Simulated Annealing and Genetic Algorithms. We conclude with an introduction of a recent development, an optimisation tool REMO, which illustrates the use of advanced and efficient version of Genetic Algorithms for simulation optimisation.

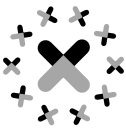
Short vita

Dr. Szczerbicka has been graduated in Applied Mathematics and has got a Ph.D. in Computer Science from the Warsaw University of Technology, Poland. After some years of teaching and research at the same University, she was appointed at the University of Karlsruhe, Germany, then took a professor position at the University of Bremen, Germany. Since 2000 she has been chairing the Institute of the Computer Science at the University of Hannover, Germany as a full professor. She works actively in the Society for Computer Simulation (SCS), the Federation of European Simulation Societies (Eurosim) and the German Simulation Society (ASIM). She serves as a member of an editorial board of the book series Frontiers of Simulation. Recently



she has been involved in international activities on establishing a curriculum for an educational program for a simulation degree and a certification of simulation professionals as a member of the international Modeling & Simulation Professional Certification Implementation Group, Washington, USA. Since 1990 she is an Associate Member of the McLeods Institutes of Simulation Sciences, USA. Since 1992 she has been conducting the FG4.5.3 Working Group Simulation and Artificial Intelligence of the German Society of Computer Science (GI). She has been involved in organization of numerous conferences in the field of simulation, working in program committees, and as a track, program or general chair as well. She is an author or co-author of more than 80 papers and co-author of one book on Simulation and Artificial Intelligence. Four papers have got a label of a best paper award. Her research interests primarily focus on the field of modelling performance and performability of large scale, discrete dynamic systems. In further development she expanded areas of interests onto application of methods of artificial intelligence to modelling, simulation and validation as well as distributed and web-based simulation. Directions in her research have been frequently triggered by industrial co-operations.

Currently she has been involved in establishing a research Center for Integrated Simulation CIS at the University of Hannover, Germany.



Wednesday February 13th

Detailed Program

Opening Session Speech

By Professor Saeid Nahavandi

Time: 09:00 – 09:15

Room: D2211

Plenary Speech

By Charles Weisbin

Time: 09:00 – 10:30

Room: D2211

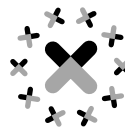
'A New Method to Evaluate, Optimize and Forecast Human and Robot Performance in 21st Century Space Operations'

Charles R. Weisbin, NASA Jet Propulsion Laboratory, USA

Revolutionary advances in human and robot cooperation will enable bold, innovative capabilities for scientific reconnaissance and exploration of planetary surfaces, for permanent presence beyond low Earth orbit, and for eventual development of space resources for use on Earth and in space. The ultimate extent of these future capabilities is unbounded, as it depends on yet to be made but anticipated innovations at the intersection of such areas as robotics, human factors, information technology, bio-technology and highly miniaturized (e.g. nano-scale) electronic systems. In order to capitalize on the great opportunities enabled by these revolutionary technologies, it is essential to define and design new human-robot architectural concepts that minimize risk, while optimizing the performance that both humans and robots working together can achieve. This is one of the challenges for the community attending this workshop.

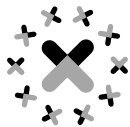
Human and robot skills are synergistic and complementary. Humans provide as yet unmatched capabilities to perceive, think, and act when faced with anomalies and unforeseen circumstances, but there are huge potential risks to human safety involved in getting these benefits.

Robots provide complementary skills in being able to work in extremely risky environments, but their ability to perceive, think, and act by themselves is currently not error-free, although these capabilities are continually improving with the emergence of new technologies. There is substantial historical evidence to validate these generally qualitative notions. For example, N. Armstrong's celebrated terminal descent maneuver to the lunar surface could most probably not be done reliably, even now, several decades after the event occurred. In contrast, robots have survived at Venus, Jupiter and other very extreme environments, not likely to be endured by humans in the foreseeable future. There are myriad similar historical anecdotes, both on



Earth and in space, that suggest the relative strengths of humans and robots. This evidence is undoubtedly all accurate. However, such evidence must now be augmented with a more rigorous analytical framework that enables systematic, quantitative evaluation of human and robot roles, in order to optimize the design and performance of human-robot system architectures using well-defined performance evaluation metrics.

This talk summarizes a new analytical method to conduct such quantitative evaluations. Ideas from several disciplines, including robotics, human factors, and information and system theory are combined into a unified analytical framework for performance evaluation, optimization and forecasting. The method is generically applicable to all scenarios, including past, current and future missions. The talk discusses how to compare quantitatively the performance of a large variety of human-robot systems, how to optimize the allocation of roles to humans and robots, and how to forecast future performance. The results of 2 representative case studies, one in surface science exploration and the other in space assembly of large telescopes, are used throughout to illustrate the application of the method.



Wednesday February 13th

Detailed Program

Application of Genetic Algorithms in Multi Agent System

Time: 11:00-12:20

Room: D2211

Chair:

11:20-11:20

#100028-02-AK-051

'Optimizing Wavelets for Wavelet Packet Analysis of Ammunition Doppler Signals by Genetic Algorithm'

Dr Abbas Z Kouzani, Deakin University, Australia

S.H. Ong, Deakin University, Australia

11:20-11:40

#100028-02-TS-112

'Evolutionary Approach to Multiobjective Problems Using Adaptive Memetic Algorithm'

Prof Dr Te-Jen Su, National Kaohuiung University of Applied Sciences, Taiwan

Boi-Wei Wang, National Kaohuiung University of Applied Sciences, Taiwan

Wen-Jye Shyr, National Changhua University of Education Changhua, Taiwan

Tze-Li Kang, National Changhua University of Education Changhua, Taiwan

11:40-12:00

#100028-02-TS-116

'Comparison of Memetic Algorithm and Genetic Algorithm for Evaluation of Optimization Problems'

Prof Te-Jen Su, National Kaohuiung University of Applied Sciences, Taiwan

Boi-Wei Wang, National Kaohuiung University of Applied Sciences, Taiwan

Wen-Jye Shyr, National Changhua University of Education Changhua, Taiwan

Tze-Li Kang, National Changhua University of Education Changhua, Taiwan

12:00-12:20

#100028-02-YN-008

'Application of Intelligent Algorithms for Humanoid Robot Gait Generation: A Case Study for Going Up-stairs'

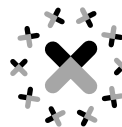
Dr Yasuo Nasu, Yamagata University, Japan

G. Capi, Yamagata University, Japan

L. Barolli, Yamagata University, Japan

K. Mitobe, Yamagata University, Japan

M. Yamano, Yamagata University, Japan



Wednesday February 13th

Generic Agent / Intelligent Agent

Time: 11:00-13:00

Room: D2212

Chair: Dr. Sahid Albayrak

11:00-11:20

#100028-02-AS-030

'Agent-Based Knowledge Fusion in Scalable Information Environment: Major Principles and System Framework'

Prof. Dr. Alexander V. Smirnov, SPIIRAS, Russia

Mikhail Pashkin, SPIIRAS, Russia

Nikolai Chilov, SPIIRAS, Russia

Tatyana Levashova, SPIIRAS, Russia

11:20-11:40

#100028-02-FB-118

'Behavior Planning for Adaptive Agents'

Prof. Dr. Freimut Bodendorf, University of Erlangen-Nuremberg, Germany

11:40-12:00

#100028-02-JV-081

'CGP- Net to Model Multi-Agent-Systems'

Mr. Jean-Dany Vally, Iremia (La Réunion), FRANCE

Rémy Courdier, Iremia (La Réunion), FRANCE

12:00-12:20

#100028-02-PS-119

'A Framework for Internet Data Collection Based on Intelligent Agents'

Mr. Pedro A. C. Sousa, UNINOVA, Portugal

João Pimentão, UNINOVA, Portugal

Adolfo Steiger, UNINOVA, Portugal

12:20-12:40

#100028-02-RB-007

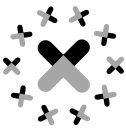
'Adaptive State Space Quantization for Reinforcement Learning Agents'

Dr. Ralph Breithaupt, Nat. Research Centre for Information Technology, Germany

Oliver Hofmann, Nat. Research Centre for Information Technology, Germany

J. Fischer, Nat. Research Center for Information Technology, Germany

M. Bode, University of Muenster, Germany



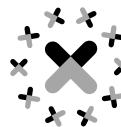
12:40-13:00

#100028-02-SA-010

***'JIAC IV - An Open, Scalable Agent Architecture for
Telecommunications Applications'***

Dr Sahin Albayrak, TU Berlin, Germany

Ralf Sessler, TU Berlin, Germany



Wednesday February 13th

Neural Network and Reinforcement Learning

Time: 11:00-12:00

Room: D2212

Chair:

11:00-11:20

#100028-02-AT-068

'Application of Artificial Neural Networks for Predicting CNC Machine Failures'

Dr Ambalavanar Tharumarajah, CSIRO Manufacturing Science & Technology, Australia

11:20-11:40

#100028-02-LZ-019

'A New Neural Network Based on Wavelet Kernel Function'

Dr Li Zhang, Xidian University, China

Weida Zhou, Xidian University, China

LiCheng Jiao, Xidian University, China

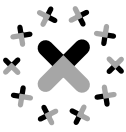
11:40-12:00

#100028-02-RA-022

'The Use of An Evolutionary Computing For Solving Course Scheduling Problems'

Dr. Reza Tavakkoli Moghaddam, University of Tehran, Iran

Kaveh Sheibani, University of Tehran, Iran



Wednesday February 13th

PLENARY SPEECH

'Modelling Support for Information Management'

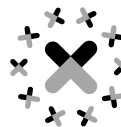
by Edward Szczerbicki, University of Newcastle, Australia

Time: 14:00–15:00

Room: D2211

ABSTRACT

Systems become increasingly complex. Their decomposition into smaller units is the usual way to overcome the problem of complexity. This has historically led to the development of atomized structures consisting of a limited number of autonomous subsystems that decide about their own information input and output requirements, i.e. can be characterized by what is called an information closure. Autonomous subsystems can still be interrelated and embedded in larger systems, as autonomy and independence are not equivalent concepts. These ideas are gaining very strong interest in both academia and industry, and the atomized approach to information flow modelling and evaluation is an idea whose time has certainly come. This presentation discusses some modelling and evaluation issues and challenges existing in the exciting area of information flow management for autonomous subsystems.



Wednesday February 13th

Multi-Agent Based System

Time: 15:30-16:50

Room: D2211

Chair:

15:30-15:50

#100028-02-DM-109

'A Simulation Environment for Heterogenic Agents'

Mr David Meyer, Vienna University of Technology, Austria

Alexandros Karatzoglou, Vienna University of Technology, Austria

Friedrich Leisch, Vienna University of Technology, Austria

Kurt Hornik, Vienna University of Technology, Austria

Christian Buchta, Vienna University of Economics and Business Administration, Austria

15:50-16:10

#100028-02-KT-085

'f-Desktop: A Framework for Follow-Me Desktop Applications in Ubiquitous Computing Environment'

Dr Kazunori Takashio, Vienna University of Economics and Business Administration, Austria

Gakuya Soeda, Vienna University of Economics and Business Administration, Austria

Hideyuki Tokuda, Keio University, JAPAN

16:10-16:30

#100028-02-SW-072

'A Multi-Agent Strategy for Dynamic Distributed Scheduling of Manufacturing Systems'

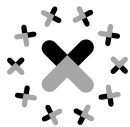
Mr Simon P Walsh, CSIRO Manufacturing Science and Technology, Australia

16:30-16:50

#100028-02-WJ-067

'A Process Algebra for Anti-Cheating Among Cooperative Agents'

Dr Wenpin Jiao, University of Victoria, Canada



Thursday February 14th

KEYNOTE SPEECH

'Capability to Search Engines-The Concept of Protoform'

by Prof. Lotfi A. Zadeh, University of California, USA

Time: 09:15 – 10:30

Room: D2211

ABSTRACT

Existing search engines have many remarkable capabilities. But what is not among them is the deduction capability -- the capability to answer a query by drawing on information which resides in various parts of the knowledge base or is augmented by the user.

Limited progress toward a realization of deduction capability is achievable through application of methods based on bivalent logic and standard probability theory. But to move beyond the reach of standard methods it is necessary to change direction. In the approach which is outlined, a concept which plays a pivotal role is that of a prototype -- a concept which has a position of centrality in human reasoning, recognition, search and decision processes.

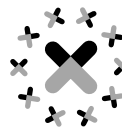
Informally, a prototype may be defined as a sigma-summary, that is, a summary of summaries. With this definition as the point of departure, a prototypical form, or protoform, for short, is defined as an abstracted prototype. As a simple example, the protoform of the proposition "Most Swedes are tall" is "QA's are B's," where Q is a fuzzy quantifier, and A and B are labels of fuzzy sets.

Abstraction has levels, just as summarization does. For example, in the case of "Most Swedes are tall," successive abstracted forms are "Most A's are tall," "Most A's are B's" and "QA's are B's."

At a specified level of abstraction, propositions are PF-equivalent if they have identical protoforms. For example, propositions "Usually Robert returns from work at about 6 pm" and "In winter, the average daily temperature in Berkeley is usually about fifteen degrees centigrade," are PF-equivalent. The importance of the concepts of protoform and PF-equivalence derives in large measure from the fact that they serve as a basis for knowledge compression.

A knowledge base is assumed to consist of a factual database, FDB, and a deduction database, DDB. In both FDB and DDB, knowledge is assumed to fall into two categories: (a) crisp and (b) fuzzy. Examples of crisp items of knowledge in FDB might be: "The height of the Eiffel tower is 324m" and "Paris is the capital of France." Examples of fuzzy items might be "Most Swedes are tall," and "California has a temperate climate." Similarly, in DDB, an example of a crisp rule might be "If A and B are crisp convex sets, then their intersection is a crisp convex set." An example of a fuzzy rule might be "If A and B are fuzzy convex sets, then their intersection is a fuzzy convex set."

The deduction database is assumed to consist of a logical database and a computational database, with the rules of deduction having the structure of protoforms. An example of a computational rule is "If Q A's are B's and Q (A and B)'s are C's," then "Q Q A's are (B and C)'s," where Q and Q are fuzzy quantifiers, and A, B and C are labels of fuzzy sets. The number of



rules in the computational database is assumed to be very large in order to allow a chaining of rules that may be query-relevant.

A very simple example of deduction in the prototype-centered approach-an example which involves string matching but no chaining -- is the following. Suppose that a query is "How many Swedes are very tall?" A protoform of this query is: ?Q A's are B, where Q is a fuzzy quantifier and B is assumed to represent the meaning of "very B," with the membership function of B being the square of the membership function of B. Searching DDB, we find the rule "If Q A's are B then Q A's are B," whose consequent matches the query, with ?Q instantiated to Q, A to "Swedes" and B to "tall." Furthermore, in FDB, we find the fact "Most Swedes are tall," which matches the antecedent of the rule, with Q instantiated to "Most." A to "Swedes" and B to "tall." Consequently, the answer to the query is "Most Swedes are very tall," where the membership function of "Most " is the square root of Most in fuzzy arithmetic.

The concept of a prototype is intrinsically fuzzy. For this reason, the prototype-centered approach to deduction is based on fuzzy logic and perception-based theory of probabilistic reasoning, rather than on bivalent logic and standard probability theory.

What should be underscored is that the problem of adding deduction capability to search engines is many-faceted and complex. It would be unrealistic to expect rapid progress toward its solution.

BIOGRAPHY

Lotfi A. Zadeh is Professor in the Graduate School and director, Berkeley initiative in Soft Computing (BISC), Computer Science Division and the Electronics Research Laboratory, Department of EECS, University of California, Berkeley, CA 94720-1776; Telephone: 510-642-4959; Fax: 510-642-1712;

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ONR Grant FDN0014991035,
ARO Grant DAAH 04-961-0341
and the BISC Program of UC Berkeley



Thursday February 14th

'Capability to Search Engines-The Concept of Protoform'

Poster Session

Time: 10:30-11:00 & 15:00-15:30

Room: Costa Hall Foyer

#100028-02-FS-114

'A Method to realize Natural Interaction in Interactive Genetic Algorithm'

Prof Dr Futoshi Sugimoto, Toyo University Japan

Masahide Yoneyama, Toyo University Japan

#100028-02-EA-037

'Determining Terms Using Compound Filed Association Words and its Knowledge Representations'

Mr ElSayed Abd Atlam, University of Tokushima, Japan

Jun Aoe, University of Tokushima, Japan

#100028-02-GC-092

'Development of Buoy-Type Automatic Water Quality Monitoring System'

Mr Gwang J Chung, Korea Institute of Machinery & Materials, Republic of Korea

Mr J. J. Lee, Korea Institute of Machinery & Materials, Republic of Korea

Mr S.W. Lee, Korea Institute of Machinery & Materials, Republic of Korea

J. H. Oh, Korea Institute of Machinery & Materials, Republic of Korea

#100028-02-HW-011

'The Changing Trends in Electricity Trading: A Role for Artificial Intelligent Agents'

Dr Henry C. Wong, University of Dundee Scotland, UK

Bruce Ramsay, University of Dundee Scotland, UK

#100028-02-JW-123

'Autonomous Multi-Agent System Model of Telecommunications Networks'

Dr John E Wells, University of Dundee Scotland, UK

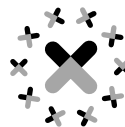
Dr Bruce Ramsay, University of Dundee Scotland, UK

#100028-02-LX-039

'Agent-Based Reconfiguration of Legacy Software Systems'

Mrs Liu Xijuan, Shanghai Jiaotong University, China

Wang Yinglin, Shanghai Jiaotong University, China



#100028-02-ME-103

'Energy Flow And Management of A Hybrid Wind/PV/ Fuel Cell Generation System'

Dr Mona N. Eskander, Electronics Research Institute, Egypt
Thanaa El Shatter, Electronics Research Institute, Egypt
Mohsen El-Hagry, Electronics Research Institute, Egypt

#100028-02-NM-104

'Real time Intelligent Driver Assistance System'

Dr Nasrollah M. M.Charkari, Tarbiat Modarres University, Iran
Ali Kheradvar, Tarbiat Modarres University, Iran

#100028-02-RP-049

'Communication Mechanisms for Mobile Agents'

Mr Ram Bahadur Patel, India Institute of Technology Roorkee, India
Prof. Kumkum Garg, India Institute of Technology Roorkee, India

#100028-02-WS-127

'Xpertfinder- Expert Finding within Specified Subject Areas Through Analysis of Messages'

Dr Wildfried Sihn, Fraunhofer-Institute for Manufacturing Eng. and Automation, Germany
Frank Heeren, Fraunhofer-Institute for Manufacturing Eng. and Automation, Germany

#100028-02-WZ-020

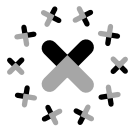
'Analysis on the Generalization Performance of SVMs'

Dr Weida Zhou, Xidian University, China
Licheng Jiao, Xidian University, China
Li Zhang, Xidian University, China

#100028-02-YY-111

'Parallel Neural Networks by Actively Repetitive Learning with Autonomous Label Assignment and Majority Voting'

Mr Yohtaro Yatsuzuka, KDDI R&D Labs, Japan
Tetsuya Sugiyama, Ecology Simulation Labs, Japan



Thursday February 14th

Poster Session

Autonomous Agents in Practice

Time:11:00- 12:00

Room:D2211

Chair:

11:00-11:20

#100028-02-LC-062

***'Autonomous Intelligent Agents for Metasynthetic Engineering:
A Macroeconomic Decision Support System***

'Dr Longbing Cao, Institute of Automation,Chinese Academy of Science, China

Ruwei Dai, Institute of Automation,Chinese Academy of Science, China

11:20-11:40

#100028-02-NE-032

***'Modeling Autonomous Agent's Architecture with Knowledge
Migration in Social Agency'***

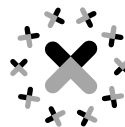
Dr Noriko Etani, Ritsumeikan University, Japan

11:40-12:00

#100028-02-ES-004

***'Defining Information Flow for Autonomous Manufacturing
Agents: Analytical Model'***

Prof Edward Szczerbicki, The University of Newcastle, Australia



Thursday February 14th

PLENARY SPEECH

'Autonomous Physical Systems'

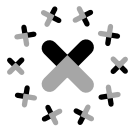
by Dr. Uwe R. Zimmer, The Australian National University,
Australia

Time: 14:00 – 15:00

Room: D2211

ABSTRACT

This presentation tries to identify current critical issues of autonomous systems operating as physical entities in the real world. Although there are many computer systems in close connection to the physical world already (embedded systems), we wonder how much and what kind of autonomy we should wish for or be afraid of. In some environments basic autonomy is not just an option, but required - like in many underwater or planetary exploration applications. In most other environments we need to understand the possible or potential degrees of autonomy before declaring a possibly multiple ton vehicle or fast and powerful machine ready to interact with the physical world or even with biological species. Real-Time and synchrony are the further key topics in understanding dynamical systems in physical environments, while reliability and robustness are the essential constraints on the road towards practical systems. Moreover, interesting systems need to be adaptive to changing environments and should perhaps even implement life-long learning. How close or how far we are from integrating all these hard and challenging topics, will be investigated based on a set of historic and recent examples.



Thursday February 14th

Control System Design

Time: 15:30-17:10

Room: D2211

Chair: Dr Frank Moore

15:30-15:50

#100028-02-FM-031

'A Methodology for Reducing the Observed Radar Cross Section of Autonomous Precision Guided Munitions'

Dr Frank W Moore, Miami University USA

15:50-16:10

#100028-02-KY-042

'Digital Observer-Based Controller Design of Decentralized Actuator Systems'

Dr Kai-Chao Yao, National Chinese Naval Academy, China

16:10-16:30

#100028-02-KY-047

'Computer Control of Decentralized Singular-Perturbed Systems'

Dr Kai-Chao Yao, National Chinese Naval Academy, China

16:30-16:50

#100028-02-RZ-095

'A Robust Control Scheme for Robot Manipulator by Using a Genetic Algorithm'

Dr Rongyan Zhu, Ashikaga Institute of Technology, Japan

Yuzo Yamane, Ashikaga Institute of Technology, Japan

16:50-17:10

#100028-02-YV-136

'Synthesis of Decentralized Nonlinear Control Systems with Uncertainties'

Y.A. Vershinin, School of Engineering Coventry University, UK

A.R. Gaiduk, Taganrog State University, Russia

M.J. West, School of Engineering Coventry University, UK

M.Y. Medveder, Taganrog State University, Russia



Thursday February 14th

Machine Learning

Time: 11:00-12:40

Room: D2212

Chair: Prof. Dr. Sæid Nahavandi

11:00-11:20

#100028-02-TL-090

'RAGUN: A Resource-Allocating Agent Based on a Network of Gaussian Units'

Prof Thibault Langlois, INESC-ID / IST, Portugal

Fernando Mira da Silva, INESC-ID / IST, Portugal

11:20-11:40

#100028-02-SN-124

'Visual Learning Control of a Robot in an Unknown Environment'

Prof. Dr. Sæid Nahavandi, Deakin University, Australia

Nan-Feng Xiao, Deakin University, Australia

11:40-12:00

#100028-02-AK-045

'Classifying Lighting Variations in Facial Images'

Abbas Z Kouzani, Deakin University, Australia

S.H. Ong, Deakin University, Australia

12:00-12:20

#100028-02-JK-071

'Automatic Region-Based Motion Detection and Segmentation for ITS'

Mr Jong Bae Kim, Kyungpook National University, South Korea

Hang Joon Kim, Kyungpook National University, South Korea

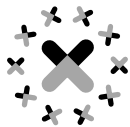
Kyung Mee Lee, Kumi 1College, South Korea

12:20-12:40

#100028-02-SM-066

'Victim Detection with Infrared Camera in a "Rescue Robot"'

Mr Saeed Moradi, Sharif University of Technology, Iran



Thursday February 14th

Machine Learning

Trajectory / Path Planning in Intelligent Mobile Robots

Time:15:30-17:50

Room:

Chair:

15:30-15:50

#100028-02-AL-080

'Hierarchical Architecture for Coordinating Ground Vehicles in Unstructured Environments'

Mr Alberto D Lacaze, National Institute of Standards and Technology, USA

15:50-16:10

#100028-02-DM-083

'Navigation Templates for PSA'

Prof David P Miller, University of Oklahoma, USA

Li Tan, University of Oklahoma, USA

16:10-16:30

#100028-02-JF-040

'DIVA: A Self Organizing Adaptive World Model for Reinforcement Learning'

Mr Joern Fischer, GMD National Research Center, Germany

Ralph Breithaupt, GMD National Research Center, Germany

Mathias Bode, GMD National Research Center, Germany

Joachim Hertzberg, GMD National Research Center, Germany

16:30-16:50

#100028-02-KM-070

'Intelligent Control for Off-Road Driving'

Mr Karl N Murphy, National Institute of Standards and Technology, USA

Marilyn Abrams, National Institute of Standards and Technology, USA

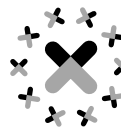
Stephen Balakirsky, National Institute of Standards and Technology, USA

Tommy Chang, National Institute of Standards and Technology, USA

Tsai Hong, National Institute of Standards and Technology, USA

Alberto Lacaze, National Institute of Standards and Technology, USA

Steve Legowik, National Institute of Standards and Technology, USA



16:50-17:10

#100028-02-LF-060

'Stabilization and Trajectory Tracking of Nonholonomic Systems: New Strategies Using Feedback Control'

Mr Luiz C Figueiredo, UNILESTE, Brazil

Fabio Jota, UFMG, Brazil

17:10-17:30

#100028-02-RJ-099

'A "Go Where you are Looking" Semi-Autonomous Robotic Wheelchair.'

Prof Raymond (Ray) A Jarvis, Monash University, Australia

17:30-17:50

#100028-02-SP-097

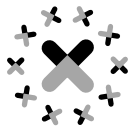
'A Geometric Approach to Natural Indoor Landmark Recognition for Mobile Robots'

Dr Stefano Panzieri, Universita degli Studi "Roma Tre", Italy

Alessandro Micarelli, Universita degli Studi "Roma Tre", Italy

Enver Snaginetto, Universita degli Studi "Roma Tre", Italy

Giuseppe Sansonetti, Universita degli Studi "Roma Tre", Italy



Friday February 15th

KEYNOTE SPEECH

'Autonomous, Tele-Autonomous and Teleoperated Outdoor Mobile Robot Navigation'

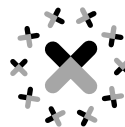
by Professor Ray Jarvis, Monash University, Australia

Time: 9:15 – 10:30

Room: D2211

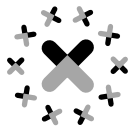
ABSTRACT

As robots move out of factory based (and other) structured environments, richer sensory data and larger amounts of Artificial Intelligence are required to cope with the varying degrees of unstructuredness (uncertainty). Currently there are many operational environments which are too complex to permit fully autonomous robotic functionality or where the expense of providing such a capability is not yet justifiable. Teleoperation and Tele-Autonomous modes of control can often provide useful solutions whilst progress towards full automation is being realised incrementally. One consistent approach to developing useful mobile systems for supporting practical applications such as search and rescue and bushfire fighting (amongst many others) is to study the requirements of full autonomy, assess the viability of providing such capability and then stepping back from this extreme to include human judgement based intervention where either needed or regarded as cost effective. This strategy has the advantage of being able to provide a useful capability here and now whilst allowing (gracefully) for future developments in sensor quality and affordability, computational power at low cost and new methodologies to move the application solution to full automation without sacrificing reliability. This presentation will outline the basic ingredients of outdoor mobile robot navigation systems (subject to the modalities of teleoperation to full autonomy) and illustrate these concepts and methodologies using case studies. A number of robotic vehicle projects (within the Intelligent Robotics Research Centre at Monash University), including work on an excavator, a Martian rover model, an amphibious vehicle, a heavy duty tracked vehicle and several water craft will provide these case studies which will be illustrated with video clip sequences. The current potential for establishing new Australian industries based upon the developments of outdoor robot navigation systems will be promoted.



SHORT BIOGRAPHICAL NOTE

Ray Jarvis completed his BE (Elec.) and Ph.D. (Elec.) at the University of Western Australian in 1962 and 1968, respectively. After two years at Purdue University he was appointed to the Australian National University (ANU) to teach Computer Science. He was instrumental in establishing the Department of Computer Science at ANU and was its first Head of Department. He joined Monash University in 1985 and established the Intelligent Robotic Research Centre in 1987. He has been the Centre's Director since then. His research interests are in Computer Vision and Robotics. Both robotic manipulators and mobile robots of various sizes have been part of his interests. Most recently he has been working on autonomous and teleoperated vehicles and vessels including a tacked vehicle, several boats, an amphibious craft, an excavator and a half scale Russian built Martian Rover. He has also recently developed a research interest in Humanoid Robotics. From an AI perspective his main interest are in Computer Vision and Path Planning.



Friday February 15th

Invited Session

Time: 11:00-12:40

Room:

11:00-11:20

#100028-02-HK-132

'An Agent for Accessing the Database of the Autonomous Distributed Total Hospital Information System II'

Hisao Kuma, Teikyo Heisei University, Japan

Masato Hakozaki, Teikyo Heisei University, Japan

Masahir Hagiwara, Teikyo Heisei University, Japan

11:20-11:40

#100028-02-TM-140

'An Algorithm for Clinical Diagnosis Using Neural Network'

Tsutomu Matsumoto, Kumamoto National College of Technology, Japan

Yuki Ueda, Kumamoto National College of Technology, Japan

Hirofumi Ohtsuka, Kumamoto National College of Technology, Japan

Shigeyasu Kawaji, Kumamoto National College of Technology, Japan

Keijirou Torigoe, Kumamoto National College of Technology, Japan

11:40-12:00

#100028-02-TM-141

'Design of Mobile Terminal for Telehealth & Life Support System Using Handy Phone'

Tsutomu Matsumoto, Kumamoto National College of Technology, Japan

Kazufumi Takamura, Kumamoto National College of Technology, Japan

Shin-ichi Ogata, Kozo Keikaku Engineering Inc., Japan

Yasuyuki Shimada, Kumamoto National College of Technology, Japan

Shigeyasu Kawaji, Kumamoto University, Japan

12:00-12:20

#100028-02-MS-134

'An Intelligent Medical Decision Support System Using Learning Classifier Systems'

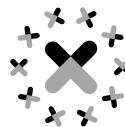
Manuel Filipe Santos, Universidade do Minho Portugal

Jose Neves, Universidade do Minho Portugal

Antonio Abelha, Universidade do Minho Portugal

Fernando Rua, Hospital Geral de Santo Antonio Portugal

Alvaro M. Silva, Hospital Geral de Santo Antonio Portugal



12:20-12:40

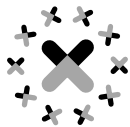
#100028-02-SA-144

'Autonomous Intelligent System Leveraging Case Base Reasoning Techniques to Compose Personalized Health Maintenance Information'

Syed Sibte Raza Abidi, Universiti Sains Malaysia, Malaysia

Chong Young Han, Universiti Sains Malaysia, Malaysia

Samina Raza Abidi, Universiti Sains Malaysia, Malaysia



Friday February 15th

Invited Session

Distributed Autonomous Systems

Time: 11:00-12:20

Room: D2212

Chair:

11:00-11:20

#100028-02-AG-053

'{Movement, Interaction, Calculus}* : an Algebraic Environment for Distributed and Mobile Calculus'

Abdelkader Gouaich, MOTOROLA LABS, France

Yves Guiraud, Universite Montpellier 2, France

11:20-11:40

#100028-02-TL-096

'Mission Level Design of Autonomous Underwater Vehicles'

Mr Thomas Liebezeit, TU Ilmenau, Germany

Volker Zerbe, TU Ilmenau, Germany

11:40-12:00

#100028-02-WW-043

'Stabilization Design for Fuzzy Large-Scale Systems'

Prof Dr Wen-June Wang, National Central University, Taiwan

Leh Luoh, National Central University, Taiwan

12:00-12:20

#100028-02-WR-107

'The Consequential Effects of Input Arrangements in Hierarchical Fuzzy Systems.'

Mr Waratt Rattasiri, University of Melbourne, Australia

Saman Halgamuge, University of Melbourne, Australia



Friday February 15th

Knowledge Discovery / Management and Data Mining

Time: 11:00- 12:40

Room: D2211

Chair: Chenggi Zhang

11:00-11:20

#100028-02-CL-073

'Information Broker: A Universal Information Mediating System'

Prof Dr Ching-Cheng Lee, California State University at Hayward, USA

Jie Deng, PeopleSoft Inc., USA

11:20-11:40

#100028-02-GW-074

'Removing Trivial Associations in Association Rule Discovery'

Prof Geoff I Webb, Deakin University, Australia

Songmao Zhang, Deakin University, Australia

11:40-12:00

#100028-02-MZ-064

'A Priori Data Selection for a SVM-Based Classification within a Diagnosis Process'

Mr Marius J Zoellner, University of Karlsruhe, Germany

Karsten Berns, University of Karlsruhe, Germany

12:00-12:20

#100028-02-SZ-048

'Identifying Quality Association Rules by External Data'

Shichao Zhang, Deakin University, Australia

Chengqi Zhang, Deakin University, Australia

12:20-12:40

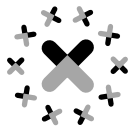
#100028-02-SZ-050

'Causality Discovery in Databases'

Mr Shichao Zhang, Deakin University, Australia

Chengqi Zhang, Deakin University, Australia

Li Liu, University of Technology, Sydney, Australia



Friday February 15th

Intelligent Interface Design

Time: 14:00-15:20

Room: D2211

Chair:

14:00-14:20

#100028-02-AA-078

'A New Approach to Computation Completion Time'

Distribution Function of Stochastic PERT Networks

Dr Masoud Rabbani, University of Tehran, Iran

Reza Tavakkoli Moghaddam, University of Tehran, Iran

14:20-14:40

#100028-02-MP-052

'SEAVS – a 3D Simulation Environment for Aerial Visual Servoing Applications'

Mr Martin J Persson, Örebro University, Sweden

Dimiter Driankov, Örebro University, Sweden

14:40-15:00

#100028-02-MR-058

'Integrated Intelligent Human Engineering Environment'

Prof Dr Ali Azadeh, University of Tehran, Iran

15:00-15:20

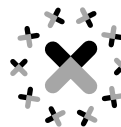
#100028-02-TM-041

'A Computer-Aided System for Designing a Pump-Impeller'

Mr Toshihiko Mochida, Hitachi,Ltd., JAPAN

Norihiko Nonaka, Hitachi,Ltd., JAPAN

Yuji Tanaka, Hitachi,Ltd., JAPAN



Friday February 15th

Solving Location- Allocation Problem by an Evolutionary Algorithm

Time: 14:00-15:00

Room: D2212

Chair: Prof. Dr. Sæid Nahavandi

14:00-14:20

#100028-02-ZZ-079

'An Agent-Based Hybrid Framework for Database Mining'

Mr Zili Zhang, Deakin University, Australia

Chengqi Zhang, University of Technology, Sydney, Australia

14:20-14:40

#100028-02-SN-125

'Adaptive Color Image Enhancement for Visual Inspection Using Evolutionary Algorithms'

Prof. Dr. Saeid Nahavandi, Deakin University, Australia

Hong Zheng, Deakin University, Australia

Abbas Kouzani, Deakin University, Australia

14:40-15:00

#100028-02-RT-038

'Solving Locating-Allocation Problem by an Evolutionary Algorithm'

Dr Reza Tavakkoli-Moghaddam, University of Tehran, Iran

Masoud M. Rabbani, University of Tehran, Iran

Ahmad-Reza Ali-Hosseini, University of Tehran, Iran

