Fourth International ICSC Symposium on

Engineering of Intelligent Systems
EIS'2004

University of Madeira
Funchal, Portugal

February 29th – March 2, 2004

ICSC Interdisciplinary Research
Canada
http://www.icsc-naiso.org

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Contents

Preface

Welcome by the EIS 2004 Chairs

Engineering in Intelligent Systems 2004 (EIS'2004) on Madeira, Portugal is the fourth conference in the series. The previous very successful conferences in the series were held in 1998 on Tenerife Island, Spain, in 2000 in Paisley, Scotland, and in 2002 in Malaga, Spain.

The title of the conference has its origin in the theory and practice of intelligent systems. The problem of engineering of intelligent systems is in fact the science of transferring the methodologies, the knowledge and the experiences from the area of artificial intelligence into the daily life, either directly through the applications or indirectly through basic or applied research. The conference originated in order to provide a wide forum in which the latest developments in the field could be discussed.

EIS'2004 is keeping up the tradition of plenary talks that are given daily in the morning and afternoon. It enables participants to join these presentations for different reasons (importance, overview of the topic, experiences, theoretical background, milestones). This year the plenary speakers are: Lenka Lhotska, Olga Stepankova, Ernst D. Dickmanns, Claus Rautenstrauch, Klaus Turowski and Peter Kokol.

For EIS'2004 we received 160 papers, including the papers within the workshops and special sessions. 95 papers were accepted as regular papers and 10 as poster papers.

It is our pleasure to announce, that the best presented papers will be selected for additional publication in the following International Journals (depending on the topic of the paper):

- International Journal of Computer Research, published by Nova Science Books and Journals
- Journal of Medical Systems, published by Kluwer Academic Publishers
- International Journal of Web Services Research, published by Idea Group Publishing
- Journal of Applied Computer Science (JACS), published by Institute of Computer Science

The papers are grouped into the following sessions:

- Robotics
- Next Generation Vision Systems
- Applying Intelligent Systems in Health
- Manufacturing Modelling & Dynamic Systems
- Hybrid System Applications
- Hybrid Algorithms for Function Approximation and Time Series Prediction
- Standard Components in the Engineering of Intelligent Systems
- Information Systems for Mass Customization
- Evolutionary Computation and Neural Networks
- Intelligent Mobile Agents in Peer -to- Peer Networks
- Image Processing & Computer Vision
- Multi-Agent Systems
- Knowledge Representation, Decision Support & Expert Systems
- Neural Networks & Fuzzy Systems

We express our sincerest gratitude to

- the International Program Committee members for the responsible and hard work done by reviewing a large number of draft papers very conscientiously and promptly.
- the authors of the papers for contributing their ideas and research results and for the effort in producing the final versions.
- the members of the Local Organizing Committee, who worked tirelessly to make this conference a success,
- the University of Madeira for the sponsorship of the audio visual equipment
- Dr Alberto Jo o Jardim, President of the Madeira Government, Prof. Dr. Rúben Antunes Capela, Rector of Madeira University and Prof. Dr. Ludwig Streit President of the Mathematical Science Centre, for the patronage
- Jeanny S.Ryffel and Dawn Jackson from ICSC for the unselfish work in organization of the conference

We like to welcome the international scientific community to the Island of Madeira in Portugal and Madeira University.

The Island of Madeira is the island of eternal spring - famous for their natural beauty and for the hospitality of their people. The spectacular landscape and singular climate of Madeira makes it especially attractive to tourists who always marvel at the mountains that reach towards the sky, steep cliffs that lean into the blue sea. Few places on can rival Madeira's wealth of natural gifts, especially in such a small area. Indigenous flora combines with an immense variety of plants from the farthest corners of the world in glorious harmony, making the islands a very beautiful and inspiring haven for plant enthusiasts.

Madeira University (UMa) is a young institution (founded at 1988). The courses durations at UMa vary 4 to 5 years, depending if education oriented or scientific. The education-oriented courses have a post-graduate training on the 5th year. The scientific ones have a one-semester final course project to do at the 5th year. The UMa has established some collaboration protocols with other national and European institution to promote interchange of students and teachers.

We wish you a pleasant stay and successful scientific work.

EIS 2004 Chairs:

Ana Isabel Portugal de Almada Cardoso, Madeira University, Portugal, General Chair
Tatjana Welzer, University of Maribor, Slovenia, Vice Chair
Marjan Družovec, University of Maribor, Slovenia, Scientific Program Chair:

General Information

Madeira - Funchal

These are the islands of eternal spring – famous for their natural beauty and for the hospitality of their people. The spectacular landscape and singular climate of Madeira makes it especially attractive to tourists who always marvel at the mountains that reach towards the sky, steep cliffs that lean into the blue sea.
Few places on can rival Madeira's wealth of natural gifts, especially in such a small area. Indigenous flora combines with an immense variety of plants from the farthest corners of the world in glorious harmony, making the islands a very beautiful and inspiring haven for plant enthusiasts.

Time
The Madeira Islands operate on the 24-hour clock which can be quite confusing for those who are accustomed to 'am' & 'pm'. Madeira maintains Greenwich Mean Time (GMT/UTC) as summer time.

Electricity
The local current is 220 AC and the connection is made by a two-pin plug. Traveler's from the USA and Canada will require a voltage converter. Travelers from the UK will require a plug adapter and this is best bought in the UK, as they are hard to find in Madeira.

Weights & measures
Metric

Electricity
Once in Madeira, the Madeirans will appreciate that you make an effort to speak their language. Their language is Portuguese. Almost all the inhabitants of the Island speak English. The main religion in Madeira is Catholic.

Currency
The Euro is the currency of the Economic and Monetary Union and was adopted by 11 State-members from the European Union on the 1st of January 1999: Portugal, Belgium, Germany, Spain, France, Ireland, Italy, Luxembourg, the Netherlands, Austria and Finland. In 2001, Greece also adopted the Euro.

The symbol of the Euro currency is an "E" crossed by two parallel lines. It is inspired on the representation of the Greek letter epsilon, calling up the birth of the European civilization and the first letter of the word Europe. The two parallel lines represent the internal stability of the Euro.

The circulation of the Euro starts on the 1st of January with 7 different bank notes and 8 different coins: bank notes of 500, 200, 100, 50, 20, 10 and 5 euros, and coins of 2 and 1 euros and 50, 20, 10, 5, 2, and 1 centimes.
Although the coins have both a European common side and a specific national side, they are accepted in all the countries that joined the Euro currency, and the same is applied to bank notes.

Both bank notes and coins were also conceived for people with visual disabilities. Therefore, the bank notes - besides having different sizes - count on elements that allow the identification of the different notes through touch. The different configurations of the coins' circumference, together with the different sizes, allow blind and partially blind people to identify the several coins.

If you don't want to carry large amounts, you can exchange your money in the local bank. Banks are usually opened from Monday to Friday, between 8.30 a.m. and 15.00 p.m. Exchange houses operate everyday between 9 am and 1 PM and from 2 PM to 7 PM. Besides this, you can exchange money at hotels.

Beware when changing cash at the bank. There is a minimum fee of 8 Euros independent of the amount you exchange. In exchange kiosks there is no exchange fee, but a slightly lower exchange rate is used. MasterCard, Visa, Cirrus, CLAU, Bancontact, and Mister Cash, are a list of some of the bank/ATM cards that can be used on the island of Madeira (also on mainland Portugal).
Euro cheques can be used to exchange for cash at the banks - but Euro cheque cards although useful for ATM machines, cannot be used to make payments in restaurants and shops.

Tourist Info
The tourism offices can provide you with useful information about interesting places to see, bus timetables, which bus to catch to see "that" place, island maps and other relative services. Once on the island, you can contact the Tourist Green Line by telephone on 800 296 296. They will be able to help you in Portuguese, English, French and Spanish, advise you about places to stay, to see, to eat, and give you information about cultural events, and the major festivals happening at the time. This service operates everyday (including holidays), from 09h to 21h.
www.madeiratourism.org

Climate
Never too hot in the summer, nor too cool in the winter, the archipelago is truly the all year round destination. Its privileged geographical position and mountainous relief, originate very mild average temperatures: 22 Celsius in the summer and 16 Celsius in the winter, and a moderate level of humidity, confer exceptional subtropical features. The seawater temperature is also very mild, because of the influence of the warm Gulf current, presenting averages of 22 Celsius in the summer and 18 Celsius in the winter.

Hotel Savoy Resort - Madeira

Address of the Conference Site
The Hotel Savoy Resort
Avenida do Infante
9004-542 Funchal, Madeira
Tel: 351-291 213 000

History

One of the longest established 5 star Hotels on Madeira, the Savoy is renowned for its comfort, service and hospitality.

Set in a magnificent location, overlooking the Bay of Funchal and only half a mile from the centre of the town, the Savoy is recommended for those seeking sophistication and refinement. Its spacious bedrooms are elegantly decorated and all have a private bath room, balcony, air conditioning, direct dial telephone, satellite TV, radio, mini-bar and hairdryer. Mountain view rooms overlook a main road.

Congress

Registration Desk/Hospitality Desk
The registration desk will be located at:
The Hotel Savoy
Mezzanine Exhibition & Meeting Floor – 1st Floor

Opening times

Saturday 28 February 2004	16.00 - 18.00
Sunday 29 February 2004	09.00 - 18.40
Monday 01 March 2004	09:00 - 18.35
Tuesday 02 March 2004	09:00 - 18.55

Paper Presentations
Please note that the scheduling of the presentations is final and 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 the 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.

Each conference room is provided with a screen, overhead projector and data projector.

Congress Proceedings Publications
The congress proceedings will be available at the conference on cd-rom. All papers presented at EIS 2004 are published in these proceedings. Additional copies are available from ICSC Academic Press, Canada ($75 – each copy)

ISBN 3-906454-35-5
Selected papers will be considered for publication in leading international journals, more information please see "Preface" on page 4

Coffee Breaks
Hotel Savoy
Lobby – Royal Business Floor

Social Program
Conference Dinner on 01 March will be offered by the President of Madeira. Location to be announced on conference board

Chairs

Erkki Oja(Honorary Chair)
Helsinki University of Technology
Finland

Ana Isabel de Almada Cardoso (General Chair)
University of Madeira,
Portugal

Tatjana Welzer (Co-Chair)
University of Maribor,
Slovenia

Marjan Druzovec (Scientific Program Chair)
University of Maribor,
Slovenia

International Program Committee

All papers for the EIS 2004 conferences are peer reviewed by our International Program Committee

- S. S. Raza Abidi, Dalhousie University, Canada
- L. Acosta, University of La Laguna Tenerife, Spain
- E. Alpaydin, Bogazici University Istanbul, Turkey
- P. Anderson, RIT, Rochester NY, USA
- W. Armstrong, Dendronic Decisions Ltd, Canada
- B. Barbat, University of Sibiu, Romania
- Z. Bien, KAIST, Korea
- P. Bosc, IRISA/ENSSAT, France
- H. H. Bothe, Technical University of Denmark, Lyngby, Denmark
- B. Brumen, University of Maribor, Slovenia
- J. Cabestany, Universidad Politecnica de Catalunya, Spain
- B. Cremelleux, University of Caen, France
- F. Cuesta, University de Sevilla, Spain
- D. Dasgupta, University of Memphis, USA
- R. De Keyser, University of Gent, Belgium
- A. Dobnikar, University of Ljubljana, Slovenia
- D. Driankov, Linkopings Universitet, Linkoping, Sweden
- G. Facchinetti, University of Modena, Italy
- C. Fyfe, University of Paisley, Scotland, United Kingdom
- M. Girolami, University of Paisley, Scotland
- I. Golob, University of Maribor, Slovenia
- P. A. Gonzalez Lanza, ICIMAF Institute of Cybernetics, Mathematics and Physics, Havana Cuba
- A. Gunasekaran, University of Massachusetts, USA
- F. Gurgen, Bogazici University, Turkey/Australia
- D. Heiss, Eudaptics Software GmbH Vienna, Austria
- M. Heiss, Siemens Vienna, Austria
- Hussain, University of Stirling, United Kingdom
- E. Ifeachor, University of Plymouth, United Kingdom
- Ch. Irgens, University of Strathclyde, United Kingdom
- C.A. Kaestner, Pontifical Catholic University of Parana, Brazil
- I. Kalaykov, Oerebro University, Sweden
- P. Kokol, University of Maribor, Slovenia
- N. Krueger, Aalborg University Esbjerg, Denmark
- B. Lees, University of Paisley, United Kingdom
- T.Y. Lin, San Jose State University, San José, USA
- F. Maire, Queensland University of Technology Brisbane, Australia
- G. N. Marichal, University La Laguna, Tenerife Spain
- J. Marx-Gomez, Technical University Clauthal, Germany
- J. Mo, CSIRO, Australia
- G. Mukundan, Daimler-Chrysler, USA
- F. Naghdy, University of Wollongong, Australia
- Ch. Nguyen, Catholic University of America, USA
- C. Orlowski, University of Gdansk, Poland
- T. Popescu, National Insitute for Research & Development in Informatics, Bucharest, Romania

- C. Rautenstrauch, University of Magdeburg, Germany
- B. Reusch, University of Dortmund, Germany
- I. Rojas-Ruiz, University of Granada, Spain
- J. Ruiz-Gomez, University of Malaga, Spain
- J.L. Sánchez, University of La Laguna Tenerife, Canary Islands, Spain
- E. Szczerbicki, University of Newcastle, Australia
- P. Szczepaniak, University of Lodz, Poland
- Tan Kok Kiong, National University of Singapore, Singapore
- A. Tharumarajah, CSIRO, Australia
- K. Turowski, University of Augsburg, Germany
- J.L. Verdegay, University of Granada, Spain
- P. Wang, Duke University Durham , USA
- K. Zreik, University of Caen, France

Congress Organizer

University of Madeira, Portugal

University of Maribor, Fac. EE and CS, Slovenia

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Who is ICSC Interdisciplinary Research?

Mission Statement: To serve the scientific community.

Our long term overall objectives of our group is 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 our aim.

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

Sponsoring Organizations

1. University of Madeira

2. University of Maribor, Fac. EE and CS, Slovenia

3. President of Madeira

4. ICSC Interdisciplinary Research Canada

Upcoming Events

NC 2004
Neural Computation
University of Stirling, Scotland
Stirling, Scotland, FK9 4LA
August 29-September 1, 2004
Chair: Amir Hussain

BIS 2004
Biologically Inspired Systems
University of Stirling, Scotland
Stirling, Scotland, FK9 4LA
August 29-September 1, 2004
Chair: Leslie Smith

CNS 2004
Cognitive Neuro Science
University of Stirling, Scotland
Stirling, Scotland, FK9 4LA
August 29-September 1, 2004
Chair: Igor Aleksander, Imperial College, London

More conferences are in the planning phase.

Congress Schedule

Saturday February 28th

Pre- registration at The Savoy Hotel
Avenida do Infante, 9004 –542, Madeira, Portugal
16.00 – 18.00 hrs
(Welcome Aperitif)

Sunday February 29th

09.00 – 09.30 hrs	**Opening Session (Chairs, University Rector)**
09.30 – 10.30 hrs	**Keynote Talk (Lenka Lhotska, Olga Stepankova)**
10.30 – 11.00 hrs	Break
11.00 – 13.00 hrs	Workshops/Tutorial (in Rooms 1, 2, 3, 4)
13.00 – 16.00 hrs	Lunch
16.00 – 17.00 hrs	**Tutorial - Vera Kurkova**
17.00 – 17.15 hrs	Break
17.15 – 18.40 hrs	Workshops/Special Sessions (in Rooms 1, 2, 3, 4)

Social Program: Welcome at the University of Madeira

Monday March 01st

09.00 – 10.00 hrs	**Plenary Ernst D. Dickmanns**
10.00 – 10.30 hrs	Break
10.30 – 13.00 hrs	Technical Sessions/Special Sessions (in Rooms 1, 2, 3, 4)
13.00 – 16.00 hrs	Lunch
16.00 – 17.00 hrs	**Plenary Claus Rautenstrauch**
17.00 – 17.15 hrs	Break
17.15 – 18.35 hrs	Technical Sessions/Special Sessions (in Rooms 1, 2, 3, 4)

Social Program: Dinner offered by President of Madeira

Tuesday March 02nd

09.00 – 10.00 hrs	**Plenary Klaus Turowski**
10.00 – 10.30 hrs	Break
10.30 – 13.00 hrs	Technical Sessions/Special Sessions (in Rooms 1, 2, 3, 4)
13.00 – 16.00 hrs	Lunch
16.00 – 17.00 hrs	**Plenary Peter Kokol**
17.00 – 17.15 hrs	Break
17.15 – 18.55 hrs	Technical Sessions/Special Sessions (in Rooms 1, 2, 3, 4)
18.55	Closing Session

Detailed Congress Schedule

Sunday, February 29, 2004

09.30 – 10.30 hrs Keynote Talk – Lenka Lhotska - Plenary Room – Room 2

Title: **Multi-Agent Systems as an Integration Environment for Classical and AI Components**

Authors: ***Lenka Lhotska and Olga Stepankova***
CZECH TECHNICAL UNIVERSITY IN PRAGUE (CTU),
The GERSTNER LABORATORY (GL) for Intelligent Decision Making and Control

Abstract
The multi-agent technology has been recently considered to be much more suitable for creating open, flexible environment able to integrate software pieces of diverse nature written in different languages and running on different types of computers. It enables to design, develop and implement a comparatively open multi-agent environment suitable for efficient creating of complex knowledge-based or decision support systems. Such an environment is able to integrate geographically distributed knowledge sources or problem solving units. The task under consideration is located just on the borderline between Software Engineering and Artificial Intelligence. The idea of software integration based on efficient communication among parallel computational processes as well as that of the open architecture (enabling to add new elements without any change in the others) has been provided by the Software Engineering area. On the other hand, the multi-agent approach stemming from the theory of agency, from behavioural models of agents and methods of agentification of stand-alone programs can be considered as a contribution of Artificial Intelligence. Multi-agent systems have useful properties, such as parallelism, robustness, and scalability. Therefore they are applicable in many domains which cannot be handled by centralized systems, in particular, they are well suited for domains which require, for example, resolution of interest and goal conflicts, integration of multiple knowledge sources and other resources, time-bounded processing of very large data sets, or on-line interpretation of data arising in different geographical locations.

10.30 – 11.00 hrs Break

11.00 – 13.00 hrs Workshops/Tutorial – Prof. Peter G. Anderson

Plenary Room – Room 2

Title: ***Genetic Algorithms***
Author: ***Prof. Peter G. Anderson***

Abstract
Genetic algorithms (GAs) solve problems in a means inspired by "selective breeding." GAs start with a random population of problem solutions; iteratively, better solutions are selected and allowed to breed (parts from two or more good solutions are composed to form children solutions); inferior solutions are selected to leave the population; and the overall fitnes of the population members gradually increases until a suitable solution is discovered.
The Workshop will comprise an introduction to techniques of genetic algorithms and the types of problem solving GAs are applicable for. Special emphasis will be placed on problems such as scheduling.

Sunday, February 29, 2004

09.30 – 10.30 hrs **Keynote Talk – Lenka Lhotska - Plenary Room – Room 2**
(please see page 15 for details)

10.30 – 11.00 **Break**

Information Systems for Mass Customization (ISMC 2004)

Session Chair: Klaus Turowski
Room 1
11.00 – 18.40

11.00 – 11.10 Opening

11.10 – 11.35 5000
'Information System Design for Mass Customization – Integrating CRM and SCM'
B. Selk, University of Augsburg
K. Turowski, Chair of Business Information Systems II, University of Augsburg
C. Winnewisser, University of Augsburg

11.35 – 13.00 Product Configuration and Product Design (1)

11.35 – 12.00 5001
'Utilization of Graph Constellations for the Development of Customizable Product Spectra'
M. Maurer, Institute of Product Development, Technische Universitaet Muenchen
Muenchen, Germany
U. Pulm, Institute of Product Development, Technische Universitaet Muenchen
Muenchen, Germany
U. Lindemann, Institute of Product Development, Technische Universitaet Muenchen
Muenchen, Germany

12.00 – 12.25 5002
'Customer Communities to Support Product Configuration'
T. Leckner, Institut für Informatik, Technische Universität München,Garching/Germany

12.25 – 12.50 5003
'Software Tools for Supported CAD-Modeling of Mass Customization Products'
D. Janitza, Technische Universitaet Muenchen, Lehrstuhl für Feingerätebau und Mikromechanik
Dr. F. Irlinger, Technische Universitaet Muenchen, Lehrstuhl für Feingerätebau und Mikromechanik

12.50 – 13.00 Wrap up

13.00 – 16.00 hrs Lunch

16.00 – 17.00 hrs Tutorial Dr. Vera Kurkova – Plenary Room – Room 2

Title: ***Learning from Data with Generalization Capability by Neural Networks and Kernel Methods***

Author: ***Dr. Vera Kurkova***
Academy of Sciences Institute of Computer Science Prague, Czech Republic

Abstract

The goal of supervised learning is to adjust parameters of a neural network so that it approximates with a desired accuracy a functional relationship between inputs and outputs by learning from a set of examples in such a way that the network has a generalization capability, i.e., it can be used for processing new data that were not used for learning. To guarantee generalization, one needs some global knowledge of the desired input/output functional relationship, such as smoothness and lack of high frequency oscillations.

The lecture will present various approaches to modelling of learning with generalization capability based on regularization methods. Learning as a regularized optimization problem will be studied for a special class of function spaces called reproducing kernel Hilbert spaces, in which many types of oscillations and smoothness conditions can be formally described. It will be shown how methods developed for treating inverse problem related to differential equations from physics can be used as tools in mathematical theory of learning. There will be described properties and relationships of important types of regularization techniques (Ivanov's regularization based on a restriction of the space of input/output functions, Tychonov's one adding to an empirical error enforcing fitting to empirical data a term penalizing undesired properties of input/output function and Miller's and Philips' combining Ivanov's and Tychonov's method). Various versions of the Representer Theorem describing the form of the unique solution of the learning problem will be derived. Algorithms based on such theorems will be discussed and compared with typical neural network algorithms designed for networks with limited model complexity.

17.00 – 17.15 hrs Break

ISMC Afternoon Session

Session Chair: Robert Winter

Room 1

17.15 – 18.40 ***Product Configuration and Product Design (2)***

17.15 – 17.40 5004
'A Modular Product Data Structuring Model Improves the Product Life Cycle Management of Service Products in the Telecommunications Industry'
C. Borgmann, Institute for Manufacturing Strategies (IMS) GmbH, Magdeburg, Germany
G. Hänßgen, Institute for Manufacturing Strategies (IMS) GmbH,Magdeburg, Germany

17.40 – 18.05 5005
'A Meta Model Based Configuration Approach for Mass-Customizable Products and Services'
A. J. Dietrich, Institute of Business Administration, University of Hohenheim,

Stuttgart, Germany
W. Hümmer, Chair for Database Systems, Friedrich-Alexander-University of Erlangen- Nuremberg, Erlangen, Germany
C. Meiler, Chair for Database Systems, Friedrich-Alexander-University of Erlangen- Nuremberg, Erlangen, Germany

18.05 – 18.30 5006
'Logistic Process Model for Mass Customization in the Shoe Industry'
M. Schenk, Fraunhofer Institute for Factory Operations and Automation, Magdeburg, Germany
R. Seelmann-Eggebert, Fraunhofer Institute for Factory Operations and Automation
Magdeburg, Germany

18.30 – 18.40 Wrap-up

Sunday, February 29, 2004

09.30 – 10.30 hrs **Keynote Talk – Lenka Lhotska - Plenary Room – Room 2**
(please see page 16 for details)

10.30 – 11.00 hrs **Break**

11.00 – 13.00 hrs **Tutorial – Prof. Peter G. Anderson – Room 2**
(please see page 16 for details)

13.00 – 16.00 hrs **Lunch**

16.00 – 17.00 hrs **Tutorial Dr. Vera Kurkova – Room 2**
(please see page 18 for details)

17.00 – 17.15 hrs **Break**

Hybrid Algorithms for Function Approximation and Time Series Prediction

Session Chair : Peter Anderson

Room 2
17.15 – 18.15

17.15 – 17.35 1087
'Connecting Geometric Independent Component Analysis to Unsupervised Learning Algorithms'
Dr E. W. Lang, Institute of Biophysics, University of Regensburg, Germany
P. Gruber, Institute of Biophysics, University of Regensburg, Germany
F. Theis, Institute of Biophysics, University of Regensburg, Germany
C. Puntonet, Arquitectura y Tecnologia Computadores, ETSII, Universidad de Granada, Spain

17.35 – 17.55 1119
'Time Series Forecasting Based on Parallel Neural Network'
C. Puntonet, Arquitectura y Tecnologia Computadores, ETSII, Universidad de Granada, Spain
J.M. Gorriz, University of Cadiz, Spain
M. Salmeron, University of Cadiz, Spain
J. Ortega, University of Cadiz, Spain
M. Aldasht, University of Cadiz, Spain

17.55 – 18.15 1053
'Turkish Stock Market Analysis using Mixture of Experts'
F. Gurgen, Nesrin Okay Bogazici University, Turkey
M.Serdar Yumlu, Nesrin Okay Bogazici University, Turkey

Sunday, February 29, 2004

09.30 – 10.30 hrs **Keynote Talk – Lenka Lhotska - Plenary Room – Room 2**
(please see page 16 for details)

10.30 – 11.00 hrs **Break**

Hybrid System Applications

Session Chair : Fikret Gürgen

Room 3

11.00 – 18.35

11.00 – 11.20 1100
'Modeling Natural Motivations into Hybrid Artificial Agents'
Dr. F. Andriamasinoro, IREMIA, University of La Reunion, France

11.20 – 11.40 1061
'Network-Based Intrusion Detection Using Unsupervised Adaptive Resonance Theory (ART)'
M. Amini, Sharif University of Technology, Tehran, Iran
R. Jalili, Sharif University of Technology, Tehran, Iran

11.20 – 11.40 1045
'Adaptive Clustering by ART2 Neural Networks'
Dr. A. Nachev, National University of Ireland, Galway

11.20 – 11.40 1048
'Evolutionary Strategies in Agile Facility Design'
A. Stachowiak, Poznan University of Technology, Poland
Prof. M. Fertsch, Poznan University of Technology, Poland

11.40 – 12.00 1063
'A Relational Theory of Interaction and Learning Based on Classifier System'
Dr. I. Nagasaka, Kobe University, Japan
Prof. M. Kikuchi, Kobe University, Japan
Prof. S. Kitamura, Kobe University, Japan

12.00 – 12.20 1067
'On Learning from past experience as a Meta-Methodology for the Application on Self-Optimizing working Principles within Complex Hierarchical Mechatronic Systems'
A. Schmidt, Heinz Nixdorf Institute, University of Paderborn, Germany
P. Scheideler, Heinz Nixdorf Institute, University of Paderborn, Germany

12.20 – 12.40 1072
'Discovering Fuzzy Classifiers by Genetic Algorithm'
M. Hasanzade, Sharif University of Technology of Iran, Iran
Prof. S. Bagheri, Sharif University of Technology of Iran, Iran
Prof. C. Lucas, Tehran University of Iran, Iran

13.00 – 16.00 hrs **Lunch**

16.00 – 17.00 hrs **Tutorial Dr. Vera Kurkova**
(please see page 18 for details)

17.00 – 17.15 hrs **Break**

17.15 – 17.35 8001
'Compensatory Logic: A Fuzzy Approach to Decision Making'
R. A. Espin-Andrade, CUJAE (Technical University of Havana), Cuba
J. Marx-Gomez, Magdeburg University. Germany
G. Mazcorro-Tellez, Interdisciplinary College of Engineering, Social and Management Sciences, Mexico
E.Fernandez -González, University of Sinaloa, Mexico
M. I. Lecich, San Juan National University, Argentina

17.35 – 17.55 8000
'Heuristics and Metaheuristics Approaches used to Solve the Rural Postman Problem: A Comparative Case Study'
M. Gulnara Baldoquín de la Peña, Prof. Dr. Dpto. Matemática General, Universidad Técnica de La Habana (ISPJAE), Habana Cuba

17.55 – 18.15 1041
'Non-linear Prediction of Speech using ANFIS: Comparison with Neural Nets'
Dr. M.H. Savoji, Professor, Electrical and Computer Engineering Faculty, Shahid Beheshti University, Iran
A. Kaboli, Electrical and Computer Engineering Faculty, Shahid Beheshti University, Iran

18.15 – 18.35 1074
'Fuzzy Sources of Intranatal Risk Assessment: Preductal Oxygen Saturation and Pulse Oximetry Measurements'
Dr. N.Guler, Yildiz Teknik Universitesi Davutpasa Kampusu, Turkey
F. Gürgen, Nesrin Okay Bogazici University, Turkey

Sunday, February 29, 2004

09.30 – 10.30 hrs **Keynote Talk – Lenka Lhotska - Plenary Room – Room 2**
(please see page 16 for details)

10.30 – 11.00 hrs **Break**

Intelligent Mobile Agents in Peer -to- Peer Networks

Session Chair: Jorge Marx-Gomez
Vice-Chair: Daniel Lübke

Room 4
11.00 – 18.35

11.00 – 11.20 1098
'*Usage of OpenPGP with Mobile Agents in Peer -to- Peer Networks*
D. Lübke, Department of Computer Science, Technical University of Clausthal, Germany
J. Marx-Gomez, Department of Computer Science, Technical University of Clausthal, Germany

11.20 – 11.40 1042
'*Semantic Web Services for Smart Devices Based on Mobile Agents'*
V. Terziyan, MIT Department, Univ. of Jyvaskyla, Finland

11.40 – 12.00 1077
'*The Virtual Twin: A Socialization Agent for Peer-to-Peer Networks'*
A Gachet, Department of Informatics, University of Fribourg, Switzerland
Prof. P. Haettenschwiler, Department of Informatics, University of Fribourg, Switzerland

12.00 – 12.20 1102
'PANDORA: an Open System of Cognitive Agents using Paraconsistent Logic'
E. S. Angelotti, Tuiuti University of Paraná, Brazil
Dr. E.E. Scalabrin, Computer Science Dept, Pontifical Catholic University of Paraná, Brazil

12.20 – 12.40 1120
'Mobile Agent Based Supply Chain Modeling With Neural Network Controlled Services'
M. Ermis, Industrial Engineering Dept., Air Force Academy, Istanbul, Turkey
O. K. Sahingoz, Computer Engineering Dept., Airforce Academy, Istanbul, Turkey
F. Ulengin, Industrial Engineering Dept., Air Force Academy, Istanbul, Turkey

12.40 – 13.00 1121
'AGVENT: Agent Based Distributed Event System'
O.K. Sahingoz, Computer Engineering Dept., Airforce Academy, Istanbul, Turkey
N. Erdogan, Computer Engineering Dept, Istanbul Technical University, Turkey

13.00 – 16.00 hrs **Lunch**

16.00 – 17.00 hrs **Tutorial Dr. Vera Kurkova**
(please see page 18 for details)

17.00 – 17.15 hrs **Break**

17.15 – 17.35 1122
'XML Communicating Agents in the Rule Based Distributed Event System'
O.K. Sahingoz, Computer Engineering Dept., Airforce Academy, Istanbul, Turkey
N. Erdogan, Computer Engineering Dept, Istanbul Technical University, Turkey

17.35 – 17.55 3001
'A Proposal for a Equipments Repair System using Agents and Web Services'
A Caballero, Dept. of Mathematics & Computer Science, Habana Univesity, Cuba
J. Marx-Gomez, Dept. of Computer Science & Business Informatics, Technical University of Clausthal, Cuba

17.55 – 18.15 3002
'Developing a Distributed ERP System Based on Peer-to-Peer-Networks and Web Services'
J. Marx Gómez, Department of Computer Science Technical University of Clausthal, Germany
O. Krüger, Department of Computer Science Technical University of Clausthal, Germany
C. Kühne, Department of Computer Science Technical University of Clausthal, Germany
D. Lübke, Department of Computer Science Technical University of Clausthal, Germany

18.15 – 18.35 3003
'The WASP Framework - Bridging the Gap between the Web of Systems, The Web of Services and the Web of Semantics with Agent Technology'
T. Biskup, Department of Computer Science, Technical University of Clausthal, Germany
J. Marx-Gomez, Department of Computer Science, Technical University of Clausthal, Germany

Monday March 01, 2004

09.00 – 10.00 hrs Plenary Speech/Plenary Room – Room 2 – Ernst D. Dickmanns

Title: ***'Dynamic Vision' - Review and Outlook***
Author: ***Ernst D. Dickmanns***
Universitaet der Bundeswehr, Munich (UBM) Germany

Abstract
A brief review on the first two generations of dynamic vision systems at UBM will be given as an introduction. Applications to ground and air vehicles as well as space flight will be summarized in video sequences. The third-generation system 'EMS vision' (Expectation-based, Multi-focal, Saccadic vision, 1997 - 2003) will be discussed in more detail. Mission performance on a network of minor roads and cross-country on grass surface including avoidance of negative obstacles will be demonstrated by video. After the three-stage basic vision system architecture has become rather stable by now, an outlook on future developments in visual machine perception will be given. This encompasses a view how steadily increasing computing power, communication bandwidth and storage availability in connection with growing knowledge representation capabilities can be used for further improvements of system reliability and adaptability in widening regions of applications.

10.00 – 10.30 hrs Break

Information Systems for Mass Customization (ISMC 2004)

Session Chair : Claus Rautenstrauch

Room 1
11.00 – 13.00

11.00 – 13.00 Managing the Customer Relationship

11.00 – 11.10 Introduction

11.10 – 11.35 5007
'Aspects of Customer Relation and Risk Management for the Concept of Mass Customization'
Prof. Dr. M. D. Rehfeldt, University of Applied Sciences Albstadt-Sigmaringen, Albstadt, Germany

11.35 – 12.00 5008
'An Advisory System for Customers' Objective needs Elicitation in Mass Customization'
Dr. T. Blecker, University of Klagenfurt, Austria
Dipl.-Ing. Dipl.-Wirtsch.-Ing. N. Abdelkafi, University of Klagenfurt, Austria
DI G. Kreutler, University of Klagenfurt, Austria
Prof. Dr. G.Friedrich, University of Klagenfurt, Austria

12.00 – 12.25 5009
'A Multi-Channel Interaction Platform for Mass Customization – Concept and Empirical Investigation'
R. Reichwald, Technische Universitaet Muenchen, Munich, Germany
F. Piller, Technische Universitaet Muenchen, Munich, Germany
M. Mueller, Technische Universitaet Muenchen, Munich, Germany

12.25 – 12.50 5010
'Conceptual Foundations for Customer Relationship Management Systems with Special Consideration of the Financial Services Sector'
R. Winter, University of St. Gallen Mueller-Friedberg, St. Gallen, Switzerland

12.50 – 13.00 Wrap up

13.00 – 16.00 Lunch

16.00 – 17.00 Plenary Speech/Plenary Room – Prof. Dr. Claus Rautenstrauch

Title: Multi Purpose Server Platforms Based on Agent and P2P Technology
Author: Prof. Dr. Claus Rautenstrauch

Critical success factors of business applications are high availability, good performance and low total cost of ownership. Up to now, the first two factors are at odds with the third one, because systems with good performance and high availability are implemented on high-performance computer systems with redundant components. Nowadays, performance and availability requirements can also be reached through distributed and shared resources in the Internet, as many commercial and semi-commercial applications show. In the keynote a generalised architecture of a server platform will be discussed which meets the critical success factors mentioned above. It is based on agent, P2P and web services technologies. The main ideas of the platform will be demonstrated with examples from mobile commerce and ERP (Enterprise Resource Planning) applications.

17.00 – 17.15 hrs Break

Manufacturing Modeling & Dynamic Systems

Session Chair: Fatima Rateb
Vice-Chair: Stefan Trzcielinski

Room 1
17.15 – 18.35

17.15 – 17.35 1019
'Bayesian Support Vector Regression for Tool Condition Monitoring and Feature Selection'
J. Dong, National University of Singapore, Singapore
Geok Soon Hong, National University of Singapore, Singapore
Yoke San Wong, National University of Singapore, Singapore

17.35 – 17.55 1057
'A New Algorithm for Adaptive Modeling of Mechanical Systems'
Dr S. Lukasiewicz, The University of Calgary, Canada
Dr. H. Hojjati, The University of Mazandaran, Bobol, Iran

17.55 – 18.15 1062
'Studying the Quality of Resistance Spot Welding Joints Using Self-Organising Maps'
H. Junno, University of Oulu, Finland
P. Laurinen, University of Oulu, Finland
L. Tuovinen, University of Oulu, Finland
J. Röning, University of Oulu, Finland

Monday, March 01, 2004

09.00 – 10.00 hrs **Plenary Speech/Plenary Room – Room 2 – Ernst D. Dickmanns**
(Please see page 25 for details)

10.00 – 10.30 hrs **Break**

Next Generation Vision Systems

Chair: Norbert Krüger

Room 2
10.30 – 13.00

10.30 – 10.50 6000
'*Actor-Critic Models of Animal Control- A Critique of Reinforcement Learning'*
F. Woergoetter, Department of Psychology,University of Stirling, Scotland

10.50 – 11.10 6001
'*Processing Multi-Modal Primitives from Image Sequences'*
N. Krueger, Aalborg University Esbjerg, Denmark
F. Woergoetter, Department of Psychology,University of Stirling, Scotland
M. Felsberg, Computer Vision Laboratory, Linköping University, Sweden

11.10 – 11.30 6002
'*Putting Gestalt Laws at Work'*
P. Kalocsai, University of California, U.S.A.

11.30 – 11.50 6003
'Space Variant Filtering of Optic Flow for Robust Three Dimensional Motion Estimation'
D. Calow, Wilhelms University, Germany
N. Krueger, Aalborg University Esbjerg, Denmark
Prof. F. Worgotter, Institute for Neuronal Computational Intelligence and Technology Stirling Scotland, UK
M. Lappe, Wilhelms University, Germany

11.50 – 12.10 6004
'*A Non-Local Stereo Similarity based on Collinear Groups'*
N. Pugeault, Dept. of Psychology, University of Stirling
Prof. F. Worgotter, Dept. Psychology, University of Stirling
N. Krueger, Aalborg University Esbjerg, Denmark

12.10 – 12.30 6005
'*Recognizing Human Faces from Video'*
V. Krueger, Aalborg University Esbjerg, Denmark

12.30 – 13.00 Discussion

13.00 – 16.00 hrs **Lunch**

16.00 – 17.00 hrs **Plenary Speech/Plenary Room - Room 2 – Prof. Dr. Claus Rautenstrauch**

(please see page 26 for details)

17.00 – 17.15 hrs Break

Robotics

Session Chair: Orlando Belo

Room 2
17.15 – 18.35

17.15 – 17.35 1051
'Overtaking a Slower-Moving Vehicle by an Autonomous Vehicle'
Dr T. Shamir, The Academic College of J&S, Ariel, Israel

17.35 – 17.55 1081
'Real-Time Implementation of On-Line Trained Neuro-Controller'
Dr A. Zaki, Electronics Research Institute, Cairo, Egypt

17.55 – 18.15 1083
'Man-Machine-Interaction and Co-Operation for Mobile and Assisting Robots'
E. Helms, Fraunhofer Institute for Manufacturing Engineering and Automation (IPA), Germany
R. D. Schraft, Fraunhofer Institute for Manufacturing Engineering and Automation (IPA), Germany
M. Hans, Fraunhofer Institute for Manufacturing Engineering and Automation (IPA), Germany
S. Thiemermann, Fraunhofer Institute for Manufacturing Engineering and Automation (IPA), Germany

18.15 – 18.35 1024
'A New Approach in the Control Problem of a Binocular Head System'
G. N. Marichal, University of La Laguna, Spain
J. Toledo, University of La Laguna, Spain
L. Acosta, University of La Laguna, Spain
J. N. Rodríguez, University of La Laguna, Spain
E. J. González, University of La Laguna, Spain

Monday, March 01, 2004

09.00 – 10.00 hrs **Plenary Speech/Plenary Room – Room 2 – Ernst D. Dickmanns**
(Please see page 25 for details)

10.00 – 10.30 hrs **Break**

Evolutionary Computation and Neural Networks (ECNN)

Chairs: Paulo Cortez, Miguel Rocha

Room 3
10.30 – 18.35

10.30 – 11.00 Overview of ECNN Combinations
Paulo Cortez,
Miguel Rocha,

11.00 – 11.20 1047
'Artificial Life Optimization over Complex Networks'
M. Lucchetti, Computer and Systems Science Department, University of Rome La Sapienza, Italy
M. Annunziato, ENEA Research Centre Casaccia, Italy
Ramon Huerta, Assistant Research Scientist, University of California, U.S.A.
Lev Tsimring, Research Scientist, University of California, U.S.A

11.20 – 11.40 1118
'*An Evolutionary Algorithmfor Manipulator Path Planning'*
R. Corsepius, Research Institute for Applied Knowledge Processing, Ulm, Germany

11.40 – 12.00 1076
'Evolving Strategy for Game Playing'
J. Hynek, Faculty of Informatics and Management, University of Hradec Kralove, Czech Republic

12.00 – 12.20 1026
'Advanced Evolutionary Design of Generalized Recurrent Neural Networks'
Dr. A.Dobnikar, University of Ljubljana, Slovenia
S. Vavpotic, University of Ljubljana, Slovenia

12.20 – 12.40 1097
'*Ensembles of Artificial Neural Networks with Heterogeneous Topologies'*
M. Rocha, University of Minho, Portugal
P. Cortez, University of Minho, Portugal
J. Neves, University of Minho, Portugal

12.40 – 13.00 1142
'A Lamarckian Model Combining Levenberg-Maquardt Algorithm and a Genetic Algorithm'
P. Pires, Universidade Portucalense – Departamento de Gestão Porto, Portugal
P. Castro, Escola Superior de Tecnologia e Gestão do Instituto Politécnico de Viana do Castelo , Portugal

13.00 – 16.00 hrs **Lunch**

16.00 – 17.00 hrs **Plenary Speech/Plenary Room - Room 2 – Prof. Dr. Claus Rautenstrauch**

(please see page 26 for details)

17.00 – 17.15 hrs **Break**

17.15 – 17.35 1141
'Evolving Modular Neural Networks to Solve Challenging Control Problems'
S. Doncieux, University Paris 6, France
J.A. Meyer, University Paris 6, France

17.35 – 17.55 1044
'*Hierarchical EvolutionaryAlgorithm in the Rule Extraction from Neural Network'*
U. Markowska-Kaczmar, Department of Computer Science, Wroclaw University of Technology, Poland
R. Zagorski, Department of Computer Science, Wroclaw University of Technology, Poland

17.55 – 18.15 1140
'Genetic Algorithms with Fitness & diversity – Guided Adaptive Operating Probabilities and Analyses of its Convergence'
L. Meiyi, College of Information Science & Engineering, Central South University , Changsha, China
C. Zixing, College of Information Science & Engineering, Central South University , Changsha, China
S. Guoyun, College of Information Science & Engineering, Central South University , Changsha, China

18.15 – 18.35 Open Discussion: 'The Future of ECNN Combinations'

Monday, March 01, 2004

09.00 – 10.00 hrs **Plenary Speech/Plenary Room – Room 2 – Ernst D. Dickmanns**
(Please see page 25 for details)

10.00 – 10.30 hrs **Break**

Standard Components and Activities in the Engineering of Intelligent Systems

Chair: Tatjana Welzer

Room 4
10.30 – 17.55

10.30 – 10.50 2003
'Machine-Assisted Learning: Enhancing Evolutionary Rules Extraction Algorithm with Expert Knowledge'
V. Podgorelec, University of Maribor, FERI, Institute of Informatics, Maribor, Slovenia
I. Rozman, University of Maribor, FERI, Institute of Informatics, Maribor, Slovenia
M. Molan Stiglic, Maribor Teaching Hospital, Department of Pediatric Surgery Maribor, Slovenia
M. Heri ko, University of Maribor, FERI, Institute of Informatics, Maribor, Slovenia

10.50 – 11.10 2002
'The DTP Model: Integrationof Intelligent Techniques for the Decision Support in Healthcare Assistance'
D. Riaño, Department d'Enginyeria Informàtica i Matemàtiques, Universitat Rovira i Virgili, Tarragona, Spain
J. A. Bohada, Universitat Politècnica de Catalunya, Barcelona, Spain.
T. Welzer, Institut of Informatics, Unviersity of Maribor, Maribor, Slovenia

11.10 – 11.30 2001
'Intelligent System to Assess and treat Developmental Dyslexia in Spanish Language
L. Moreno, Universidad La Laguna. Islas Canarias. Spain
C. González, Universidad La Laguna. Islas Canarias. Spain
J. Sánchez, Universidad La Laguna. Islas Canarias. Spain
V. Muñoz, Universidad La Laguna. Islas Canarias. Spain
J. Estévez, Universidad La Laguna. Islas Canarias. Spain
R. Aguilar, Universidad La Laguna. Islas Canarias. Spain
J. Sigut, Universidad La Laguna. Islas Canarias. Spain

11.30 – 11.50 2004
'System Design for Classification Process'
M. Druzovec, University of Maribor, Maribor, Slovenia
T. Welzer, University of Maribor, Maribor, Slovenia

11.50 – 12.10 2006
'Data Policy for Increasing the Data Quality in Intelligent Systems'
T. Welzer, Unviersity of Maribor, Maribor, Slovenia
I Golob, University oF Maribor, Maribor, Slovenia
M. Druzovec, University of Maribor, Maribor, Slovenia
B. Brumen, University of Maribor, Maribor Slovenia

12.10 – 12.30 2000
'Higher-Order Mobile Agents for Controlling Intelligent Robots'
Y. Kambayashi, Nippon Institute of Technology, Japan
M. Takimoto, Tokyo University of Science, Japan

12.30 – 12.50 2005
'GRID Technology for Intelligent Systems and Data Mining'
B. Brumen, University of Maribor, Slovenia
A. Kamišali , University of Maribor, Slovenia
D. Riano, Universitat Rovira I Virgili, Tarragona, Spain
T. Welzer, University of Maribor, Slovenia2005

12.50 – 16.00 hrs Lunch

16.00 – 17.00 hrs Plenary Speech/Plenary Room - Room 2 – Prof. Dr. Claus Rautenstrauch
(please see page 26 for details)

17.00 – 17.15 hrs Break

17.15 – 17.35 1013
'Model-Based Door Localization for Corridor Navigation'
J. Sigut, University of La Laguna, Spain

17.35 – 17.55 2007
'An Adaptive Method for Map Reconstruction'
I.K. Altinel, Bogazici University, Turkiye
N.Aras, Bogazici University, Turkiye
B.J. Oommen, Carleton University, Ottawa, Canada

09.00 – 10.00 hrs Plenary Speech/Plenary Room – Prof. Dr. Klaus Turowski

Title: ***The Road to Mass Customization - Bridging the Gap from Concept to Reality***

Author: ***Prof. Dr. Klaus Turowski***
Chair of Business Informatics and Systems Engineering, University of Augsburg, Germany

Abstract
The advancement of information technology, especially Web-based technologies, has moved the concept of mass customization in the focus of both the scientific and the business community. First introduced by Davis primarily as a strategic marketing concept in 1987, mass customization has been more broadly defined by Pine II in 1993 as a means to deliver goods and services, which on the one hand largely meet individual customers' needs but on the other hand are being produced with near mass production efficiency without a considerable price premium for those goods and services. While early adopters of mass customization strategies such as Dell have already demonstrated the profound impact on both company performance and industry structure, there is still some uncertainty about the key factors to successfully put the concept to work in various settings. In this talk, an overview of the basic engineering, production management and technological requirements is given, which have to be combined and coordinated to make mass customization work. Additionally, the current state of research and future research directions will be highlighted.

10.00 – 10.30 hrs Break

Knowledge Representation, Decision Support & Expert Systems

Room 1
10.30 – 17.55

Chair: A. Dobnikar
Co-Chair: M. Savoji

10.30 – 10.50 1020
'Image Incorporated Mammogram and Ultrasound Based Expert System For Breast Diseases'
U. Kalthum Ngah, Universiti Sains Malaysia, Malaysia
Kim Lin Siew, Universiti Sains Malaysia, Malaysia
Noraini Mat Shariff, Universiti Sains Malaysia, Malaysia
Chan Chee Loon, Universiti Sains Malaysia, Malaysia
Shalihatun Azlin Aziz, Universiti Sains Malaysia, Malaysia

10.50 – 11.10 1043
'An Analysis of Association Rule Mining Algorithms'
R. Iváncsy, Budapest University of Technology and Economics, Hungary
I. Vajk, Budapest University of Technology and Economics, Hungary

11.10 – 11.30 1046
'Dynamic Itemset Counting in PC Cluster Based Association Rule Mining'
F. Kovács, Budapest University of Technology and Economics, Hungary
I Vajk, Budapest University of Technology and Economics, Hungary

11.30 – 11.50 1056
'Optimisation of Pattern Mining : A New Method Founded on Database Transposition'
F. Rioult, Université de Caen, France
B. Crémilleux, Université de Caen, France

11.50 – 12.10 1059
'A Comparison of Two Methods to Establish Drug-reaction Relationships in the ADRAC Database'
Dr G. Saunders, University of Ballarat, Australia
M. Mammadov, University of Ballarat, Australia
J. Yearwood, University of Ballarat, Australia

12.10 - 12.30 1071
'Ease– A Software Agent That Extracts Financial Data from the Sec's Edgar Database'
Prof. D. Seese, University Karlsruhe, Germany
O. Cetinkaya, University Karlsruhe, Germany
R. Spoeth, University Karlsruhe, Germany
T. Stuempert, University Karlsruhe, Germany

12.30 – 12.50 1103
'MML-based Compressive Models for Musical Melody'
A. Bickerstaffe, Monash University, Australia
Prof. D. L. Dowe, Monash University, Australia

13.00 – 16.00 hrs **Lunch**

16.00 – 17.00 hrs **Plenary Speech/Plenary Room – Room 2 - Peter Kokol**

Title: ***The Art Of Building Decision Trees in the Medical Domain***
Author: ***Prof. Peter Kokol***
Faculty of Electrical Engineering & Computer Science, University of Maribor, Slovenia

Abstract
Many real-world medical problems are nowadays being handled with tools for automatic intelligent data analysis. Various methods have been developed to improve the quality of analysis for specific domains. Application of any method in a specific domain has special requirements. While medical experts are not "very good with numbers" we as informaticians must focus on methods, that are capable of extracting knowledge in a form closer to human perception (white box methods), e.g. methods that induce decision trees, classification rules, etc. For the same reason instance methods based on artificial neural networks (black box methods) that are nevertheless capable of generalization of nonlinearly separable problems, but have poor explanatory power are not suitable to be used in the medical domain. Knowing the "no free lunch theorem" and the fact that normally medical experts do not have enough time and knowledge to find the best possible method for their specific problem we developed a Multimethod machine learning paradigm that can be used to automatically analyze various machine learning approaches, compare and combine them in a hybrid decision tree. In the talk we will present the new paradigm and the results obtained with using it. We will compare various decision tree approaches, purity measures, ensemble methods and finally hybrid decision trees.

17.00 – 17.15 hrs **Break**

17.15 – 17.35 1028
'Fast Efficient Association Rule Mining from Web Data'
W. Hussein, Ain shams University, Egypt
O.H. Karam, Ain shams University, Egypt
A. M. Hamad, Ain shams University, Egypt

17.35 – 17.55 1116
'Abnormal Data Formats Identification and Resolution on Data Warehousing Populating Process'
Dr A. Lourenço, Universidade do Minho, Portugal
Prof. O. Belo, University of Minho, Portugal

09.00 – 10.00 hrs **Plenary Speech/Plenary Room – Prof. Dr. Klaus Turowski** **(please see page 33 for details)**

10.00 – 10.30 hrs **Break**

Image Processing & Computer Vision

Morning Session Chair: D. Linkens

Room 2
10.30 – 12:10

10.30 – 10.50 1021
'Ovarian Ultrasound Image Enhancement By Pseudocolouring'
U. Kalthum Ngah, Universiti Sains Malaysia, Malaysia
N. Saidin, Universiti Sains Malaysia, Malaysia
Y. Mashor, Universiti Sains Malaysia, Malaysia

10.50 – 11.10 1075
'Pulsed Neural Networks for Feature Detection using Dynamic Synapses'
Dr A.Heittmann, Infineon Technologies AG, Munich
U. Ramacher, Infineon Technologies AG, Munich

11.10 – 11.30 1084
'Automatic Denoising using Local Independent Component Analysis'
P.Gruber, Institute of Biophysics, University of Regensburg, Germany
F.J.Theis, Institute of Biophysics, University of Regensburg, Germany
A.M.Tomé, Dep. Electrónica e telecomunicações, Universidade de Aveiro, Aveiro, Portugal
E.W.Lang, Institute of Biophysics, University of Regensburg, Germany

11.30 – 11.50 1109
'Human Presence Detection by Smart Devices'
B. Raducanu, Technical University of Eindhoven, The Netherlands
S. Subramanian, Technical University of Eindhoven, The Netherlands
P. Markopoulos, Technical University of Eindhoven, The Netherlands

11.50 – 12.10 1058
'Mutual Information Restoration of Multispectral Images Using A Generalized Neighborhood Operation'
H. Z. Rafi, University of Tehran, Iran
H. Soltanian-Zadeh, Medical Image Analysis Lab. at Radiology Department of Henry Ford Health systems Detroit, USA

Neural Networks & Fuzzy Systems

Chair: Peter Anderson

Room 2
12.10 – 18.15

12.10 – 12.30 1005
'Perceptron Learning versus Support Vector Machines'
Dr B. J. Falkowski, University of Applied Sciences Stralsund, Germany
S. Clausen, University of Applied Sciences Stralsund, Germany

12.30 – 12.50 1022
'Classification of Recorded Classical Music Using Neural Networks'
Dr R. Malheiro, Catholic University of Portugal, Portugal
R. P.Paiva, Centre for Informatics and Systems of the University of Coimbra A. J.Mendes, Centre for Informatics and Systems of the University of Coimbra
T. Mendes, Centre for Informatics and Systems of the University of Coimbra
A. Cardoso, Centre for Informatics and Systems of the University of Coimbra

13.00 – 16.00 hrs **Lunch**

16.00 – 17.00 hrs **Plenary Speech/Plenary Room – Room 2 - Peter Kokol** **(please see page 34 for details)**

17.00 – 17.15 hrs **Break**

Afternoon Session Chair: Peter Anderson

17.15 – 17.35 1025
'Artificial Neural Networks for Harmonic Estimation in Low-Voltage Power Systems'
D. Ould Abdeslam, Université de Haute Alsace, France
J. Mercklé, Université de Haute Alsace, France
R. Ngwanyi, Université de Haute Alsace, France
Y.A. Chapuis, Université Louis Pasteur, France

17.35 – 17.55 1095
'A Derivative-Free Kalman Filter for Parameter Estimation of Recurrent Neural Networks and Its Applications to Nonlinear Channel Equalization'
J. Choi, University of Ottawa, Canada
M. Bouchard, University of Ottawa, Canada
T. Hin Yeap, University of Ottawa, Canada
O. Kwon, School of Electronics and Information Engineering, Kunsan National University, Kunsan, Korea

17.55 – 18.15 1128
'Predicting the Morphology of Arbitrary Dendritic Trees through Simulated Annealing'
N.Venkateswaran, Waran Research Foundation(WARF), India (presented by Chandramouli)
R.Rajesh, WARF, India
R.Rajasimhan, WARF, India

Tuesday, March 02, 2004

09.00 – 10.00 hrs **Plenary Speech/Plenary Room – Room 2 - Prof. Dr. Klaus Turowski**

(please see page 33 for details)

10.00 – 10.30 hrs **Break**

Manufacturing Modeling & Dynamic Systems

Morning Session Chair: H. Junno
Co-Chair: B. Raducanu

Room 3
10:30 – 11:10

10.30 – 10.50 1092
'Segmental Linear Regression Method by Using Boosting Algorithm'
Dr X.Wang, University of Portsmouth, U.K.
D. Brown, University of Portsmouth, U.K.

10.50 – 11.10 1106
'Application of Queueing Theory to Real-Time Systems with Shortage of Maintenance Teams'
E. Ianovsky, Ben-Gurion University of the Negev, Israel
J. Kreimer, Ben-Gurion University of the Negev, Israel

11.10 – 11.30 1144
'Teleworking – The Potential Scope of Implementation in Manufacturing Company'
S. Trzcielinski, Poznan University of Technology, Poland

11.30 – 11.50 1030
'Fuzzy Approach to Risk Assessment in the Crisis Management Systems'
P. Goli ska, Institute of Management Engineering, Poznan University of Technology, Poland
Prof. M. Fertsch, Institute of Management Engineering, Poznan University of Technology, Poland

Multi-Agent Systems
Session Chair: Gulnara Baldoquín de la Peña

Room 3
11.50 – 18.55

11.50 – 12.10 1052
'Efficient 1-Bit-Communication Synchronization Protocols for Cellular Automata'
Dr H.Umeo, University of Osaka Electro-Communication, Japan
Koshi Michisaka, Internet Initiative Japan Inc., Chiyoda-ku
Kanda, Tokyo, Japan
Naoki Kamikawa, Noritsu Koki Co., Ltd., Wakayama, Japan
Jun Nishimura, MegaChips Co. LTD, Osaka, Japan

12.10 – 12.30 1066
'Knowledge Communication for Intelligent, Mechatronic Agents'
P.Scheideler, University of Paderborn, Germany
W. Dangelmaier, University of Paderborn, Germany
G. Leichtnam, University of Paderborn, Germany
A. Schmidt, University of Paderborn, Germany

12.30 – 12.50 1108
'Enhancing the Effectiveness of Simple Multi-Agent Systems Through Stigmergic Coordination'
S. Negulescu, "Lucian Blaga" University of Sibiu, Romania
B. E. Barbat, "Lucian Blaga" University of Sibiu, Romania

12:50 – 16:00 Lunch

16:00 – 17:00 Plenary Speech/Plenary Room – Room 2 - Peter Kokol
(please see page 34 for details)

17:00 – 17:15 Break

Afternoon Session Chair: Jorge Marx-Gomez

17.15 – 17.35 1114
'Obsage - An Agent-based Model of Observational Learning'
K. Jones, Rochester Institute of Technology, U.S.A.
Dr. M.Van Wie, Rochester Institute of Technology, U.S.A.

17.35 – 17.55 1124
'An Experimental Collective Intelligence Research Tool'
B.Wang, State University of New York at Stony Brook, U.S.A.
D. Hoang, University of Bridgeport, U.S.A.
C. Okpala, University of Bridgeport, U.S.A.
T.M. Sobh, University of Bridgeport, U.S.A.

17.55 – 18.15 1126
'The Impact of Education on Healthcare: A Malaria Agent-Based Simulation'
F. Rateb, University of Granada, Spain
Prof. B. Pavard, GRIC-IRIT, Toulouse, France
Dr. J.J. Merelo Guervos, University of Granada, Spain
Dr. N. Bellamine-BenSaoud, University of Tunis, Tunisia
Dr. M. I.Garcia Arenas, University of Granada, Spain

18.15 – 18.35 1031
'Mobile Intelligent Agents in Erlang'
S. Mandl, University Erlangen-Nürnberg, Germany
R. Bimazubute, University Erlangen-Nürnberg, Germany
H. Stoyan, University Erlangen-Nürnberg, Germany

18.35 – 18.55 1129
'Application of Multi-Agent Technology to Fault Diagnosis of Power Distribution Systems'
Dr M. Montakhab, The University of The West of England, U.K

Tuesday, March 02, 2004

09.00 – 10.00 hrs **Plenary Speech/Plenary Room – Room 2 - Prof. Dr. Klaus Turowski**

(please see page 33 for details)

10.00 – 10.30 hrs **Break**

Mini-Symposia: Computational Medicine Building & Applying Intelligent Systems in Health

Morning Session Chair: Peter Kokol

Room 4
10.30 – 17.35

10.30 – 10.50 1099
'Application of Soft Systems Methodology in Waiting Line in Public Hospitals of Brazil'
C. S. Arroyo, University of São Paulo
S. V. Walter Borges de Oliveira, University of São Paulo, Brazil
M. M. Borges de Oliveira, University of São Paulo, Brazil

10.50 – 11.10 7000
'Lessons Learned from Development of Decision-Support Systems'
L. Lhotska, Department of Cybernetics, Czech Technical University in Prague, Czech Republic

11:10 - 11:30 7001
'Rule Discovery from Medical Data Using Genetic Algorithm'
J. Dryl, Medical University of Wrocław, Poland
H. Kwasnicka, Wroclaw University of Technology, Poland
J. Kornafel, Medical University of Wrocław, Poland
U. Markowska-Kaczmar Wroclaw University of Technology, Poland
R. Matkowski, Medical University of Wrocław, Poland
P. Mikołajczyk, Wroclaw University of Technology, Poland
J. Tomasiak, Wroclaw University of Technology, Poland

11:30 - 11:50 7002
'Symbolic Approach to Unsupervised Learning'
E. Avdi auševi , University of Maribor, Slovenia
M. Leni , University of Maribor, Slovenia
M. Molan Stiglic, University of Maribor, Slovenia

11:50 - 12:10 7003
'How can we Benefit from Application of Intelligent Systems in Cardiology'
M. Zorman, University of Maribor, Maribor, Slovenia
M. M. Štiglic, Dept. of Pediatric Surgery, General Maribor Hospital, Slovenia
P. Povalej, University of Maribor, Maribor, Slovenia
M. Leni , University of Maribor, Maribor, Slovenia
M. Mertik, University of Maribor, Maribor, Slovenia
G. Štiglic, University of Maribor, Maribor, Slovenia

12:10 - 12:30 7004
'Discovering Dependencies in Medical Data by Visualisation'
J. Dryl, Medical University of Wrocław, Poland
H. Kwasnicka, Wroclaw University of Technology, Poland
U. Markowska-Kaczmar Wroclaw University of Technology, Poland
R. Matkowski, Medical University of Wrocław, Poland
P. Mikołajczyk, Wroclaw University of Technology, Poland
J. Tomasiak, Wroclaw University of Technology, Poland

12.30 – 12.50 7005
'To Combine or not Combine: Integration of Rough Sets in Multimethod Approach?'
M. Mertik, Laboratory for System Design, University of Maribor, Slovenia
G. Štiglic, Laboratory for System Design, University of Maribor, Slovenia
M. Leni , Laboratory for System Design, University of Maribor, Slovenia
Peter Kokol, Laboratory for System Design, University of Maribor, Slovenia

13.00 – 16.00 hrs Lunch

16:00 – 17:00 Plenary Speech/Plenary Room – Room 2 - Peter Kokol
(please see page 34 for details)

17.00 – 17.15 hrs Break

17.15 – 17.35 7006
'Boosting the Medical Knowledge Infrastructure — A Feasibility Study on Very Large Terminological Knowledge Bases'
U. Hahn**,** Text Knowledge Engineering Lab**,** Albert-Ludwigs-Universitat Freiburg, Germany
S. Schulz, Medical Informatics Department**,** Universitatsklinikum Freiburg, Germany

17.35-17.55 hrs 1039
'A Hybrid Model-Based Reasoning Ventilatory Decision Support System'
Dr. D. Linkens, University of Sheffield, Sheffield, U.K.
H.F.Kwok, University of Sheffield, Sheffield, U.K.
M.Mahfouf, University of Sheffield, Sheffield, U.K.
G.H.Mills, University of Sheffield, Sheffield, U.K.

Abstracts

Track 13: Information Systems for Mass Customization

Track 16: Hybrid Algorithms for Function Approximation and Time Series Prediction

Track 14: Hybrid System Applications

Track 17: Intelligent Mobile Agents in Peer -to- Peer Networks

Track 4: Manufacturing Modeling & Dynamic Systems

Track 18: Next Generation Vision Systems

Track 7: Robotics

Track 15: Evolutionary Computation & Neural Networks (ECNN)

Track 20: Standard Components and Activities in the Engineering of Intelligent Systems

Track 3: Knowledge Representation, Decision Support & Expert Systems

Track 2: Image Processing & Computer Vision

Track 6: Neural Networks & Fuzzy Systems

Track 5: Multi-Agent Sytems

Track 12: Mini-Symposia: Computational Medicine Building & Applying Intelligent Systems in Health

Track 13 – Information Systems for Mass Customization

Information System Design for Demand-Driven Supply Networks – Integrating CRM & SCM

Bernhard Selk*, Klaus Turowski^, Christian Winnewisser~

* Chair of Business Information Systems, University of Augsburg

^ University of Augsburg

~ University of Augsburg

Abstract

Many of the current initiatives for the practical, IT-supported employment of the concept of mass customization are generally based on the exploitation of modular designs, which limit the customer's choice largely to a guided configuration of the end product, without being able to take substantial influence on functions such as design, fabrication, assembly and distribution. To overcome these shortcomings and to provide a direct link from the customer interface to all relevant functions for fulfillment throughout the whole production network, this paper introduces the concept of demand driven supply networks and lays out the concept for a data and process model integrating multiple sales channels and the customer relationship management (CRM) function on the one hand with supply chain management (SCM), product data management (PDM) and logistics functions in a supply network on the other hand. This proposed process model aims to serve as a basis for designing integrated information systems that support mass customization in demand driven supply networks.

Utilization of Graph Constellations for the Development of Customizable Product Spectra

Maik Maurer, Udo Pulm, Udo Lindemann

Institute of Product Development, Technische Universitaet Muenchen, Muenchen, Germany

Abstract

Difficulties of assigning mass customization approaches to mechatronical products can be found in the high complexity concerning the structural assembly of product elements. Here we present an approach for a tool, which assists the product designer in identifying specific ranges in product model networks. These networks are highly cross-linked due to the representation of increasing variability. In consequence we introduce an appropriate interface between product designer and product model, which permits the handling of extensive interdependency chains resulting from the mapping of variability. The implementation of the tool comprises eight modules, whereas the most important ones are the parallel graph and matrix visualization. In a user-defined number of frames these possibilities of network description allow simultaneous execution of control, creation, and adaptation of interdependencies. The handling of complexity is supported by filter and analysis modules. The presented proceeding consists of two steps to reach manageable partial graphs of specific characteristics. Starting from an arbitrary product definition the general characteristics (colourability, function of distance, etc.) are determined. After this specific partial graphs, such as minimal frames or path sets are extracted from the graph in question. The approach will be extended in the future by integrating a methodical support for the interpretation of specific substructures.

Customer Communities to Support Product Configuration

Thomas Leckner

Institut für Informatik, Technische Universität München, Garching / Germany

Abstract

More and more enterprises use Internet and WWW to improve their contacts to customers and to enhance customer relationships. The link between e-commerce and customer relationship management is well-known and is discussed in different publications. But Internet and WWW can offer even more: It can be an enabler for new and innovative business strategies, like for example Mass Customization. Supported by online configurator tools customers are entitled to virtually assemble a product, by adapting values for the product's «degrees of freedom» in accordance to their individual preferences and needs. But often the disadvantage of many degrees of freedom is confusion and uncertainty for the customer. Additionally in many cases customers do not clearly know, what they want and the pure configurator tool does not really help them in making informed decisions. Therefore the main idea of this paper contribution is to overcome such problems by enhancing configurator tools with community support functionality. The paper discusses, how the community influences individual decision making and how different community functionalities could support customers in virtually specifying their individual products.

Software Tools for Supported CAD-Modeling of Mass Customization Products

Dennis Janitza, Dr. Franz Irlinger

Technische Universitaet Muenchen, Lehrstuhl für Feingerätebau und Mikromechanik

Abstract

In terms of mass customization, there is an increasing necessity to integrate the customer within the product develop-ment cycle. So far the customer input was reduced to define the basic tasks and requirements through information gathered by the sales and marketing departments. In terms of the new approach standard product development cycles are adapted in order to meet the new requirements. In the stages of solution principle search and module structuring the enhanced information has to be gathered.

During the following phases the products have to be pre-thought and pre-designed by modeling highly flexible and informative CAD-data using the functionalities of modern CAD-systems to define interdependencies and constraints within the product structure. These definitions lead to a set of degrees of freedom, which later on offers an individualization range for the customer. Supported by a software tool the engineers extract the developed degrees of freedom and create an flexible database file. This file is used by the customers in a configuration software, to define their own, individualized product via the internet on a client server based process. While the definition process is visualized at all times the modification information is stored in a new database file.

A Modular Product Data Structuring Model Improves the Product Life Cycle Management of Service Products in the Telecommunication Industry

Claudius Borgmann, Guido Hänßgen

Institute for Manufacturing Strategies (IMS) GmbH, Magdeburg, Germany

Abstract

We have developed and implemented an object-oriented model that covers a holistic product view of physical and service products. The introduction of the object view for all parts of a product deviates significantly from the popular material based description of product structure which is embodied in ERP systems realised by the method of part lists in particular. Using the functional view all product parts need to be allocated to five distinctive function groups. This grouping already defines specific aspects for the product construction sequences. In this newly developed product structure model we have linked significant elements of the well-known modular system with the function orientated methodology of the value engineering. The first defines modules, which consist of clearly defined relations. The latter is based on a functional model. Combining both methodologies we can define functional modules, which integrates the relationships as well as the values of the functional model. The advantage becomes particularly clear with more complex products. With this model, the product term could be extended also to services and thus cover even non-physical components. The implementation in a telecommunication company proved that the automation of customer centric processes can be achieved if the product design includes the coding of human knowledge.

A Meta Model Based Configuration Approach for Mass-Customizable Products and Services

Andreas J. Dietrich*, Wolfgang Hümmer^, Christian Meiler^

*Institute of Business Administration, University of Hohenheim,Stuttgart, Germany

^Chair for Database Systems, Institute for Computer Science VI, Friedrich-Alexander-University of Erlangen- Nuremberg

Abstract

We argue that extensibility is the key factor for domain independent mass customization solutions concerning product and service modelling and configuration. A modelling approach for hard- and soft-customizable products and services is introduced. To achieve extensibility a meta-model based strategy is chosen concerning modelling and implementation aspects. The meta model is based on a flexible and generic concept for modelling highly variable products and services of practically any domain. Such a meta model cannot only be understood as the basis for product modelling or configuration, but for the whole mass customization supply chain.

Logistics Process Model for Mass Customization in the Shoe Industry

Michael Schenk, Ralph Seelmann-Eggebert

Fraunhofer Institute for Factory Operations and Automation, Magdeburg, Germany

Abstract

Introduced by Joseph Pine in 1993, the marketing strategy of Mass Customization has become indispensable for the strategic development of many enterprises. The basic idea of Mass Customization along with all its different facets excites marketing and retail workers as well as marketing directors and CEOs. Nevertheless, Mass Customization is still not a worldwide standard. The reason for this can be seen in the complexity of implementing Mass Customization in existing mass or serial production. Pioneering examples often focus on newly founded enterprises or exclusively on production lines already set up. Precisely because every product, every form of production and every logistics system have evolved individually, no standard solution is or can be offered for implementation in an existing production or joint production line. Thus, questions remain such as which product, which possible features and how many of them should or could be individualized. In addition, time is becoming an even more crucial factor than it was before. Logistic systems have to be redesigned in order to meet new challenges. Long transport times have to be reduced in and between production lines. A lot size of 1 in a machine does not imply a lot size of 1 in transport. Both information and goods have to be controlled and managed in order for them to be at the right place at the right time. Therefore, logistics plays an extremely important role in Mass Customization.

Aspects of Customer Relation and Risk Management for the Concept of Mass Customization

Prof. Dr. Markus D. Rehfeldt, Industrial Engineering and Business Information Systems,

University of Applied Sciences Albstadt-Sigmaringen, Albstadt, Germany

Abstract

Today business applications focus on information management to support customer relation management and mass customization. They rarely take into account the additional aspect of risk management under the perspective of business continuity evaluations. Without those evaluations it takes only a small step from success to failure. This paper presents some aspects that have to be taken into account for a successful approach in customer relation applications for mass customization.

An Advisory System for Customers' Objective Needs Elicitation in Mass Customization

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Abstract

To better understand customer requirements in mass customization, we introduce here a model distinguishing between the objective and the subjective customers' needs. The model points out that the explicitly expressed customer requirements do not necessarily correspond to what customers really want. This model enables the explanation of the main shortcomings of the existing customer interaction systems. We conclude that customers should be better assisted during the elicitation process. Then, we briefly examine recommender systems within E-commerce. However, they are not able to provide customer assistance based on objective needs. Therefore, we introduce the notion of advisory systems for mass customization and we outline its basic structure. To better elicit the objective customers needs, we identify main extension fields of the system. Furthermore, to ensure the implementation of the extended advisory system, we describe the required technical infrastructure.

A Multi-Channel Customer Interaction Platform for Mass Customization - Concept and Empirical Investigation

Ralf Reichwald, Frank Piller, Melanie Mueller

Technische Universitaet Muenchen, TUM Business School, Department of General and Industrial Management, Munich, Germany

Abstract

Mass customization requires a process of co-design between each single customer and the supplier. Therefore, the interaction and configuration platform that enables users to design the desired product is crucial. Despite the fact that all known mass customization systems are at least to some extent IT-based, configuration has not to be limited to pure online interaction systems. In the past years multi-channel interaction platforms emerged, combining online and offline configuration systems as well as electronic and personal interaction. The main characteristic of such platforms is that the mass customizer offers different ways and possibilities for interaction and configuration. The customers themselves decide which channel they want to use according to individual preferences, e.g. product knowledge or configuration experience. There are three main scenarios which are imaginable from the customer's point of view: a pure offline interaction system, a mixed strategy combining online and offline orders, and pure online interaction. The objectives of this paper are threefold: (i) to discuss the options of implementing multi-channel interaction systems, (ii) to formulate important questions of research deriving from these options, and (iii) to present the layout of an empirical research project aiming to explore customer interaction on such a multi-channel interaction platform in larger detail. In this research, main fields of interest are process patterns of user interaction, user satisfaction, perceived risk as well as value of individualization.

Acknowledgments: This research is based on two research grants, which support is gratefully appreciated. The European Community's 5th Framework project "EuroShoe" provided support for the foundation of this research. The German Federal Ministry of Education and Research (BMBF) provided support within the project "EwoMacs" for the empirical study presented in this paper.

Conceptual Foundations of Customer Relationship Management Systems - with Special Consideration of the Financial Services Sector

Robert Winter

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Abstract

Customer relationship management systems are introduced in many (especially service) companies to support relationship marketing. The frequently observed failure of such projects is attributed to a lack of or incorrect alignment in the analysis phase, i.e. specification of the strategies and processes to be implemented, which has become an accepted and perfected component of the implementation process for other types of business software. Despite the fact that customer relationship management strategies and processes have been presented, they continue to be transaction-oriented rather than relationship-oriented in many cases. In this article, the problems involved are analyzed based on examples from the financial services sector, and relationship-oriented strategies and processes are outlined. The analysis is based on the findings of a two-year collaboration project with six medium and large-sized retail banks.

Track 16 - Hybrid Algorithms for Function Approximation and Time Series Prediction

Connecting Geometric Independent Component Analysis to Unsupervised Learning Algorithms

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+Arquitectura y Tecnologia Computadores, ETSII, Universidad de Granada, Spain

Abstract

The goal of independent component analysis (ICA) lies in transforming a mixed random vector in order to render it as independent as possible. This paper shows how to use adaptive learning and clustering algorithms to approximate mixture space densities thus learning the mixing model. Here, a linear square-model is assumed, and as learning algorithm either a self-organizing map (SOM) or a neural gas (NG) is used. These result in a considerable improvement in separation quality in comparison to other mixture-space analysis ('geometric') algorithms, although the computational cost is rather high. By establishing this connection between neural networks and ICA, applications like for example transferring convergence proofs for SOMs to geometric ICA algorithms now seem possible.

Time Series Forecasting Based on Parallel Neural Network

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~University of Cadiz, Spain

Abstract

In this paper we show a Parallel Neural Network (Cross-over Prediction Model) for time series forecasting implemented in PVM ("Parallel Virtual Machine") and MPI ("Message Passing Interface"), in order to reduce computational time. Parallelization is achieved twofold: (a) updating autoregressive parameters using a genetic algorithm (GA) and (b) evaluating the overall prediction function via a parallel neural network. We implement the GA in two popular architectures of parallel processors (i.e hypercube and 2D-mesh) and discuss their time efficiency.

Turkish Stock Market Analysis using Mixture of Experts

F. Gurgen, M.Serdar Yumlu

Nesrin Okay Bogazici University, Turkey

Abstract

This paper investigates the use of artificial neural networks (ANN) in risk estimation of asset returns. Istanbul Stock Exchange (ISE) index (XU100) is studied with a mixture of experts ANN architecture using daily data over a 12-year period. Results are compared to feed-forward neural networks, multilayer perceptron (MLP) and radial basis function (RBF) networks and recurrent neural networks (RNN). They are also compared to widely accepted Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) volatility model. These results suggest that mixture of experts (MoE) have the strength to capture the volatility in index return series and prepares a valuable basis for ¯financial decision making.

Track 14 – Hybrid System Applications

A Hybrid Model-Based Reasoning Ventilatory Decision Support System

Dr. D. Linkens, H.F.Kwok, M.Mahfouf, G.H.Mills

University of Sheffield, Sheffield, U.K.

Abstract

A hybrid knowledge-and-model-based advisory system for intensive care ventilator management has been developed. The system consists of two parts: a knowledge-based top-level module using neural fuzzy technology and a model-based lower-level module consisting of 4 sub-units. The system generates advice on four ventilator settings (the inspired fraction of oxygen (FiO2), positive end-expiratory pressure (PEEP), peak inspiratory pressure (PINSP) and ventilatory rate) based on the patient's routine and cardio-respiratory measurements. The top-level module and the sub-units of the lower level module are implemented in MATLAB scripts and SIMULINK.LABVIEW provides the graphics user interface and the flow control of the program.The validation results of the top-level module are encouraging. Validation of the integrated system using retrospective clinical data is underway.A good PEEP model will be required for future develpoment of the PEEP control sub-unit of the lower level module.

Network-Based Intrusion Detection Using Unsupervised Adaptive Resonance Theory (ART)

Morteza Amini, Rasool Jalili

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Abstract

This paper introduces the Unsupervised Neural Net based Intrusion Detector (UNNID) system, which detects network-based intrusions and attacks using unsupervised neural networks. The system has facilities for training, testing, and tunning of unsupervised nets to be used in intrusion detection. Using the system, we tested two types of unsupervised Adaptive Resonance Theory (ART) nets (ART-1 and ART-2). Based on the results, such nets can efficiently classify network traffic into normal and intrusive. The system uses a hybrid of misuse and anomaly detection approaches, so is capable of detecting known attack types as well as new attack types as anomalies.

Adaptive Clustering by ART 2 Neural Networks

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~ Dept. of Electronic & Computer Engineering, University of Limerick, Limerick, Ireland

Abstract

This paper proposes a general learning mechanism for ART2 neural networks that relaxes the specification within the classic ART2 model, which restricts learning only to the active node. Thus the learning allows slow forgetting by exponential decay of all long-term memory traces. This approach changes the ATR2 learning rules, but does not use additional node features, or supervisory subsystems. It preserves the basic ART2 architecture and functioning, whereby makes the implementation straightforward. The proposed general learning mechanism releases redundant committed nodes for further learning, helps to prevent the system from blocking, and enhances a variety of network features. It may be used for some classes of applications that require clustering in a very large input space, or rapidly changing environmental conditions.

Evolutionary Strategies in Agile Facility Design

A Stachowiak, Prof. M. Fertsch

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Abstract

Facility layout usually depends on products the facility manufactures and processes it performs. Nowadays market situation is volatile as customers' demands change more and more often. That is why the facility has to be agile to survive. Main characteristics of agility which are changing product mix, co-operation and interaction with customer in product development process and focusing on customers' requirements make agile facility layout design difficult. Designing facility layout for the manufacturing process which cannot be precisely formulated and is supposed to change is undoubtedly a specific problem. To solve this problem model of agile facility is to be introduced and evolutionary strategy is to be used.
Evolutionary strategies are the AI methods of optimising functions by imitating the natural selection and biological evolutionary process in order to achieve the best solution of a problem according to the rule "the best survives". They combine randomised search and stochastic heuristic. Evolutionary strategies, as well as genetic algorithms, are believed to be suitable methods for FLP (Facility Layout Problems) because they are easy, cheap and fast to use. The paper introduces the idea of agility, the model of agile facility and the evolutionary strategy used in agile facility design procedure.

A Relational Theory of Interaction and Learning Based on Classifier System

Dr. I. Nagasaka, Prof. M. Kikuchi, Prof. S. Kitamura

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Abstract

In engineering, the word interaction and learning can cover many aspects of processes of intelligent systems. In this paper, we regard the process of the interaction as transition of the status of an interface between them. From this point of view, we give a formal model of interaction and learning based on a learning system called classifier system. Firstly, we show a general view of interaction by focusing on the role of interface. Then, the role of interface is formulated as function using the idea of relational theory of meaning in Situation Semantics. By applying the formulation, the interaction between the classifier system and the environment is defined formally in a mathematical framework of information flow called Channel Theory. In accordance with this formulation, we present an alternative view of the concept of learning, that is, learning is a process of defining a function of interface between the learning system and the environment.

On Learning from Past Experience as a Meta-Methodology for the Application on Self-Optimizing working Principles within Complex Hierarchical Mechatronic Systems

A Schmidt, P. Scheideler

Heinz Nixdorf Institute, University of Paderborn, Germany

Abstract

Modern mechatronic products make use of the close interaction between mechanics, electronics, control engineering and software. As those systems increase in complexity and the interaction with its environment demands autonomous behavior, the need for inherent intelligence becomes ever urgent. Based on a framework for self-optimizing mechatronic systems, this paper introduces Working Principles of Self-Optimization as intelligent building blocks for self-optimizing module-agents. As a consequence of changing influences on the technical system, the working principles allow for an endogenous modification of the module-agents' multi-objective system and for an autonomous adaptation of its parameterization, behavior and structure. Knowledge bases of working principles together with an extended process model for learning from past experience enables the mechatronic agents to apply stored working principles to current situations and to learn from the outcome of their execution. The proposed approach is verified within a railway application scenario. The linear-motor drive of shuttle trains is self-optimized by the working principle of Preview Control.

Discovering Fuzzy Classifiers by Genetic Algorithm

M. Hasanzade, Prof. S. Bagheri, Prof. C. Lucas

Sharif University of Technology of Iran, Iran

Abstract

Today's solving most of application problems results in solving a data classification problem. Lots of solutions are proposed for classification problems. Most of them concentrate on reducing detection error of classifiers. For error reduction fuzzy logic can be useful. Obtaining error free and optimized classifiers could be done by evolutionary algorithms. Base on these, we proposed a machine learning based method for discovering fuzzy classifiers (a set of fuzzy rules) by genetic algorithms. The proposed method is tested by a number of benchmark data sets. Results in these tests are better than those of similar systems. This paper exhibits the obtained results.

Modeling Natural Motivations into Hybrid Artificial Agents

Dr. F. Andriamasinoro

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Abstract

Beforehand, the concept of natural motivations (i.e.motivations related to the satisfaction of natural needs) has been generally integrated into reactive agents, and particularly to animats. In this paper, we present and discuss a generic model which introduces such notions into hybrid agents. The basis of our model is the Abraham Maslow's pyramid of needs.

Keywords: artificial agent, natural motivations, hybridism, behavior

Compensatory Logic: A Fuzzy Approach to Decision Making

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^Magdeburg University. Germany

~Interdisciplinary College of Engineering, Social and Management Sciences, Mexico

+University of Sinaloa, Mexico

`San Juan National University, Argentina

Abstract

The flexibility and adaptability of Fuzzy Logic are convenient qualities to Decision Making. Its capacity to elaborate linguistic models could be very useful to solve real problems getting a better communication with Decision Makers and Experts. Many revealing studies has been accomplished on Multi-valued Logics, including the explorations of a variety of operators; however, the real possibility to incorporate expert knowledge, and Decision Maker subjectivity in practical models still being limited. This lack is crucial; the necessity of better axiomatic approaches and practical capacity is evident. The aim of this paper is to provide a new axiomatic development on Multi-valued Logic, with applications in Decision Making. The proposal disregards the classical point of view of norm and conorm,. Existential and Universal quantifiers are defined consequently and Propositional Bivalent Classic Calculus is introduced from this Logical System.

Keywords: Fuzzy Logic, Management, Decision Making, Multivalued Logic.

Heuristics and Metaheuristics Approaches used to Solve the Rural Postman Problem: A Comparative Case Study

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Abstract

The Rural Postman Problem (RPP) consists of determining a minimum cost tour of a specified arc set of a graph (G=(V,A)) with the particularity that only a subset T ($T \subseteq A$) of arcs is required to be traversed at least once. The arcs can be directed, undirected or both. This problem appears in a variety of practical contexts like mail, fuel and newspaper deliveries, school bus routing, electrical lines inspection, etc. (Frederickson, 1979). RPP is a NP-hard problem, therefore it has been tackled with some heuristics and metaheuristics due to the difficulty of using exact approaches to global optimality. Up to now, and based in computational results using 26 instances described in Christofides et al. (1981) and in Corberán & Sanchis (1994), a heuristic algorithm for the RPP by Fernández de Córdoba et al. (1998) based on Monte Carlo method had obtained the best results. Baldoquín et al. (2002) developed a hybrid approach based on GRASP and Genetic Algorithm comparable with the above method testing the same instances. In this paper a new hybrid approach based on Simulated Annealing, GRASP and Genetic Algorithm is introduced to solve the Undirected Rural Postman Problem (URPP). We describe the design of a computational experiment to compare the performance of Monte Carlo and the two hybrid method mentioned before, using the same 26 instances. Computational results indicate that the new hybrid approach presented in this paper, and considering the instances tested, outperformed the other methods.

Key words: heuristics, metaheuristics, routing problems, GRASP, Genetic Algorithms, Simulated Annealing.

Non-linear Prediction of Speech using ANFIS: Comparison with Neural Nets

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^Electrical and Computer Engineering Faculty, Shahid Beheshti University, Iran

Abstract

The neuro-fuzzy non-linear prediction of long segments of speech, as long as whole vowels, using ANFIS is reported in this paper and comparisons are made when neural nets are used for the same purpose. Emphasis is put on the generalization properties of the trained fuzzy inference system when both intra-vowels and inter-vowels variability are considered. The data-base used is composed of Farsi vowels whose waveforms are sampled at 11 and 22 KHz and digitized at 8 and 16 bit resolution. The effects of sampling frequency and bit resolution on the working of ANFIS are also reported. It is shown that although results are qualitatively similar to those obtained using neural nets, ANFIS has the ability to train more quickly, in just a few epochs, and is more apt to tune in a given data set. The tuning is more pronounced when the input data is of wider bandwidth.

Fuzzy Sources of Intranatal Risk Assessment: Preductal Oxygen Saturation and Pulse Oximetry Measurements

Dr. N.Guler*, F. Gürgen^

*Yildiz Teknik Universitesi Davutpasa Kampusu, Turkey

^Nesrin Okay Bogazici University, Turkey

Abstract

The study discusses fuzzy ef-fects of oxygen saturation (SaO2) values obtained using spectrophotometry meas-urements during intranatal fetal monitor-ing. The measurements were taken from umbilical artery (UA) and umbilical vein (UV). The fuzzy rules describe reliability and importance of SaO2 values. This helps to produce a decision with a certain degree of warning value that helps doctors to initiate extra cautions to prevent hy-poxic conditions during intrapartum. Mothers with singleton, livebirths were included in the study (N=1537). The af-terbirth measurements were used. But it is assumed that they have indicated SaO2 values just before birth. It is verified that the local oxygen saturation information presents a fuzzy value for the indication of adverse conditions. The significance and reliability of the intranatal diagnosis were discussed.

Track 17: Intelligent Mobile Agents in Peer -to- Peer Networks

Usage of OpenPGP with Mobile Agents in Peer -to- Peer Networks

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Abstract

Much research effort has been put into the development of mobile agent systems based on peer-to-peer network technology. However, not a very strong focus has yet been on the security of these systems. Only rudimentary security measures have been implemented which are not suited for developing open and anonymous networks which are very popular today, like for example Kazaa. This paper proposes the use of the OpenPGP standard for encryption and digital signatures allowing much more flexibility and fine grained user control of the security settings.

Keywords: OpenPGP, Mobile Agent, Encryption, Signature, Peer-to-Peer Network, X.509

Semantic Web Services for Smart Devices Based on Mobile Agents

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Abstract

Among traditional users of Web resources industry has also a growing set of smart industrial devices with embedded intelligence. As well as humans they need online services, e.g. for condition monitoring, remote diagnostics, maintenance, etc. In this paper we present one possible implementation framework for such Web services. Assumed that such services should be Semantic Web enabled and form a Service Network based on internal and external agents' platforms, which can host heterogeneous mobile agents and coordinate them to perform needed tasks. Concept of a "mobile service component" assumes not only exchanging queries and service responses but also delivering and composition of a service provider itself. Mobile service component carrier (agent) can move to a field device's local environment (embedded agent platform) and perform its activities locally. Service components improve their performance through online learning and communication with other components. Heterogeneous service components' discovery is based on semantic P2P search.

The Virtual Twin: A Socialization Agent for Peer-to-Peer Networks

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Abstract

As peer-to-peer computing finally reaches a critical mass, it triggers changes in the IT landscape that traditional network infrastructures based on centralized, client/server topologies cannot manage. Consequently, the ad hoc, self-organized and loosely controlled nature of peer-to-peer networks needs to be supported by a new coordination layer representing the interests of the user. In order to define this new abstraction layer, this paper introduces the concept of the virtual twin - a kind of anthropomorphic representation of the networked person, with whom the user can identify and feel comfortable. We discuss the inner structure of the virtual twin, first in an intuitive and informal way, with an emphasis on its social aspect, then in a more detailed way, with the analysis of its main components.

PANDORA: An Open System of Cognitive Agents using Paraconsistent Logic

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Abstract

This work is part of the Multicheck Project that defines an architecture of cognitive and independents agents for the automatic treatment of handwritten Brazilian bank checks. The concept of autonomous agents allows us to organize the application knowledge and brings from this approach several own benefits. The choice of this approach is supported in a triple hypothesis. First, the nature of the problem in question allows decomposition in well-defined tasks, and each of them can be encapsulated in an independent agent. Second, the natural capability of interaction of the agents makes the check treatment process more robust, solving situations apparently difficult. Third, the natural parallelism between the agents can contribute to implement an application with high performance.

Keywords: Autonomous Agent, Paraconsistent Logic, Task Distribution.

Mobile Agent Based Supply Chain Modeling With Neural Network Controlled Services

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Abstract

Supply Chain refers to any system of consisting of multiple entities (companies or business units within an enterprises), that depend on each other in some way in conducting their businesses. In this paper, we intend to introduce a new approach, based on mobile agents, which is capable in providing near-optimal adaptive business and knowledge management strategies to help managers for reducing mental efforts as well as search costs. Our mobile agent based system uses the publish/ subscribe communication mechanism, therefore, customers and suppliers can dynamically connect and disconnect to the system at any time. System uses mobile agents as a mediator between customers and suppliers, with a two-leveled mobile agent structure and some design details of the procurement process that is a part of an ongoing research at Turkish Air Force Academy, based on neural network approach of a supply chain management system is represented and implemented.

AGVENT: Agent Based Distributed Event System

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Abstract

In recent years, a growing attention has been paid to the publish/subscribe communication paradigm as a means for disseminating information (also called events) through distributed systems on wide-area networks. As it allows events to be propagated in a way that is completely hidden to the component that has generated them as well as to its receivers, it is particularly interesting when easy reconfiguration and decoupling among components in a distributed system is required. The historical development of publish/subscribe systems has followed a line which has evolved from channel-based systems, to subject-based systems, next content-based systems and finally object-based systems. In this paper, we propose a new model for agent based distributed events systems, the Agvent System, which combines the advantages of publish/subscribe communication and mobile agents into a flexible and extensible distributed execution environment. The Agvent system exploits mobile agents as mediators between participants of an event based distributed system.

XML Communicating Agents in the Rule Based Distributed Event System

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Abstract

Efficient agent based systems require flexible Agent Communication Languages, such as FIPA ACL, to define the exchange of structured and unstructured information between agent components of the system. The problem of encapsulating semantically rich data, which are to be exchanged between users, applications or agents, can be tackled by XML (Extensible Markup Language). XML is proving to be the backbone of open, platform-neutral data solutions. Therefore, we investigate how agent technologies and Agent Communication Languages can be integrated with XML. This paper discusses relevant technology issues related to the integration task. A rule based distributed event system scenario is outlined to demonstrate the technologies and their integration.

A Proposal for a Equipments Repair System using Agents and Web Services

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~Dept. of Computer Science & Business Informatics, Technical University of Clausthal, Cuba

Abstract

The paper shows the first ideas for a proposal of system using agent and Web Services to suggest to the user the best equipment repair real service. The user obtains a listing with the most suitable real services according to his preferences and requirements. It treats the most important elements considered in the proposal development. This work is not finished yet. I is concerned as a research-in-progress paper.

Keywords: Agents, Enterprise Java Beans, Equipments Repair Service, Framework, Web Service

Developing a Distributed ERP System Based on Peer-to-Peer-Networks and Web Services

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Abstract

As the business world gets more and more dependent on digital technology, including information systems for resource management, even the small- to medium-sized enterprises have to install and maintain complex enterprise resource planning (ERP) systems. However, these are designed as an all-in-one solution, often implementing functionality not needed. Furthermore, ERP systems like SAP depend on very large-scale infrastructures like servers and networking technology, which are very expensive to install and to maintain. Customizing these large-scale systems to the needs of a small- to medium-sized business is nearly as expensive as the customization for a large enterprise and therefore not affordable for these companies. Because of this, in this paper we present a design for a distributed ERP system, which is based on Web Services and peer-to-peer technology. It is easier to install and to maintain and cheaper than the traditional solutions.

Keywords: ERP, Web Service, SOAP, Business Component, Peer-to-Peer (P2P)

The WASP Framework - Bridging the Gap between the Web of Systems, The Web of Services and the Web of Semantics with Agent Technology

T. Biskup, J. Marx-Gomez

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Abstract

Currently we face a major gap between the reality of the web – a disjoined and tangled mass of loosely coupled information resources – and the vision for the web – a tightly integrated and openly structured information network with machine-readable data that allows autonomous agencies to create new applications empowered by this wealth of information. Current research shows that we can hope to achieve this goal, but there are many obstacles left to be mastered. We propose a framework to allow researchers and developers to choose the level of detail, the type of technologies and the extend of computing power they want to utilize for their proposed solutions. We focus on a flexible abstraction layer, pattern-oriented architecture and open interfaces to build on the successful foundations of the web: ease of use, flexibility and almost unlimited expression power. Agents are the central paradigm for software development using this architecture.

Track 4: Manufacturing Modeling & Dynamic Systems

Bayesian Support Vector Regression for Tool Condition Monitoring and Feature Selection

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Abstract

This paper introduces the application of Bayesian support vector regression (SVR) and automatic relevance determination (ARD) methods for the selection of relevant features derived from force signal for tool condition monitoring (TCM) during face milling processes. 7 primary features used by other researchers are considered, including the power spectral density, skewness, kurtosis, average and maximum force, root mean square of force, and the residual error based on the AR^1 model. A two-step approach is applied to extract the features. In the first step, the 7 primary features are derived. And then a moving window is used to calculate the mean and variance value of each primary feature. As a result, 14 features are obtained and fed into the ARD model. Different features have been found to be sensitive to two different phenomena, micro-chipping and gradual wear. The successful features of all the experiments are combined together to make them applicable for different cases. An additional set of experimental data is used to test the generalization capability of the features. The comparison between the selected features and the rejected ones prove that the selected features are really more useful. Finally, a moving average approach is proposed to further process the regression results. And fairly good estimation result has been achieved using the selected features.

A New Algorithm for Adaptive Modeling of Mechanical Systems

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~The University of Mazandaran, Bobol, Iran

Abstract

The paper presents an application of Adaptive Matrix Filter method [1] to the modeling of the mechanical systems utilizing a new algorithm [2] for solving any combination of linear-nonlinear systems of equations. This algothm is based on the separation of linear equations in terms of some selected variables from the nonlinear ones. The linear group is solved by means of any method suitable for the linear system. This operation needs no iteration. The nonlinear group, however, is solved by an iterative technique based on a new formula developed using the Taylor series expansion. The method has successfully been applied to several examples of analytical systems as well as in some engineering applications with very good results. The proposed method needs the initial guess for nonlinear variables only. This is far less than needed in Newton- Raphson method. The method also has a very good convergence rate and it is shown that the results are not sensitive to the selected initial guess. The proposed method is most beneficial for Adaptive Modeling problems that very often involve large number of linear equations with limited number of nonlinear equations. This approach makes the Adaptive Matrix Filter method an effective tool in engineering applications.

Studying the Quality of Resistance Spot Welding Joints Using Self-Organising Maps

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Abstract

Resistance spot welding is used to join two or more metal objects together, and the technique is in widespread use in, for example, the automotive and electrical industries. The quality of the welding joint is estimated by destructive or non-destructive tests. In this work, a method was developed that can be used to study the quality of a welding spot without destroying the joint. In this paper, the quality of the welding spot is analysed by using the diameter as a measure of quality. The relations between the diameter of the welding spot and certain features extracted from the welding signal curves are studied by dividing the signal curves into ten parts of equal length and using their averages as training parameters. Self-organising maps are also trained by using the most dissimilar features of the feature set. The relations between the diameter and the other features can be easily seen from the respective maps. According to the results, compression force has a notable influence on the size of the diameter. Two general rules of spot welding were confirmed by our study, which indicates that large values of diameter co-occur with small values of compression force and vice versa. Also, small values of current and small values of some features of voltage correlate with small values of diameter. This dependency naturally only holds true within reasonable limits of maximum current (to prevent splashing) and minimum force. The results also show that the quality of the welding spots can be inferred from data on other welds.

Segmental Linear Regression Method by Using Boosting Algorithm

Dr X.Wang, D. Brown,

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Abstract

As an easy and useful tool in data analysis and data mining, linear regression occupies an important position in data analysis. This paper shows a research result on multi-segmental linear regression by using boosting method.

Application of Queueing Theory to Real-Time Systems with Shortage of Maintenance Teams

E. Ianovsky, J. Kreimer

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Abstract

We present optimality conditions for real-time multiserver system with large number of identical servers (e.g. unmanned air vehicles, machine controllers, etc.) and several non-identical channels (e.g. surveillance regions, assembly lines, etc.) working under maximum load regime with limited maintenance facilities. Optimization of these systems is a very important task. We calculate limiting values of system availability and its loss penalty function and show how to obtain optimal assignment probabilities which optimize (maximize and minimize respectively) these performance measures.

Teleworking – The Potential Scope of Implementation in Manufacturing Company

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Abstract

Telework is defined as working at home or at other off-site locations that are linked electronically (via computer, fax, etc.) to a central office or principal place of employment. It can be considered as a way of turning the company towards virtuality. In this paper the features of virtuality are withdrawn from the model of dimension of integration of company. There are three dimensions:
Durability of relations among partners, Organizational distance with its three components: location distance, information distance and social distance, Need for coordination.
Virtual organization is that one which is characterized by temporary relations among partners, short information distance in spite of long physical and social distance among them, and coordination of partners' activities exploiting mutual adjustment mechanism. The information distance refers to time of reaction on threats and disturbances. The short information distance as well as the mutual adjustment mechanism of coordination is facilitated by use of IT. The concept of virtuality refers to both external and internal aspects of organization. The external aspect relates to networking company when the internal one concerns the organizational structure of the firm. Teleworking is one of solutions creating the virtual organizational structure of company. There are variety of functions performed in the organizational structure of manufacturing company. They can be systematically presented with the help of model of tree of functions. In this paper the model is used to appoint these functions which are susceptible to teleworking. In some sense outsourcing can be considered as an alternative mode of making virtual of the organizational structure of company. By applying both teleworking and outsourcing the company becomes lean. Extremely lean company has very little physical resources and has virtual organization. The model of tree of functions is used to appoint these functions which can be outsourced or performed at off-site location. Working at off-site location (at home) requires IT to link the location to the central office of company. The technology is expected to ensure some functions like: protection against not authorized access, protection the data between off-site location and the corporate network, remote access to the corporation's files and so on. Depending on the IT configuration there can be different scope of the functions' fulfillment. In this paper a review of models of IT configuration as well as some products dedicated for teleworking is presented.

Fuzzy Approach to Risk Assessment in the Crisis Management Systems

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Abstract

The aim of the paper is to propose the theoretical framework for the design of a risk assessment tool that might be successfully implemented into the crisis management system of manufacturing organisation.
The paper presents the potential application of the fuzzy sets theory in the design of risk assessment tool that breaks down the complex problems associated with crisis management into discrete units that supplies aid in the process of understanding and assessing the level of risk. Units included in the designed tool are developed using fuzzy sets theory. The risk assessment tool is designed for management of risk from man -induce disasters. The emphasis is placed on the pre-impact crisis phases like mitigation and preparation, which are bounded with high costs but also benefits when being successful.
The article is divided into five sections: Section 2 presents the theoretical introduction to the crisis management. Section 3 describes risk assessment methodology and discuses briefly techniques that might be applied to the risk assessment in manufacturing organisation. Section 4 proposes the risk assessment tool and points the problems that might occur in process of risk assessment within the framework of manufacturing organisation. Final conclusion is stated in section 5.

Track 18 –Next Generation Vision Systems

Actor-Critic Models of Animal Control- A Critique of Reinforcement Learning

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Abstract

In this article we will compare traditional reinforcement learning techniques with a novel correlation based algorithm. We will discuss several problems which occur in reward-based reinforcement learning
and outline alternative solutions. An example of a robot control task shown at the end will support our claims.

Processing Multi-Modal Primitives from Image Sequences

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~ Computer Vision Laboratory, Linköping University, Sweden

Abstract

In this paper, we describe a new kind of image representation in terms of local multi--modal Primitives. Our local Primitives can be characterized by three properties: (1) They represent different aspects of the image in terms of multiple visual modalities. (2) They are adaptable according to context. (3) They provide a condensed representation of local image structure. These three properties make them especially useful as a first stage of visual scene analysis. Our Primitives initialize a process of contextual integration that disambiguated locally ambiguous information in an artificial visual system.

Putting Gestalt Laws at Work

P. Kalocsai

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Abstract

The inherent complexity and ambiguity of scene properties renders vision extremely difficult without taking advantage of the statistical regularities of natural images. The most basic forms of these image regularities are captured by the Gestalt laws of perceptual organization [5, 15, 21]. This paper reports two versions of a multiscale and multiorientation artificial recognition system in which some of these Gestalt laws: good continuation, cocurvilinearity, proximity, and constancy of curvature (smoothness) are explicitly implemented. The recognition performance of these two 'Gestalt enhanced' models, of humans and of a baseline model where no Gestalt principles were implemented are compared on several sets of line-drawn images. It was found that the performance of the two 'Gestalt enhanced' recognition systems not only increased significantly compared with the baseline model, but their performance also became qualitatively much closer to that of humans. There was no significant difference found between the performance of the two enhanced models with slightly different Gestalt law implementations. The inherent complexity and ambiguity of scene properties renders vision extremely difficult without taking
advantage of the statistical regularities of natural images. The most basic forms of these image regularities are captured by the Gestalt laws of perceptual organization [5, 15, 21]. This paper reports two versions of a multiscale and multiorientation artificial recognition system in which some of these Gestalt laws: good continuation, cocurvilinearity, proximity, and constancy of curvature (smoothness) are explicitly implemented. The recognition performance of these two 'Gestalt enhanced' models, of humans and of a baseline model where no Gestalt principles were implemented are compared on several sets of line-drawn images. It was found that the performance of the two 'Gestalt enhanced' recognition systems not only increased significantly compared with the baseline model, but their performance also became qualitatively much closer to that of humans. There was no significant difference found between the performance of the two enhanced models with slightly different Gestalt law implementations.

Space Variant Filtering of Optic Flow for Robust Three Dimensional Motion Estimation

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2 Institute for Neuronal Computational Intelligence and Technology Stirling Scotland, UK

3 Dep. of Computer Science and Engineering Aalborg University Esbjerg, Denmark

Abstract

We test a biologically motivated filtering method [9] for noise decreasing in optical flow fields. We use the task of heading detection from optic flow as a way to estimate improvements of
flow fields generated by a standard algorithm. The image sequences which we use for the testing are
directly calculated from three dimensional real world data assuming a given self motion. Thus we
retain the control about the exact heading and rotation and have ground truth. Not surprisingly,
due to the noise and the aperture problem the results for the raw flows are often incorrect. In contrast the filtered flows allow correct heading detection.

A Non-Local Stereo Similarity based on Collinear Groups

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Abstract

In stereo-vision, the goal is to reconstruct the three-dimensional structure of the scene observed from two (or more) camera inputs. The main problem there is the matching of features into both camera frames. In this paper we use a rating scheme of the potential correspondences, based on the multi-modal intrinsic similarity of the features. Then we propose an estimations for feature consistency, and of feature stereo-consistency. This stereo-consistency applied to the neighbourhood of a feature is then used to evaluate the extrinsic similarity between the two features, estimating how the semi-local constellation of features is consistent over stereo. We have applied this process to remove outlier in our stereopsis, over artificial and natural scenes.

Recognizing Human Faces from Video

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Abstract

We present an exemplar-based probabilistic approach for face recognition in video data. The approach has two stages: First, Exemplars, which are selected representatives from the raw video, are automatically extracted from gallery videos. The exemplars are used to summarize the gallery video information. In the second part, these exemplars are then used as centers for probabilistic mixture distributions for the tracking and recognition process. Here, we exploit the fact, that tracking and recognition are related problems. The use of probabilistic methods are attractive because they allow a systematic handling of uncertainty and an elegant way for fusing temporal information. We tested our approach on more than 100 training and testing sequences, with 25 different individuals.

Track 7: Robotics

A New Approach in the Control Problem of a Binocular Head System

G. N. Marichal, J. Toledo, L. Acosta, J. N. Rodríguez, E. J. González

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Abstract

In this paper a new approach for steering a binocular head is presented. This approach is based on extracting the expert's knowledge in order to improve the behaviour of the classical control strategies. The presented technique uses a Neuro-Fuzzy system along with a classical control strategy, and as a result a new behaviour more similar to a human one is achieved.

Overtaking a Slower-Moving Vehicle by an Autonomous Vehicle

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Abstract

In the past few years there is much research on various aspects of control of autonomous vehicles. However, it seems that the problem of overtaking a slower-moving vehicle has been somewhat neglected. This paper deals with the three-phase overtaking maneuver and with designing a smooth and ergonomic optimal lane-change trajectory on a straight road. It is shown that the absolute shape, size and time of the first-phase trajectory do not depend on the velocity of the leading, slower-moving vehicle. Only the absolute point for initiating the diversion is affected. The relatively simple mathematical model for each lane-change trajectory is based on minimizing the total kinetic energy during the maneuver, superimposed on a "minimum-jerk trajectory". For high enough initial velocities, (above 5 m/s) explicit formulas are obtained for the optimal distance and the optimal time of the maneuver. By using the results of the suggested model, an autonomous vehicle, equipped with appropriate sensors, can estimate the best time and place to begin and end the overtaking and its total time and distance. This may help to make a decision whether to overtake or not.

Real-Time Implementation of On-Line Trained Neuro-Controller

Dr A. Zaki

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Abstract

Recently there have been many cases in the control field where automatic control theories and techniques have played an important role. With the progress in control theory, applications for automatic control with improved performance are non implementable. As systems to be controlled
become increasingly complicated, it is expected that control theories and techniques will also make
further progress.

Man-Machine-Interaction and Co-Operation for Mobile and Assisting Robots

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Abstract

In this contribution we present three robot assistants built at the Fraunhofer Institute for Manufacturing Engineering and Automation (IPA): The production assistant rob@work assists workers doing fetch and carry tasks and participates in manual arc welding. The robotic home assistant Care-O-bot® II sup-ports elderly and handicapped people in their living environment. The cooperation work station team@work enables a worker to co-operate with the robot in a common workspace. Beside the hardware architecture of the system, emphasis is placed on the manner of co-operation between man and robot. Furthermore the needed sensor system and motion con-trol is described.

Track 15 – Evolutionary Computation and Neural Networks (ECNN)

Artificial Life Optimization over Complex Networks

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Abstract

Different topologies for the life space of an artificial life environment facing continuous optimization problems are explored. Starting from a lattice we tested the efficiency of the algorithm when the physical space in which the agents evolve is represented first by a higher degree lattice, then by a small world network, next by a random graph and last by a scale-free network. Interesting results are obtained about efficiency improvement with respect to the lattice in all cases, but the most relevant are those ones connected to the scale-free topology. Even if obtained on a particular implementation of an evolutionary algorithm, results shown are supposed to hold for a larger class of artificial environment and/or evolutionary contexts implemented in literature. First empirical explanations of the observed phenomena are given.

Keywords – Artificial life, complex networks

An Evolutionary Algorithm for Manipulator Path Planning

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Abstract

In this paper, a versatile and scalable manipulator path planning algorithm based on an evolutionary algorithm will be described. The evolutionary algorithm realizes path planning by probabilistically searching feasible solutions in configuration space, with evolutionary rating taking place both in configuration space and work spaces simultaneously. This algorithm is intentionally kept simple and avoids inverse kinematics, which allows it to be applied for path planning of high-dimensional and redundant manipulators.

Evolving Strategy for Game Playing

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Abstract

This paper examines genetic algorithm and machine learning using the game of Nim. We have studied various attempts to evolve a competitive or even optimal strategy for this game that have been undertaken before. Based on these findings we have reviewed them and then we have designed a new approach that has been tested on a particular version of the game of Nim. Contrary to the evolving populations of "hosts" and "parasites", we have proposed a solution that is based on a genetic algorithm utilizing single population only. Moreover, we have exploited a kind of macromutation operator previously utilized within the field of genetic programming. The so-called headless chicken crossover helped us to significantly speed up the evolutionary process. We have carried out series of experiments and the analysis of these experiments is presented here. We do believe that the approaches and results described here can be useful when tackling other problems where the suitable strategy goal is pursued.

Genetic Algorithms with Fitness & Diversity –Guided Adaptive Operating Probabilities and Analyses of its Convergence

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Abstract

The paper has analyzed global convergence properties of adaptive genetic algorithms combining adaptive probabilities of crossover and mutation with diversity-guided crossover and mutation. By means of homogeneous finite Markov chains, it is proved that AGAD, which is present in this paper, and GAD (genetic algorithms with diversity-guided mutation) maintaining the best solution converge to the global optimum, which is the main contributions of this paper. The performance of AGA(adaptive genetic algorithms with adaptive probabilities of crossover and mutation), GAD and AGAD in optimizing several unimodal and multimodal functions has been compared. For multimodal functions, the AGAD converges to the global optimum for fewer generations than AGA and GAD, and it hardly has premature convergence.

Ensembles of Artificial Neural Networks with Heterogeneous Topologies

M. Rocha, P. Cortez, J. Neves,

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Abstract

Within the Machine Learning field, the emergence of ensembles, combinations of learning models, has been boosting the performance of several algorithms. Under this context, Artificial Neural Networks (ANNs) make a fruitful arena, once they are inherently stochastic. In this work, ensembles of ANNs are approached, being used several output combination methods and two heuristic ensemble construction strategies.These were applied to real world classification and regression tasks. The results reveal some improvements of ensembles over single ANNs, favoring the combination of ANNs with distinct complexity (topologies) and the weighted averaging of the outputs as the combination method. The proposed approach is also able to perform automatic model selection.

A Lamarckian Model Combining Levenberg-Maquardt Algorithm and a Genetic Algorithm

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Abstract

We review the integration between the genetic and evolutionary techniques with artificial neural networks. A Lamarckian model is proposed based on genetic algorithms and artificial neural networks. The genetic algorithm evolves the population while the artificial neural network performs the learning process. The direct encoding scheme was used. This model was submitted to several data sets and provided good results, exhibiting superior robustness when compared with the Levenberg-Marquardt and the Scaled Conjugate Gradient algorithms. It also achieved the best solutions in the regression problems.

Evolving Modular Neural Networks to Solve Challenging Control Problems

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Abstract

This article describes ModNet, a framework devoted to the evolution of modular neural controllers that affords possibilities of bootstrapping the search for efficient solutions to challenging problems. Initial
knowledge may be provided either as modules assigned to specific computations, or as an overall connectivity pattern describing how modules could be connected to each other or to the controller's inputs and outputs. These possibilities are used to automatically design neural networks that control respectively two complex dynamic systems: a cartpole and a lenticular blimp.

Hierarchical EvolutionaryAlgorithm in the Rule Extraction from Neural Network

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Abstract

This paper describes a method of extracting rules from trained neural network based on two-level hierarchical evolutionary algorithm. Evolutionary algorithm on the lower level extracts one rule at a time. Those rules are the base for higher level evolutionary algorithm to search for whole set of rules. The proposed method has been tested on five public domain data sets and the results have been compared with other rule extraction methods.

Advanced Evolutionary Design of Generalized Recurrent Neural Networks'

Dr. A.Dobnikar, S. Vavpotic

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Abstract

A new evolutionary algorithm for evolving generalized recurrent neural networks was developed. It has many advanced features, such as forking, exchanging mutation probability distributions and learning, which enable it to find optimal neural network topologies and weights for given problems. We also defined a new parameter, neural network processing speed, which enables us to use networks with one layer of neurons instead of those with many layers. It was proved that the new evolutionary algorithm always finds an optimal solution in a finite number of generations. The proposed algorithm was tested on different problem domains and the results obtained are very promising.

Track 20: Standard Components and Activities in the Engineering of Intelligent Systems

Higher-Order Mobile Agents for Controlling Intelligent Robots

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Abstract

This paper presents a framework for controlling intelligent robots. This framework provides novel methods to control coordinated systems using higher-order mobile agents. Higher-order mobile agents are hierarchically structured agents that can contain other mobile agents. By using higher-order mobile agents, intelligent robots in action can acquire new functionalities dynamically as well as exchange their roles with other colleague robots. The higher-order property of the mobile agents enables them to be organized hierarchically and dynamically. Each mobile agent can be a container of other mobile agents and can migrate to other agents. Therefore the robots controlled by the mobile agents can acquire new functions by migration of other agents. The extended agent behaves as a single agent so that it can migrate to another agent with the containing agents. In addition to the advantages described above, higher-order mobile agents require minimum communication. They only need connection being established when they perform migration. This is useful for controlling robots working in a remote site.

Model-Based Door Localization for Corridor Navigation

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Abstract

The goal of this work is to provide a mobile robot with visual capabilities to navigate along a corridor and recognize the doors situated on one side of it. A monocular camera and a laser rangefinder were used for this purpose. A model-based vision strategy has been followed. Special emphasis has been put on the perceptual grouping stage and also on the determination of the parameters defining the transformation from the real 3-D scene to the 2-D image acquired by the camera. Several algorithms have been implemented in order to solve these tasks.

Intelligent System to Assess and Treat Developmental Dyslexia in Spanish Language

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Abstract

This paper describes the architecture of the already implemented package where three important elements interact: a multimedia interface, an inference module and a database. This architecture provides the system with the flexibility to support a large variety of tasks, dynamic presentations, and complex teaching strategies. The application of speech recognition technology is also an important part of the dyslexi c children evaluation and treatment. A research effort has been done to develop a software environment to help tutors of dyslexic children with the diagnostic and treatment tasks. Nowadays it is being used in several Spanish Schools as part of its validation process.

The DTP Model: Integrationof Intelligent Techniques for the Decision Support in Healthcare Assistance

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Abstract

The paper introduces a new model, called the DTM model, that uses Artificial Intelligence techniques to obtain health-care knowledge that can be applied in a combined way to support the decision making in some relevant medical activities as diagnosis, treatment selection, and prognosis. The DTP model applies inductive learning techniques to hospital data and obtains action rules, clinical guidelines and belief networks. These knowledge structures are respectively exploited by an inference engine, a case-based reasoner, and a probability propagation system to automatically propose a Diagnostic-Treatment-Prognostic (DTP) sequence that the new patients should follow. The model and its implementation has been tested with data concerning cardiopathologies of the patients assisted in the Hospital Joan XXIII in Tarragona.

Machine-Assisted Learning: Enhancing Evolutionary Rules Extraction Algorithm with Expert Knowledge

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Abstract

Machine learning is a very important aspect for improving experts' everyday work. Not that it only helps in a routine task such as classification, where the state-of-the-art learning tools are a necessity; machine learning also helps in learning new patterns, which potentially reveal a whole new perspective onto areas not even imaginable so far. In order to squeeze as much out of machines as possible, an expert assistance in a learning process could be of vital importance to achieve the desirable results. In the paper we present a possible approach to enhance the machine learning algorithm with the help of experts' assessment of the progressing solution in order to find new patterns in the available data. We call the process machine-assisted learning. The method for automatic extraction of rules is presented that is based on the evolutionary induction of decision trees and automatic programming. The method is applied to a cardiovascular database; several sets of rules are induced upon different groups of attributes which should possibly reveal the presence of some specific cardiovascular problems in young patients. The obtained rules are assessed by physicians to evaluate the strength of the developed knowledge discovery method.

System Design for Classification Process

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Abstract

Changes of a production process and consecutive alterations of products can be analysed by different methods. A particular error usually influences the product very specifically. So, if is it possible to classify the unsuitable product in a specific class of deformation, we could predict changes in the production process. Inspection of the production process is performed by a measuring system with a number of probes placed on the product. On the base of these measured values we could make additional classification of the product that is not required for the production control. The additional classification classifies the product in the appropriate class of deformations and diagnoses the defects in the production process. The purpose of the paper is to introduce a qualitative system model for classification. The presented concept is very general and could be used in different application domains not only for classification. We developed this concept to classify a product in a proper class of deformation and to identify and eliminate sources for the alteration in a production process.

GRID Technology for Intelligent Systems and Data Mining

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Abstract

GRID technology is a new emerging computation paradigm that combines distributed computers to solve a time-consuming problem using idle computing cycles. GRID computing has emerged as an important new field, distinguished from conventional distributed computing by its focus on large-scale inter-organizational resource sharing, innovative applications, and high-performance orientation. It is an evolving area of computing, where standards and technology are still being developed to enable this new paradigm.

Intelligent systems can use the emerging new field in several ways. The most important impact GRID systems can have on intelligent systems is the potential to solve computationally and data intensive problems, which are inherent to the data mining. Secondly, because of the new paradigm, the already solved problems need to be re-addressed in the light of new architecture and new requirements.

In the paper, we outline the open research questions in the field of data mining in the light of the new GRID computing paradigm.

Data Policy for Increasing the Data Quality in Intelligent Systems

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Abstract

The electronic availability and use of data in various areas has put importance of data quality to higher level. In general data quality has syntactic and semantic component. The syntactic component is relatively easy to achieve if supported by tools, while semantic component requires more research. In many cases such data come from different sources, which are distributed across enterprise and are at different quality levels. Special attention needs to be paid to data upon which critical decisions are met. Most of decisions made on the results of intelligent systems are critical as well. In the present paper we will focus on the semantic component of data quality in the selected domain and data policy for increasing the quality of data used and/or acquired in intelligent systems.

An Adaptive Method for Map Reconstruction

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Abstract

We consider the fundamental problem of reconstructing a map when the given data is the set of road travel distances among cities in a region. This problem is the "inverse" of the distance estimation problem, in which the goal is to determine a good estimator for inter-city road travel distances. More specifically, given the road distances among cities in a geographical area, we attempt to determine the locations of the cities in a two dimensional map so that the Euclidean inter-city distances approximate the actual road distances as closely as possible. The reported solutions to this problem are few, and primarily involve multi-dimensional scaling techniques. We propose an adaptive method to overcome their distinct disadvantages. The new method has been rigorously tested on different data sets obtained from various countries. Our results have also been compared with the performance of the classical multi-dimensional scaling and ALSCAL. The accuracy of the proposed method is superior. It has also two additional desirable properties. First, we can obtain point configurations even if some of the input data are missing. Second, it becomes possible to determine configurations where points representing cities are located close to the original ones.

Track 3: Knowledge Representation, Decision Support & Expert Systems

Image Incorporated Mammogram and Ultrasound Based Expert System For Breast Diseases

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Abstract

Every woman in the world is at risk for breast cancer. In Malaysia alone, recent statistics show that breast cancer is the number one cause of cancer-related deaths among women. Early detection is most vital for good prognosis and mammography proves to be the best method of detection. Women who are in the high risk group should consider having their first baseline mammograph taken. Most Asian countries have not implemented mass screening as yet. If so, radiologists would be faced with an increased caseload, thereby elevating the chances of improper diagnosis. In practice, both mammography and ultrasound investigations are frequently used to assess breast lesions after undergoing the first assessment i.e. physical examination as the three investigations typically give complementary information. Diagnosticians with the training and experience to interpret mammographic and breast ultrasound images are scarce. An expert system would make diagnostic expertise more widely and readily available in the clinical community. The design and development of an image incorporated mammograph and breast ultrasound expert system has been detailed in this paper. Possible extension to this would be to embed image processing modules on the image based mammograph and breast ultrasound expert system.

Keywords

Expert System, Breast Cancer, Mammogram, Breast Ultrasound

An Analysis of Association Rule Mining Algorithms

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Abstract

The association rule mining is a fundamentally important task in the process of knowledge discovery in large databases. Several algorithms have been developed for single-level, single-dimensional, Boolean association rule mining. Some of them require a small amount of memory, but heavy disk access (such as Apriori-like algorithms); others necessitate low I/O activity, but large amount of memory (such as FP-growth). Different algorithms support different applications and requirements depending on the technical background. For this reason it is desirable to classify these algorithms. In this paper a trade-off is illustrated, namely, which aspects of selection should be considered, when one classifies association rule mining algorithms. Well known algorithms are categorized with these criteria, and the concept of restricted association rule mining is introduced. Necessary modifications are also shown to the algorithms assuming that not all frequent itemsets are needed, only those with maximal size of a given threshold. The paper examines the mining time for both the original and the modified algorithms, and calculates the profit.

Dynamic Itemset Counting in PC Cluster Based Association Rule Mining

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Abstract

One of the most important problems in data mining is association rule mining. It requires very large computation and I/O traffic capacity. For that reason there are several parallel mining algorithms, which can take advantage of the performance of the cluster systems. These algorithms are optimized and developed on supercomputer platforms, but nowadays the capacity of PC keeps the possibility to build cluster systems cheaper. Usage of PC cluster systems raises some issues about the optimization of the distributed mining algorithms, especially the cost of the node to node communication and cost of the synchronization. The communication costs of currently used main distributed association rule mining algorithms depends on the number of nodes with O(n2) complexity. The node synchronization is also a very important issue. The current algorithms contain too many synchronization points and this can cause performance decrease, especially in PC cluster environment. In this paper a new distributed association rule mining algorithm is introduced, which is based on dynamic itemset counting. The communication costs of this newly developed algorithm is O(n) and the nodes can work asynchronously.

Optimisation of Pattern Mining : A New Method Founded on Database Transposition

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Abstract

Looking in a database for interesting patterns of attributes (the columns) or groups of objects (lines) that verify some properties is a classic task in data mining, today well mastered. Nevertheless, some difficult contexts such as the data provided by gene analysis remain intractable, because of a disproportionate number of attributes, compared to the number of objects. In these conditions, it is naturally tempting to transpose the matrix of data to carry out more efficiently the pattern mining. This article exposes this new method and shows its interest but also the difficulties to solve so that this approach is fruitful. With using the Galois connection, the extraction achieved in the transposed base allows to infer results on the initial data. We detail the contributions of this practice on data containing a big number of attributes, such as data of genome, as well as its possible application to the mining under monotonous constraint and the obtaining of the totality of the closed patterns.

A Comparison of Two Methods to Establish Drug-reaction Relationships in the ADRAC Database

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Abstract

In this paper we present drug-reaction relations in the form of weights that indicate the "probability" of occurrence of reactions. The comparison of two different datasets for establishing such a representation is made: one uses all drugs involved and the other dataset uses only suspected drugs reported.

Ease– A Software Agent That Extracts Financial Data from the Sec's Edgar Database

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Abstract

In this paper we discuss text mining approaches for financial data from the Electronic Data Gathering, Analysis and Retrieval (EDGAR) database of the Securities and Exchange Commission (SEC) which contains filings including financial statements of about 68,000 companies. The structure of these filings varies between companies, and changes over time for individual companies as well. Moreover, their technical specification is comparably weak. Altogether, this makes automated data extraction a great challenge for software agents. The focus of this paper was the recognition of balance sheets, that is, how to find relevant sections in a large document. A filing consists of HTML or plain text. With respect to this distinction, we followed two different approaches for the respective types. Regarding HTML encoded content the agent builds a DOM (Document Object Model) instance on top of non-standard filing, which allows very convenient data access. This DOM-based approach revealed additional potential for navigation in these filings in order to detect financial information faster and more reliably even when filings do not adhere to syntactical conventions strictly. For plain text, a modified vector space model has been developed. We succeeded to extract key financial information at a reasonably high level for conventional text files.

Fast Efficient Association Rule Mining from Web Data

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Abstract

The need for the analysis of the behavior of users on the World Wide Web motivated the use of data mining techniques for the discovery of traversal patterns. These patterns are usually expressed in the form of association rules. In this paper, we suggest a graph representation of the transactions database to assist with its division into a set of databases each containing fewer transactions and items. The runtime of the Apriori algorithm was compared when run on both the original and the divided databases. The division of the database was shown to improve the runtime by an average of 43.45% while maintaining the same results. Interestingness measures were also introduced as a way to improve the quality of the resulting rules. Introducing interestingness measures to the division process improved the average precision of the algorithm by a minimum of 15.5%.

Key Words: Web Usage Mining, Data Mining, Association Rules, Interestingness Measures.

Local Estimate of Distribution Mapping Exponent for Classification of Multivariate Data

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Abstract

Methods for classification of multivariate data which are based on the nearest neighbors approach solve the problem of classification by an estimate of the probability density at point x of the data space by ratio i/V. i is the number points of a given class of the training set in a suitable ball of volume V with center at point x. The method proposed is based on notion of distribution mapping exponent and its local estimate q for each point x. Distances of all points of a given class of the training set from a given (unknown) point x are used for the probability density estimate. It is shown that the sum of reciprocals of q-th power of these distances can be used as the probability density estimate. The classification quality was tested and compared with other methods using multivariate data from UCI Machine Learning Repository. The method has no tuning parameters.

MML-based Compressive Models for Musical Melody

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Abstract

Human inference of melodic structure is seemingly innate and intuitive, yet little is known about the cognitive processes that lead to such inference. Subsequently, computer modelling of melodic structure remains a difficult problem. Successful inference of the structure in musical data can provide insight into the process which created the data (e.g. the style of a composer) and result in data compression. Music is structurally rich data, with structure present at several levels, ranging from short term (e.g. note level) to long term (e.g. theme level). To systematically investigate melodic structure, we first begin with short term structure, that is, the structure of individual music notes. This paper provides eight new pitch models and one duration model for musical notes. These models are based upon the Minimum Message Length (MML) principle. Using MML, we discover which models best fit the test melodies and show that the best MML-based models compare favourably to existing compression techniques. We discuss limitations of the proposed methods and, finally, offer possible directions towards improving the MML-based models.

Abnormal Data Formats Identification and Resolution on Data Warehousing Populating Process

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Abstract

Data Warehousing systems are perhaps one of the most valuable assets that organisations possess today. They manage and sustain crucial, strategic information, granting the urging decision support. However, before taking advantage of this magnificent resource, there has to be set a plan to ensure its population. The process of extracting, transforming and loading data into the data warehouse is anything less straightforward. These scenarios are inherently heterogeneous. The idea of gathering every piece of information that is available and thought useful brings along different data models and data schemas to conciliate. Besides, within each single source, it is likely that several kinds of conflicts, inconsistencies and errors pump up. Therefore, tools capable of identifying and resolving these situations are in order. This paper aims to bring some light into the subject, covering basic issues related with data cleaning, as well as,
proposing a new computational platform - an agent-based abnormal data formats identification and resolution platform. The aim was set on assisting the process, learning from past experiences and thus, evolving wrappers knowledge about abnormal situations' resolution. Eventually, this evolving will
enhance the data warehouse population process, enlarging the integrated volume of data and enriching its actual quality and consistency.

KEYWORDS: Data Warehousing systems, data cleaning and integration, agent-based systems, FIPA, JADE, and Knowledge Discovery in Databases.

Track 2: Image Processing & Computer Vision

Ovarian Ultrasound Image Enhancement By Pseudocolouring

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Abstract

Image processing may be employed on ovarian ultrasound images to assist doctors in diagnostic analysis. The gray levels of ovarian images are usually concentrated at the zero end of the spectrum, making the image too low in contrast and too dark for the naked eye. This paper examines the effectiveness in displaying gray level ultrasound images as colour images and proposes a pseudocolouring approach for enhancing features in ultrasound ovarian image, which allows easy discrimination of texture information. A combination of the pseudocolouring method with other image enhancement manipulations such as contrast stretching and seed based region growing was also investigated. The combination of the pseudocolouring approaches with the other image enhancement techniques can dramatically increase the information in ovarian ultrasound.

Keyword:
Ultrasound, medical imaging, image enhancement, pseudocolouring

Mutual Information Restoration of Multispectral Images Using A Generalized Neighborhood Operation

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Abstract

Information theory based techniques for signal and image processing are now considered as a viable alternative to other popular techniques. This paper presents a new multispectral filter based on mutual information maximization to mutually restore multispectral images. For the sake of simplicity we consider only two multispectral images, but the idea can be generalized to more images. Since multispectral images contain analogous information about a scene, as a rule their mutual information is assumed to be maximal; but noise and other independent artifacts decrease their mutual information. A generalized neighborhood operation based on an alternative mutual information measure is used to increase the mutual information between the two neighborhood windows, sliding simultaneously on both images. The main feature of this generalized neighborhood operation is that it updates all pixels inside the neighborhood window. This filter does not assume any specific relation among the gray level intensities of images, and uses both inter-frame and intra-frame information to suppress noise. Application of the proposed method to simulated images shows the outperformance of this method compared with Perona-Malik method which has received much attention in recent years because of its capability in both noise reduction and edge enhancement.

Pulsed Neural Networks for Feature Detection using Dynamic Synapses

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Abstract

Technical applications where scene analysis is involved rely on a robust feature extraction. Feature extraction based on neural principles traditionally emphasize the analogue representation of information as well as analogue information processing at least to the level where simple cells are modeled. In contrast to this we will show in this paper how principles of correlation and detection of correlation can be used to extract features up to a level of complexity of at least that of simple cells. Using only two data-driven adaption rules for connection weights dependent on membrane potentials as well as on dendritic current simple networks can be implemented to detect gradients of intensity. By replicating of those detectors and defining densitiy of connectivity to the receptors of the retina complex detector-profiles can be implemented.

Automatic Denoising using Local Independent Component Analysis

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Abstract

We present a denoising algorithm for enhancing noisy signals based on local independent component analysis (ICA). We extend a noise reduction algorithm proposed by Vetter et al. by using ICA to separate the signal from the noise. This is done by applying ICA to the signal in localized delayed coordinates. The components resembling noise are detected using estimators of kurtosis or the variance of the autocorrelation. This algorithm can also be applied to the problem of denoising multidimensional data like images or fMRI data sets. In comparison to denoising algorithms using wavelets or Wiener filters the local PCA and ICA algorithms perform considerably better especially the ICA algorithms considering the estimation of higher order statistical moments like kurtosis.

Human Presence Detection by Smart Devices

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Abstract

This paper discusses a computer vision based approach for enhancing a common device (display) with machine perception capabilities. Using techniques for assessing the distance and orientation of a target from the camera, a "smart device" becomes aware about user's presence and his interaction intentions. In other words, the "smart device" is aware when it becomes the user's focus of attention and it knows to respond accordingly. Our solution uses low-cost cameras adapted with infrared technology and is designed to be robust to lighting variations typical of home and work environments.

Track 6: Neural Networks & Fuzzy Systems

Perceptron Learning versus Support Vector Machines

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Abstract

In this paper the performance of perceptron learning is compared with that of support vector machines if the pertinent Vapnik-Chervonenkis (VC-) Bound is small, thus complementing some known results. To this end the creditworthiness of bank customers is evaluated using real-life (anonymous) data and a so-called scoring system. Since in practical situations there is usually a shortage of available learning data as well as a lack of sophisticated software a comparatively small number of data is used for fault tolerant perceptron learning implemented in Excel using VBA. In order to justify the tests it is shown that the VC-Bound of the raw data is indeed small. The significance of experimental results with respect to applying perceptron learning as opposed to SVMs is discussed since it allows the use of cost functions. This is of particular relevance within the banking context.

Key words: support vector machines, perceptron learning, scoring systems

Classification of Recorded Classical Music Using Neural Networks

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Abstract

As a result of recent technological innovations, there has been a tremendous growth in the Electronic Music Distribution industry. In this way, tasks such us automatic music genre classification address new and exciting research challenges. Automatic music genre recognition involves issues like feature extraction and development of classifiers using the obtained features. As for feature extraction, we use the number of zero crossings, loudness, spectral centroid, bandwidth and uniformity. These features are statistically manipulated, making a total of 40 features. Regarding the task of genre modeling, we train a feedforward neural network (FFNN) with the Levenberg-Marquardt algorithm. A taxonomy of subgenres of classical music is used. We consider three classification problems: in the first one, we aim at discriminating between music for flute, piano and violin; in the second problem, we distinguish choral music from opera; finally, in the third one, we aim at discriminating between all the abovementioned five genres together. We obtained 85% classification accuracy in the three-class problem, 90% in the two-class problem and 76% in the five-class problem. These results are encouraging and show that the presented methodology may be a good starting point for addressing more challenging tasks.

Artificial Neural Networks for Harmonic Estimation in Low-Voltage Power Systems

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Abstract

Harmonic estimation is the foundation of every active noise canceling method in low-voltage power systems. Reference currents are generated and re-injected in phase opposition through an active power line conditioner. Active Power Filters (APFs) are today the most widely used systems to compensate harmonics in industrial power plants. We propose to improve the performances of conventional APFs by using artificial neural networks (ANNs) for harmonics estimation. This new method combines both the advantages of conventional APF to compute instantaneous real and imaginary powers and the learning capabilities of ANNs to adaptively choose the parameters of the power system. In fact, the separation of the powers is implemented with an Adaline neural network which uses a priori known frequencies as inputs. Furthermore, multilayer feedforward networks are used to approximate the instantaneous powers and to compute the reference currents. Simulation results show the reliability of the method and better performances than conventional APFs.

A Derivative-Free Kalman Filter for Parameter Estimation of Recurrent Neural Networks and Its Applications to Nonlinear Channel Equalization

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Abstract

Recurrent neural networks (RNNs) trained with gradient-based algorithms such as real-time recurrent learning or back-propagation through time have a drawback of slow convergence rate. These algorithms also need the derivative calculation which is not trivialized in through the error back-propagation process. In this paper, a derivative-free Kalman filter, so called the unscented Kalman filter (UKF), for training a fully connected RNN is presented in a state-space formulation of the system. The UKF algorithm makes the RNN have fast convergence speed and good tracking performance without the derivative computation. Through experiments of nonlinear channel equalization, the performance of the RNN with the UKF is evaluated.

Predicting the Morphology of Arbitrary Dendritic Trees through Simulated Annealing

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Abstract

The inter-neural connectivity plays a major role in the various regions of the brain affecting their functionality. In this regard, the knowledge of the dendritic interconnect structure is imperative. There are quite a few experimental approaches currently available to explore the dendritic connectivity which have their own shortcomings. On the other hand, a theoretical approach would be helpful in developing simulation and fault models for the dendritic tree structure which has wide applications in research and diagnostics. In this paper, we propose a powerful approach based on a randomized algorithm, to predict the dendritic tree structure connectivity. This approach involves two finite steps, one dealing with the topological aspects and the other dealing with the fixing up of the physical length of each of the dendritic branches. The randomized algorithm employed is the simulated annealing and it is powerful in the sense that it can overcome local minima to achieve global minima to obtain near optimal solution. We also propose in this paper, an integrated approach in which simulated annealing algorithm is simultaneously employed for dendritic structure prediction and the length prediction with dynamic scheduling. This ensures faster convergence towards optimal solution. Extensive simulations have been carried out and results are presented demonstrating the feasibility and powerfulness of the proposed approaches.

Semantic Handwriting Recognition

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Abstract

“Handwriting is regarded as that action of emotion, of thought, and of decision that has recorded the history of mankind, revealed the genius of invention, and disclosed the inmost depths of the soulful heart. It gives ideas tangible form through letters, pictographs, symbols, and signs. Handwriting forges a bond across millennia and generations that not only ties us to the thoughts and deeds of our forebears, but also serves as an irrevocable link to our humanity. Neither machines nor technology can replace or equal the contribution or continuing importance of this inexpensive portable skill. Necessary in every age, handwriting remains just as vital to the enduring saga of civilization as our next breath.” “Semantic Handwriting Recognition” deals with recognition and identification of handwritten characters as well as handwriting. Computer handwriting recognition offers a new way of improving the human-computer interface and of enabling computers to read and process the many handwritten documents that must currently be processed manually. While many researchers have successfully provided partial solutions to this difficult problem, the problem of character recognition in general and handwritten character recognition in particular, remains unsolved as far as 100% accuracy is concerned. Specifically, more reliable methods need to be found before human performance in recognizing characters can be matched. So taking inspiration from the human brain, I have tried to imitate its function partially by using neural networks. So in this paper I will discuss the various issues and characteristics involved with Handwriting Recognition especially cursive handwriting. In brief, the steps involved in most character recognition systems can be broadly classified into pre-processing, feature extraction and classification. Of these steps, methods of feature extraction have received the largest amount of research and development. There are two parts to this step: (a) Defining distinctive features of characters, (b) Extracting features once they have been defined. Part (a) of this problem remains open. That existing character recognition systems have yet to match human performance can in part be ascribed to the intractable nature of designing distinctive characteristics for character patterns.

Track 5: Multi-Agent Systems

Efficient 1-Bit-Communication Synchronization Protocols for Cellular Automata

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Abstract

We study a classical firing squad synchronization problem for a large scale of one- and two-dimensional cellular automata having 1-bit inter-cell communications (CA). First, it is shown that there exists a one-dimensional CA that can synchronize n cells with the general on the left cell in optimum 2n -2 steps. In addition we show that there exists a one-dimensional CA that can synchronize n cells with the general on the k-th cell in n +max(k, n-k+1) steps, where the performance is two steps larger than the optimum one that was developed for O(1)-bit communication model. Next, we give a two-dimensional CA which can synchronize any n x n square and m x n rectangular arrays in 2n - 1 and m+n+max(m, n) steps, respectively. Lastly, we propose a generalized synchronization algorithm that operates in m + n + max(r + s, m + n - r - s) + O(1) steps on two-dimensional m x n rectangular arrays with the general located at an arbitrary position (r, s) of the array, where 1< r < m and 1< s < n. The time complexities for the first three algorithms developed are one to four steps larger than optimum ones proposed for O(1)-bit communication models. We show that there still exist several new interesting synchronization algorithms on CA, although more than 40 years have passed since the development of the problem.

Knowledge Communication for Intelligent, Mechatronic Agents

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Abstract

The objective of the Collaborative research centre 614 “Self-optimising Concepts and Structures in Mechanical Engineering” is the ability to assemble comprehensive future mechanical systems from single intelligent units. These units have specific abilities assuming autonomously the solution of a problem. The individual systems are integrated into one overall system being characterised by an active communication and cooperation between the units. If these units exchange information (data), from the IT point of view, we refer to an agent system. An agent of this system is an autonomous, active, and intelligent entity striving to optimise its own behaviour either autonomously or in cooperation with other agents. In case the system is optimised by a cooperation process, it is necessary for the agents to communicate with each other. Therefore, a multi agent system acting in more than one world of topics requires a precise notional concept for the receiver and the sender to understand the exchanged message. The solution for achieving this state are ontologies. They structure and describe unambiguously the environment. Without this unambiguity, misunderstandings and therefore the failure or collapse of a complex system might be the consequence. Thus, a system environment is to be developed maintaining the unambiguousness for all situations.

Enhancing the Effectiveness of Simple Multi-Agent Systems Through Stigmergic Coordination

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Abstract

After detailing the terminology employed, the paper explains the rationale of choosing stigmergic coordination to enhance the problem-solving power of simple MAS, emphasizing the engineering advantages (very simple entities, unaware of each other). To be affordable on usual configurations, a reduced number of agents and a problem-class of manageable complexity are needed. To be comparable against related work, an effectiveness measure is defined and two reference usual algorithms are chosen. All tests apply to the Travelling Salesperson Problem (TSP) solved with variants of the Elitist Ant System (EAS). The paper follows two paths: searching for local enhancements (based on the biological model) and creating a problem-solving method for TSP (searching for inter-paradigmatic synergy). The first path proved useful (from about 45 algorithm instances tested out, 22 gave relevant results): effectiveness is visible (albeit not much) enhanced by fine-tuning the EAS. The second (more promising) path is based on adding symbolic processing factors (adapting the environment and instituting a limited central coordination). Since now the added factors are controlled externally, quantitative evaluations are missing but improvements are apparent. The paper concludes that stigmergic coordination improves effectiveness on affordable configurations with simple MAS, classical problems and usual benchmarks.

Obsage - An Agent-based Model of Observational Learning

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Abstract

In many social systems, individuals are able to learn new behaviors by observing others. This paper describes experiments in augmenting reinforcement learners in an artificial society with the ability to observe each others' actions and rewards; the initial hypothesis was that observant agents would
have an advantage over their non-observant counterparts. Experimentation shows that observation helps most when experienced teachers are available, and is most effective early in an agent's life-cycle.

An Experimental Collective Intelligence Research Tool

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Abstract

The Collective Intelligence Research Tool (CIRT) is an experimental software and hardware research tool. It provides an inexpensive and efficient alternative research implementation that demonstrates simulations of the collective behavior of self-organized systems, primarily social insects. The software focuses on 2D simulations of the woodchip-collecting behavior of termites and 3D simulations of the building behavior of wasps. The hardware simulation employs a Boe-Bot robot, which has the potential of simulating simple movements of a social insect, by extending its functionality through adding sensors and integrating a control chip.

Keywords Artificial Life, Intelligent Agents and Multi Agent Systems.

The Impact of Education on Healthcare: A Malaria Agent-Based Simulation

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Abstract

Malaria is a vector-borne disease that greatly affects social and economic development. We adopt the complex system paradigm in our analysis of the problem. Our aim is to assess the impact of education on malaria healthcare. Multi-agent systems are employed to model the spread of malaria in Haiti, where we introduce malaria education as a possible way of regulating deaths due to the parasite. We launch three experiments, each with environment modifications: 3 hospitals; 3 hospitals and 20 schools; and 5 hospitals and 20 schools. The results of running 10 simulations for each experiment show that there is a reduction in malaria deaths not only when including schools, but when in combination with increasing the number of hospitals.

KEYWORDS
Multi-agent systems, Education, Health care, Malaria, Decentralised system.

Mobile Intelligent Agents in Erlang

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Abstract

We present a vision for distributed application programming in peer-to-peer networks based on a modified version of the Procedural Reasoning System that we call ePRS. The original PRS is expanded to provide mobility between nodes, which may be spread over a network of computers. The node concept is strongly linked to the concept of computation environments. We show that the goal-based nature of ePRS agents makes them useable even in environments that were unknown at the time they were defined. The Erlang language, which
is used as implementation language provides the basic networking technology. An example from the domain of database consistency is proposed.

Application of Multi-Agent Technology to Fault Diagnosis of Power Distribution Systems

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Abstract

When a fault occurs in a power system, the protective relays detect the fault and trip appropriate circuit breakers, which isolate the affected equipment from the rest of the power system. Fault diagnosis of power systems is the process of identifying faulty components and/or sections by analysing observable symptoms (telemetry messages). As the domain itself is characterised by dynamic situations, extensive telemetering, complex operations, and distribution of lines and substations over a large geographical area, it is difficult to tackle fault diagnosis problems through the strength and capability of a single intelligent system. This paper describes an experimental multi-agent system developed for and aimed at a computer-supported fault diagnosis in electricity distribution networks. The system is based on a hierarchy of five agents that cooperate with each other to diagnose a fault. The results obtained suggest that agent-based approach is very efficient and with a good potential for real-time application.

Keywords: agents, multi-agent systems, fault diagnosis, electricity distribution networks

Track 12 – Mini-Symposia: Computational Medicine Building & Applying Intelligent Systems in Health

Application of Soft Systems Methodology in Waiting Line in Public Hospitals of Brazil

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Abstract

The patients' selection in public hospitals of the Sistema Único de Saúde (Unique System of Health) has been presenting countless problems, as waiting lines and bad quality of the infrastructure, that brings the user's dissatisfaction. For a system analysis of this problem, this paper proposes the use of Soft System Methodology together with the queuing theory, to facilitate the understanding and to suggest possible options, which will result in the choice of the best solution and improvement of the service quality in this section.

Lessons Learned from Development of Decision-Support Systems

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Abstract

The aim of the paper is to point to the most important aspects that must be considered before and during development of a decision-support system, especially in such a dynamically developing area as medicine. We have to consider that medical doctors concentrate more on patient's diagnosis and treatment than on consulting a computer. So introducing any computer-based system to their work must not be done using force so that the doctors do not have the feeling they are manipulated and pressed to use it. Problems, such as motivation of researchers and users, steps in design and development, human-computer interaction, problem domain data and knowledge, reasons of failures, are briefly discussed.

Rule Discovery from Medical Data Using Genetic Algorithm

Jacek Dryl[+], Halina Kwasnicka[*], Jan Kornafel[+], Urszula Markowska-Kaczmar[*], Rafal Matkowski[+], Paweł Mikołajczyk[*], Jacek Tomasiak[*]

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Abstract

The paper presents a genetic algorithm used as a tool for rule discovery from real medical data. The data concern carcinoma of the cervix uteri, they cover 527 patients from three years. The last covered year is 1998, so we know results of applied therapy of patients. The efficiency of genetic algorithm used as a tool for such a problem has been studied and obtained results are shortly presented. Summary and the future work are also included in the paper.

Symbolic Approach to Unsupervised Learning

Enis Avdi auševi , Mitja Leni , M. Molan Stiglic

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Abstract

As important as data mining techniques are, they still require too much technical knowledge from users. This is most evident in the process of interpretation of results, where domain experts are involved. One of the most challenging tasks in the area of knowledge discovery is to express discovered knowledge in a form, which can be understood by domain experts (e.g. medical experts). In the paper we present our approach to unsupervised learning using multivariate symbolic hybrid. Main advantage of multimethod symbolic hybrid is that learned knowledge is expressed in a form of symbolic rules. Learned knowledge is much more understandable to domain experts, which increases its value and makes it much easier to apply.

How Can We Benefit from Application of Intelligent Systems in Cardiology

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Abstract

In this paper we present the role of the physician in developing and using intelligent systems and benefits from using intelligent systems on cardiovascular database. As in many other areas, predictions play an important role in health care. What will be the status of the patient after the selected treatment, will the healing process end with the success or not are just some of the possible predictive questions faced by both patients and medical staff. Statistics can be of great help in many real world situations, but sometimes its use is limited. As an alternative we can use so called intelligent data analysis techniques like neural networks, case based reasoning, logic programming, or decision trees. The greatest weakness of the majority of these techniques is that they are black box approaches – normally giving good predictions but without explanation. One of the techniques overcoming this fault is the decision tree approach, which in addition to immense prediction power also explains the decisions leading to the predictions using a simple two dimensional graphical model. We used the decision tree approach in the intelligent analysis of cardiac diseases in the young. We got excellent results, where some new diagnostic rules and guidelines have been extracted.

Keywords - intelligent systems, decision making, cardiology, cardiovascular.

Discovering Dependencies in Medical Data by Visualisation

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Abstract

In the paper the visualization of medical data sets by Samonn's mapping is tested. This mapping performs the projection of multidimentional data into the small size space. For the purpose of visualization the size is equal 2. The obtained results were verified with the results of statistical approach. The application of Samonn's mapping seems to be promising results for discovering the new regularities in the data and for producing the prognosis of the disease free survival for new patients, as well. In the future development of application the implementation of neural network is planned, which will perform the transformation of new data in an automatically way and it will help to find the values of missing data.

To Combine or not Combine: Integration of Rough Sets in Multimethod Approach?

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Abstract

Due to the weakness of single methods their integration into hybrids is intensively researched in recent years. Most of these approaches use the static approach which is not successful in every situation therefore we build Multimethod approach that dynamically combines different machine learning methods following the assumption that only the synergetic combination of single models can unleash their full power. To increase the power of Multimethod approach we have to use as many as possible methods, which have to be integrated in Multimethod framework. In this paper we present a feasibility study for integration of the rough sets and its possible contributions to the system as a whole.

Boosting the Medical Knowledge Infrastructure — A Feasibility Study on Very Large Terminological Knowledge Bases

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Abstract

We conducted a feasibility study in which conceptual knowledge was extracted from an informal medical thesaurus (UMLS) and automatically converted into a formally sound description logics system.
Our approach consists of four steps: concept definitions are automatically generated from the UMLS source, integrity checking of taxonomic and partonomic hierarchies is performed by the terminological classifier, cycles and inconsistencies are eliminated, and incremental refinement of the evolving knowledge base is performed by a domain expert. We report on experiments with a very
large terminological knowledge base composed of 164,000 concepts and 76,000 relations.

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