



WAC 2006

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Intelligent Automation: **Imed Kacem**, Université de Technologie de Troyes (UTT)

France Secretariat of ISIAC 2006: **Khaled Mesghouni**, Ecole Centrale de Lille, France



ISOMA 2006 10th International Symposium on Manufacturing and Applications

Chairs: **Saeid Nahavandi**, Deakin University, Australia

And **Hamid Abachi**, Monash University, Australia



ISSCI 2006 6th International Symposium on Intelligent Automation and Control

Co-Chairs:

Mattheius Reuter, Universitat Claushal, Germany

Koczy Laszlo, Budapest Technical University, Hungary

Diego Andina, Universidad Politecnica de Madrid, Spain



IFMIP 2006 5th International Forum on Multimedia and Image Processing

Chair: **Yutaka Hata**, University of Hyogo, Japan

Co-chairs:

Image Processing: **Erzsébet Merényi**, Rice University, USA

Biomedicine: **Syoji Kobashi**, Japan

Financial Engineering: **Jorge Marx Gómez**, University of Magdeburg, Germany

Multimedia: **Naoyuki Kubota**, Tokyo Metropolitan University, Japan

Special Issues of the AutoSoft Journal - WAC accepted and presented papers can be coordinated into a unified theme as special issue of the WAC Official publication - *Intelligent Automation and Soft Computing - AutoSoft Journal* (a well-respected 12-year old journal which is being abstracted at numerous sites and services around the world). For more details, contact your session organizer (chair) or autosoft@wacong.org.

Continued inside back cover – Program Committee

Right side first page



WAC 2006...celebrating its 20th year of serving the global technical community, is technically co-sponsored by the **IEEE Systems, Man and Cybernetics Society**, and in cooperation with **Japan Robotic Society**, **Korean Soft Computing Association**.

<http://wacong.org>



Budapest Hilton, Budapest, Hungary
July 24-26, 2006

WORLD AUTOMATION CONGRESS 2006...

Welcome to WAC 2006 in Budapest.

It is my distinct pleasure to welcome each and every one of you to WAC --- World Automation Congress 2006. The plans for this conference began back in 2003 when it was decided to come to the beautiful and historical city of Budapest in Hungary. WAC 2006 is duly dedicated to two distinguished Hungarian Scholars – Professors and academicians **Tibor Vamos** and **Pal Michelberger** for their giant contributions to systems engineering, control systems and international leadership

We at WAC have begun a new approach for our bi-annual annual congress, i.e., soliciting full papers only. We attracted over 250 full papers, including many special session proposals. The five tracks of WAC program committees sent all the papers, unsolicited and special ones, to 2 to 3 reviewers each in a span of 15 weeks time. Over 1000 individual reviews were reported to the track chairs and WAC Secretariat in USA. The program that you are witnessing here is the result of diligent work of many wonderful volunteers to help run this international conference. On the top of that list are our five track Chairs **Dan Cox** (Robotics), **Yutaka Hata** (Multimedia, bio-medicine and image processing), **Saeid Nahavandi** (Manufacturing), **Mattheus Reuter** (Soft computing) and **Abdel Elkamel** (control and automation). I thank the Hungarian peers who encouraged WAC to come to Budapest – **Imre Rudas** (Rector, Budapest Tech.) and **Lazlo Koczy** (Budapest Technology and Economics University). On behalf of the track teams, I wish to sincerely thank hundreds of our peers who took their valuable times to review the WAC 2006 papers.

We hope that this congress will render not only a beautiful and scenic venue, but provide you a very rewarding and innovative technical meeting where new interests in many issues relevant to technical interests for the 21st Century are discussed.

WAC 2006 is proud to have a very distinguished group of keynote speakers: **M. Athans, A. Madni, P. Michelberger, D. Tesar, T. Vamos, M. Vukobratovic, C. Weisbin, T. Yamakawa, and L. Zadeh.**

Asides from the keynote speeches and many parallel sessions, we will celebrate the achievements of 5 individuals for their lifetime achievements in automation and/or soft computing, as it is a common practice in biannual WAC meetings.

Aside from the technical program committees of 5 tracks, many others have spent numerous hours helping to bring this wonderful meeting to you. I wish to thank Mr. Prasanna Sridhar, WAC 2006 Webmaster who designed, enhanced and improved the quality of paper submissions, reviews, etc. The diligent works of the organizing team, headed by P. Sridhar, Nima Jamshidi, Jamal Madni, Dr. Kishan Kumbla and Mrs. Smita Kumbla are all truly appreciated. I should thank the hard work and sacrifices of my better half – Jila for doing so much inside and outside of our house to help me make our lives more fulfilling. Last, but by no means least, we thank the Budapest team, specially Ms. Sandra Vamos for her superb professional help in launching WAC 2006.

Enjoy the BEAUTIFUL and HISTORICAL city of Budapest.... and have a wonderful stay in Hungary.

WAC General Chair
Editor-in-Chief, *AutoSoft Journal*
Mo Jamshidi



Badge: PLEASE wear your badge at all times. The badge is required for entry to all functions at the Conference.

Social Events: In order to take part in Gala Banquet (Lazar Equestrian Park) and the Lifetime Celebration of **Prof. Faz Reza**, you need to have coupons in hand.

Welcome Reception and Concert by Tamae and Takeshi Yamakawa, Japan: Sunday July 23, 2006 at 1830 until 2030

Venue: **Dominican Courtyard** (Lobby Level).

REGISTRATION DESK SCHEDULE

DAY	DATE	OPEN HOURS
Sunday	July 23, 2006	1400 -1700
Monday	July 24, 2006	0800 -1700
Tuesday	July 25, 2006	0800 -1600
Wednesday	July 26, 2006	0800 -1400

Internet Access: The hotel has daily wireless access available from your room or at the lobby for a charge of about \$30 or so, for 100 minutes. Additionally WAC will also have wireless Internet access in **ENDRE** room on the Ballroom Level (2nd floor).

Coffee Breaks: There will be two breaks each day, serving coffee, tea, water, fruits and other refreshments.

Lunches: Budapest Hilton has set up a special-rate “cash & carry” (at author’s own expenses) lunches for a quick return to the sessions on each of the three days. This lunch can be purchased in the hotel’s restaurant under the “WAC Menu”.

WAC 2006 SOCIAL PROGRAMS AT A GLANCE

WAC 2006 Time	EVENT	AT A GLANCE Venue
	SUNDAY JULY 23, 2006	
1830-2030	WELCOME RECEPTION & Japanese traditional lecture concert by Tamae and Takeshi Yamakawa	Dominican Courtyard Lobby Level Budapest Hilton
	TUESDAY JULY 25, 2006	
1800-2300	Gala Banquet – Equestrian Show + Gypsy Band (Buses leave Hilton Hotel at 1730) (Extra Euro 65 Dinner Ticket is needed for student registration)	Lazar Equestrian Park (45 km Outside Budapest)
	WEDNESDAY JULY 26, 2006	
1930-2200	Reflection to Life Time of a Scientist and a Literary Man ... Faz Reza 90 th Birthday Ceremony (Extra Euro 45 Dinner Ticket is needed)	Rivalda Café & Restaurant (Castle District)

KEYNOTE SPEECHES

Day	Time	Speaker	Chair
MON-1	08:30-09:30	Lotfi Zadeh	Mattheus Reuter
MON-2	09:30-10:30	Moimor Vukobratovic	Daniel Cox
MON - 3	10:50-11:50	Delbert Tesar & Cheaten Kapoor	Daniel Cox
TUE - 1	08:00-09:00	Tibor Vamos	Mo Jamshidi
TUE - 2	09:00-10:00	Pal Michaelberger	Imre Rudas
TUE - 3	10:20-11:20	Michael Athans	Mo Jamshidi
WED-1	08:00-09:00	Takeshi Yamakawa	Laszlo Koczy
WED-2	09:00-10:00	Asad Madni	Yutaka Hata
WED-3	11:00-12:00	Charles Weisbin	Saeid Nahavandi

Monday July 24, 2006

**KEYNOTE SPEECH MON-1 0830-0930 Ballroom A&B
Chair: Mattheus Reuter, Universitat Claushal, Germany**

The Concept of a Generalized Constraint—A Bridge from Natural Languages to Systems Analysis

**Lotfi A. Zadeh
University of California – Berkeley, USA**

ABSTRACT

Existing search engines, with Google at the top, have many truly remarkable capabilities. Furthermore, constant progress is being made in improving their performance. But what is not widely recognized is that there is a basic capability which existing search engines do not have: deduction capability—the capability to synthesize an answer to a query by drawing on bodies of information which reside in various parts of the knowledge base. By definition, a question-answering system is a system, which has deduction capability. Can a search engine be upgraded to a question-answering system through the use of existing tools—tools that are based on bivalent logic and probability theory? A view, which is articulated in the following is that, the answer is: No.

There are three major obstacles: (a) world knowledge; (b) relevance; and (c) deduction. The problem with world knowledge is that in large measure it is perception-based and hence is intrinsically imprecise. Example: Usually it does not rain in San Francisco in midsummer. Perception-based information is not available to manipulation through the use of bivalent logic and probability theory.

The problem with relevance is that existing approaches to assessment of relevance attempt to deal with relevance in a statistical framework, with no consideration of semantics. The results leave much to be desired.

The problem with deduction is that in realistic settings the premises are generally imprecise, uncertain and partially true. In such settings, conventional methods of deduction do not work.

To deal with the problems of world knowledge, assessment of relevance and deduction, new tools are needed. The new tools, which are outlined in my lecture, are Precisiated Natural Language (PNL), Protoform Theory (PFT) and Generalized Theory of Uncertainty (GTU). The centerpiece of these tools is the concept of a generalized constraint. The concept of a generalized constraint is what makes us possible to deal effectively with information which is permanently imprecise, uncertain and partially true.

Monday July 24, 2006

**KEYNOTE SPEECH MON-2 0930-1030 Ballroom A&B
Chair: Daniel Cox, University of Northern Florida, USA**

Are we Going Towards Artificial Man? - Humanoid Robotics: Past, Present State and Future

**Moimor Vukobratovic
Mihailo Pupin Institute, Serbia and Montenegro**

ABSTRACT

Rapid development of humanoid robots brings about new shifts of the boundaries of Robotics as a scientific and technological discipline. New technologies of components, sensors, microcomputers, as well as new materials, have recently put up the barriers to real-time integrated control of some very complex dynamic systems such as humanoid robots are, which already today possess about fifty degrees of freedom and are updated in microseconds of controller signals.

In view of the above statements, the work for the first time raises the essential question on the justifiability of increasing the number of degrees of freedom of humanoid robots, having in mind that for the overall skeletal activity man has at its disposal roughly about 650 muscles of human body which could be approximately expressed by more than three hundreds equivalent degrees of freedom, i.e. the same number of biological actuators.

In relation to this, the work raises also some **new fundamental questions** concerning the necessary anthropomorphism of humanoid robots, how to define the degree of **anthropomorphism**, and finally, how to achieve the highest degree of anthropomorphism with a lowest number of degrees of freedom. On the example of a humanoid robot, concrete measures are proposed how to achieve the desired degree of anthropomorphism of humanoids.

The above-mentioned barrier being taken down, along with the humanoid robots playing mainly the role of communicators and entertainers, there have appeared **humanoids of quite different aspirations** in the domain of manipulation-locomotion activities of humans (case of sports-man on a trampoline, man on the mobile dynamic platform, running, balanced motion on the foot - a karate kick, playing tennis, soccer or volleyball, gymnastics on the floor or by using some gymnastic apparatus, skiing - balanced - motion with sliding, etc.).

The work is also **promoting some new ideas** concerning the already visible trends of expanding activities of humanoid robotics to cover the above new tasks. **The novelty** is related to **generalized approach** to the modeling of humanoid motion. Instead of an usual **inductive approach** that starts from the analysis of different real motion situations and tries to make a generalization, the work proposes a new **deductive approach**.

My opinion is that there are still limited results on human-like motion, while the field of human-like communication has produced several viable alternatives. On the contrary, human-like intelligence is the main obstacle to be overcome because of its complexity and multidimensionality; it is also responsible for coordination of the entire personal robot behavior.

And finally, bearing in mind the current progress in the constantly developing field of humanoid robotics, whose end products will certainly acquire with time more and more human-like characteristics, we can ask an ungrateful question: Can we imagine that it may not be long before biologists construct a "perfect personal robot" a real human cloned and genetically engineered with all attributes of a perfect servant (a worker, a soldier) despite of all the ethical, legal and sociological problems that may arise?

In my opinion, it will be possible to get closer to human characteristics only if such progress is made in technological innovations (artificial muscles, adaptive materials, self-learning) that will allow the performances of artificial systems become similar to those of man.

Monday July 24, 2006

**KEYNOTE SPEECH MON-3 1050-1150 Ballroom A&B
Chair: Don Cox, University of Northern Florida, USA**

Open Architecture Intelligent Mechanical System

**Delbert Tesar & Cheton Kapoor
University of Texas, Austin, USA**

ABSTRACT

The emphasis here is to build on the past breadth of applications for the discipline of mechanical engineering, develop a completely modern science base for intelligent machines (assembled on demand) in order to create a new wave of technology building on the success of the last wave associated with computers (see chart below). This wave will have a greater impact than that provided by computers over the past 40 years by modernizing all our basic systems (aircraft, ships, manufacturing and construction equipment, automobiles, household appliances, etc.) moving into the field of robotics, reducing human drudgery, and enhancing the relationship between man and machine. This new wave will be made of two major components. The hardware component is actuators (just as the computer chip is for computers – Intel Corp.) and the software component operates all machines made up of these actuators (just as Microsoft's Windows runs all P.C.'s). Actuators drive anything that moves on cars, airplanes, ships, manufacturing systems, space

systems, human orthotics, prostheses, etc. It is more important than computer chips in the future economy. The system software is universal; it provides for maximum performance (norms and envelopes prioritized by the human operator), condition based maintenance for timely repair (plug-and-play actuator replacement), and fault tolerance (on-line recovery from a fault to prevent loss of life or large economic-loss).

Tuesday July 25, 2006

KEYNOTE SPEECH TUE-1 0800-0900 Ballroom A&B

Chair: Mo Jamshidi, University of Texas, San Antonio, USA

The human being in the information society - two selected problems, one from the top, the other about the bottom

Tibor Vamos

Hungarian Academy of Sciences, Hungary

ABSTRACT

In the last two or three decades several people achieved the status of a popular oracle, by writing nice and ugly about the information society. Not with the intent of joining them, for this occasion I selected two problems, both currently highly topical.

The first affects the top but has, in my views, deep impacts on the fast approaching society relations. This is the problem of personal identification, in a more advanced context: the symbolic representation of human identity.

The relevant change with the info society is the predominant role of indirect representation of the self in all nonemotional relations. This representation is now an essentially dual objective: representation of the *property* (property of all kinds, personal data, money, movable and immovable, license etc. - all represented in digital codes) and the representation of the *self*, the owner of the represented property. The latter was represented by the personal attendance with her/his certificates or by some intermediate representation, authorizations, signatures, and stamps - all requiring complicated previous personal activities.

In my talk I will speak briefly about the deficiencies of the earlier methods and the much higher reliability of the methods offered by computer science. I will talk more about its social-psychological effect on the individual and the society, by strengthening the consciousness of individual identity, its values (values of the self) of relations concerning rights and responsibilities, about the positive power of an organized, democratic society and about the simultaneous freedom of the individual. Privacy and safety, safety of the individual and of the society receive, for the first time in history, a harmonic and self-elevating solution.

The other issue is the problem of the underclass: a historically continuous problem of societies and always emerging in dangerous and tragic dimensions at changes of traditional technologies, in the ways of division of labor, requirements of skills. Automation created a new advent for good and evil, blessing or catastrophic bifurcation of history. That is an excessively discussed problem but not enough from the point of view of the revolutionary change in human activity roles. For the first time in history the majority of the population is not forced to work in hard physical labour, working as draught animals, and not even in dull, boring repetitive administrative roles, considered earlier as a somehow higher art of the workplace. The flood of unemployment was more or less present always but now the problem of appropriate human workplaces is a new one: will the population, now suppressed to an underclass be able in their majority to use those new opportunities that appear as deficits in workplace requirements, well-skilled, reliable, responsible people for real human-oriented services?

I will try to talk about that hard educational, social transformational, motivational, psychological problem, not with the vainglory of offering any panacea but about approaches required for that essential long-range social investment.

Tuesday July 25, 2006

KEYNOTE SPEECH TUE-2 0900-1000 Ballroom A&B

Chair: Imre Rudas, Budapest Tech., Hungary

Strategic Development of Intelligent Transportation Systems

Pál Michelberger

Hungarian Academy of Sciences, Hungary

ABSTRACT

In the lecture there the structure and build-up of transportation systems, their development, and especially, the needs established by the society that motivate the continuous expansion of such systems will be outlined. The development is determined by the four participants (“components”) of these systems, namely by the human beings, vehicles, infrastructure and regulations. The principal element of the process is man with his demands for mobility and transportation. These demands can be satisfied by manufacturers who produce the desired vehicles. The response time of manufacturers is much shorter than the development of infrastructure; however, the later is also essential in order to serve transportation processes. The low flexibility of infrastructure is partly caused by the huge amount of necessary investment, and also by the complex ownership relations. The last element that usually appears with delay compared to the other three is the regulation system (laws, standards, specifications etc.), and it also expresses the needs of the society as long as the development – motivated by social demands – sometimes conflicts with other needs, i.e. the needs for safety or for the protection of environment. This contradiction finally closes the “control loop”, and actuates the evolution of transportation systems.

Tuesday July 25, 2006

**KEYNOTE SPEECH TUE-3 1020-1120 Ballroom A&B
Chair: Mo Jamshidi, University of Texas, USA**

New Results on Robust Multiple-Model Adaptive Control (RMMAC)

Michael Athans

**Instituto de Sistemas e Robotica
Instituto Superior Tecnico
Lisbon, Portugal**

ABSTRACT

In this talk we discuss a general philosophy for designing “robust” adaptive multivariable feedback control systems for plants that include both unmodeled dynamics and uncertain real parameters in the plant state description. The adjective “adaptive” refers to the fact that the real parameter uncertainty and performance requirements require the implementation of a feedback architecture with greater complexity than that of the best possible non-adaptive controller. The word “robust” refers to the desire that the adaptive control system remains stable and meets the posed performance specifications for all possible “legal” parameter values and unmodeled dynamics.

Early approaches to adaptive control, such as the model-reference adaptive method (MRAC) and its variants, were concerned with real-time parameter identification and simultaneous adjustment of the loop-gain. In the model-reference method the emphasis was on proving convergence to the real parameter and subsequent deterministic Lyapunov arguments for closed-loop stability. However, the assumptions required for stability and convergence did not include the presence of unmodeled dynamics, unmeasurable disturbances and sensor noise. Moreover, no explicit performance requirement was posed for the adaptive system; rather the “goodness” of the model-reference design was by the nature of the command-following error based upon simulations. Classical model-reference adaptive systems would indeed become unstable in the presence of disturbances and high-frequency unmodeled dynamics.

More recent approaches to the adaptive problem involved multiple-model techniques. The (large) parameter uncertainty set is subdivided into smaller subsets, each giving rise to a different plant model but with reduced parameter uncertainty. One then designs a set of control gains or a dynamic compensator for each model so that if indeed the true parameter belongs to a specific model a “satisfactory” performance was obtained. The identification of the most likely model is carried out by a “supervisor” which either switched in and out one of several controllers based primarily on deterministic concepts or relied upon stochastic identification concepts that generate on-line posterior probabilities reflecting which of the models is more likely. In the latter approach the controllers could be designed either by classical LQG methods or by using more sophisticated methods.

In all adaptive methods that employ multiple models, the complexity of the feedback system will depend on the number of models employed. By decreasing the size of the parametric subsets one would obtain more models. Thus, all multiple model approaches must address the following:

- (a) how to divide the initial large parameter uncertain set into N smaller subsets,

- (b) what should be the size of each subset, and
- (c) how large should N be?

Up to the present time the approaches available in the literature use either the Vinnicombe metric to measure the “distance” between different linear systems or (in the stochastic versions) the Baram probabilistic metric. The emphasis was focused upon feedback stability and little attention was paid to any robustness requirements on guaranteed adaptive performance.

In this talk we shall focus on explicitly defined “robust performance” requirements on the adaptive system implemented by the RMMAC.

If we turn our attention to the non-adaptive literature there exists a well-documented design methodology, and MATLAB design software, for linear time-invariant plants that addresses simultaneously both robust-stability and robust-performance in the presence of unmodeled dynamics and parametric uncertainty as well as exogenous disturbances and sensor noise. This methodology, pioneered by Doyle et al, is often called the mixed- μ design method. The mixed- μ design method incorporates the state-of-the-art in non-adaptive multivariable robust control synthesis and exploits the proper use of frequency-domain weights to define desired performance. Typically, using the mixed- μ design method, one finds that as the size of the parametric uncertainty is reduced the guaranteed desired performance, say disturbance-rejection, increases. Unfortunately, very little has been done in integrating the non-adaptive mixed- μ design methodology with that of robust adaptive control studies; even though it should be apparent that the mixed- μ design method should provide us guidance on the selection and number, N, of the models to be used in any multiple-model adaptive control scheme.

We now summarize how in the RMMAC method we integrate the mixed- μ synthesis with multiple model adaptive control. We concentrate on improving the performance by maximizing the disturbance-rejection capability in the presence of noisy sensor measurements, unmodeled dynamics and parametric uncertainty. Moreover, we use explicit performance requirements for the design of the

Step 1. We use the mixed- μ synthesis method to design the best non-adaptive controller for the original large parameter uncertainty set. We increase the “gain” of the output performance weight until the mixed- μ upper bound reaches unity. This defines the “best” non-adaptive controller.

Step 2. We calculate an upper bound for possible performance by neglecting parametric uncertainty, but including unmodeled dynamics, for the same type of performance specification. We construct this upper bound on performance by designing robust controllers using the complex- μ method and varying the real parameter over the uncertainty set. In essence this could lead to an adaptive multiple-model design where the number of models, N, is infinite.

Step 3. Since now we have both an upper bound and a lower bound on performance, we can make an intelligent choice on how to specify the desired performance requirements for the multiple-model adaptive system. We shall describe in the talk the specific way this is done using specific numerical examples; the idea is to guarantee an adaptive performance of, say, at least 80% of the unattainable upper performance bound by using the smallest possible number of models, i.e. uncertainty subsets.

This design methodology of Step 3 also defines the specific size of each uncertainty subset and it naturally includes any limits on disturbance-rejection that may arise from non-minimum phase zeros, unstable poles, and unmodeled dynamics. As the performance requirements become more stringent, for example by increasing the bandwidth of the output frequency weight, the minimum number of required models increases. In this manner, we fully quantify how the computational complexity of the adaptive system (as a function of the number N of required models) changes as we make our performance requirement more stringent.

The procedure summarized above can be used with any of the adaptive multiple-model methods. We shall illustrate its detailed design and properties, using extensive Monte Carlo simulations, by using the RMMAC method in the context of dynamic hypothesis-testing, which involves generating the posterior probability for each model. The important point to remember is that all multiple-model adaptive schemes require the definition of the minimum number of models required to achieve both robust stability and robust performance, and these can only be defined after we pose realistic performance requirements for the adaptive system as summarized in Steps 1 to 3 above.

References:

1. S. Fekri, *Robust Adaptive MIMO Control using Multiple-Model Hypothesis Testing and Mixed- μ Synthesis*, Ph.D. Thesis, Instituto Superior Técnico, Lisbon, Portugal, January 2006

2. M. Athans, S. Fekri and A. Pascoal, "Issues on Robust Adaptive Control," Invited Plenary paper, Preprints *16th IFAC World Congress*, Prague, Czech Republic, July 2005, pp. 9-39
3. S. Fekri, M. Athans and A. Pascoal, "RMMAC: A Novel Robust Adaptive Control Scheme-Part I: Architecture," *Proc. IEEE Conf. On Decision and Control*, Paradise Island, Bahamas, Dec. 2004, pp. 1140-1139
4. S. Fekri, M. Athans and A. Pascoal, "RMMAC: A Novel Robust Adaptive Control Scheme-Part II: Performance Evaluation," *Proc. IEEE Conf. On Decision and Control*, Paradise Island, Bahamas, Dec. 2004, pp. 1140-1145
5. S. Fekri, M. Athans and A. Pascoal, "A New Robust Adaptive Control Method using Multiple Models," *Proc. 12th IEEE Mediterranean Conference on Control and Automation (MED'04)*, Kusadasi, Turkey, June 2004
6. S. Fekri, M. Athans and A. Pascoal, "A Two-Input Two-Output Robust Multiple Model Adaptive Control (RMMAC) Case Study," submitted to *American Control Conference*, June 2006

Wednesday July 26, 2006

KEYNOTE SPEECH WED-2 0900-1000 Ballroom A&B

Chair: Yutaka Hata, University of Hyogo, Japan

Smart Configurable Wireless Sensors and Actuators for Industrial Monitoring and Control

Asad Madni

Past President and COO, BEI-Technologies, Inc., USA

ABSTRACT

Intelligent wireless sensor-based controls have drawn industry attention on account of reduced costs, better power management, ease in maintenance, and effortless deployment in remote and hard-to-reach areas. They have been successfully deployed in many industrial applications such as maintenance, monitoring, control, security, etc. This presentation focuses on research that addresses the issues faced by instrumentation systems and predictive maintenance industrial applications and presents a design solution to cater to the issues faced by these applications.

Instrumentation systems are either open or closed loop control systems formed using sensors and actuators with the objective of controlling certain parameters, or state of the system. The system elements are always in communication with each other, typically, requiring real-time performance and built-in fault-tolerance for communication/node failure – to return to a safe-state in a deterministic amount of time.

Predictive-maintenance involves tracking physical state of equipment or machine, and to take action, if an acceptable or allowed state(s) is violated. Predictive-maintenance applications are not active all the time in order to conserve energy. The sensors are either periodic or event-based; they wake up, check status and go back to sleep. In case of any violation, they raise an alarm or record the digression. They are very useful in keeping machine down-times low and help locate the problem before the machine breaks down.

Typical systems employ different types of sensors (e.g., position, accelerometers, gyros, etc.) and actuators (e.g., motors) often deployed within the same network, having different capabilities, interfaces, and supporting different protocols for data and communications. Formation of systems from such diverse distributed sensor elements entails versatile control modules, which understand different sensor protocols and utilize them. In addition, the operational challenges are exacerbated when different RF links have to be used to satisfy the requirements of bandwidth, payload, delay, jitter, range, noise immunity and others (including cost) for communication.

The Smart Sensor Platform discussed in this presentation is an attempt to develop a generic platform with ‘plug-and-play’ capability to support hardware interface, payload and communications needs of multiple inertial and position sensors, and actuators/motors used in instrumentation systems and predictive maintenance applications. Communication is carried out using a RF link (Wi-Fi, Bluetooth, Mote or RFID), in a point-to-point topology. The design also provides means to update operating and monitoring parameters, and thresholds as well as sensor and RF link specific firmware modules ‘over-the-air’. It is composed of two main components – a sensor-wireless hardware interface and system integration framework, which facilitates the defining of interaction between sensors/actuators based on process needs. The intelligence necessary to process the sensor signals, monitor the functions against defined operational templates, and enable swapping of sensor and RF link resides on the microcontroller of the hardware interface. A variety of industrial motion sensors like gyroscopes, Inertial Measurement Units (IMU), linear position sensors, absolute and incremental encoders and Brushless DC motors, have been interfaced and successfully tested with the platform.

Wednesday July 26, 2006

KEYNOTE SPEECH WED-3 1020-1120

Chair: Saeid Nahavandi, Deakin University, Australia

Technology Assessment in Support of the Presidential Vision for Space Exploration

Charles Weisbin

NASA/CALTECH Jet Propulsion Laboratory, USA

ABSTRACT

This speech discusses the process and results of technology assessment in support of the United States Vision for Space Exploration of the Moon, Mars and Beyond. First, the Presidential Vision is reviewed: a major endeavor in building systems of systems. We discuss why we wish to return to the Moon; and the exploration architecture for getting there safely, sustaining a presence, and safely returning. Next, a methodology for optimal technology investment is proposed with discussion of inputs including a capability hierarchy, mission importance weightings, time dependent cost profiles and available resources, likelihoods of development success, and an overall objective function. A temporal optimization formulation is presented, and the investment recommendations provided along with sensitivity analyses. Key questions addressed are sensitivity of budget allocations to cost uncertainties, reduction in available budget levels, and shifting funding within constraints imposed by mission timeline.

WAC-AUTOSOFT LIFETIME ACHIEVEMENTS AWARDS SESSION-1

Monday July 24, 2006 – 1720-1820

Panel Session – 1

Achievements of **Homayoun Seraji** (NASA/Caltech JPL, USA)

Chair: **Mo Jamshidi**

University of Texas, USA

Speakers:

Fred Y Hadaegh

Firouz Naderi

Charles Weisbin

Edward Tunstel, Jr.

Mo Jamshidi

WAC-AUTOSOFT LIFETIME ACHIEVEMENTS AWARDS SESSION-2

Wednesday July 26, 2006 -- 1710 – 1810

Achievements of **Gordon Lee** (San Diego State University, USA)

Achievements of **Madjid Fathi** (University of Siegen, Germany)

Chair: **Mo Jamshidi**

University of Texas, San Antonio, USA

MONDAY JULY 24, 2006

8:15 - 8:30 OPENING CEREMONY

Room: BALLROOM A & B

Chair: **Dan Cox** University of Northern Florida, USA

WELCOME: **Mo Jamshidi**, General Chairman, WAC 2006, ECE Department and ACE Center, The University of Texas, USA

Imre Rudas, President, Budapest Tech., Hungary

Saeid Nahavandi, Deakin University, Australia, Technical Program and Announcements.

0830-0930 KEYNOTE SPEECH MON-1 Lotfi Zadeh, Ballroom A&B

0930-1030 KEYNOTE SPEECH MON-2 M. Vukobratovic, Ballroom A&B

1050-1150 KEYNOTE SPEECH MON-3 Delbert Tesar & Cheaten Kapoor, Ballroom A&B

MONDAY PARALLEL SESSIONS

Time	ISORA Session M-AM1 Room: Ballroom A&B	IFMIP Session M-AM2 Room: Ballroom C	ISSCI Session M-AM3 Room: Erzsebet	ISIAC Session M-AM4 Room: Margit	ISOMA Session M-AM5 Room: Parlamant
1150-1310	MOBILE ROBOTS	INFORMATION SECURITY AND HARDWARE IMPLEMENTATIONS I	INTELLIGENT SYSTEMS DESIGN USING INFERENCE	OPTIMIZATION AND EDUCATION	INTELLIGENT INFORMATION PROCESSING
Time	ISORA Session M-PM1	IFMIP Session M-PM2	ISSCI Session M-PM3	ISIAC Session M-PM4	IFMIP Session M-PM5
1420-1540	INTELLIGENT AND COGNITIVE CONTROL FOR ROBOTICS	SOFT COMPUTING I	INTELLIGENT SYSTEMS FOR CALIBRATION, INSPECTION AND DETECTION	ADVANCE CONTROL AND FILTERING - I	MEDICAL ENGINEERING - I
Time	ISORA Session M-PM6	IFMIP Session M-PM7	ISSCI Session M-PM8	ISIAC Session M-PM9	ISOMA Session M-PM10
1540-1700	ROBOT SENSOR FUSION AND ENVIRONMENT INTERACTION	INFORMATION SECURITY AND HARDWARE IMPLEMENTATIONS II	INTELLIGENT SYSTEMS FOR SOFT COMPUTING APPLICATIONS	ADVANCE CONTROL AND FILTERING - II	KNOWLEDGE EXTRACTION

Session M-AM1 Track ISORA	Room Ballroom A&B	Time 1150-1310	Session Title MOBILE ROBOTS	Chair E. Tunstel	Co-chair G. Anderson
Presentation Time	Paper No.	Paper Title			Authors
1150	ISORA-123	A RFID landmark navigation auxiliary system			G. Yang, G. Anderson, and E. Tunstel

1210	ISORA- 69	Mobile robots for harsh environments: Lessons learned from field experiments	Akers, R. Stansbury, T. Akins, and A. Agah
1230	ISORA-158	Mobile robot position determination using data integration of odometry and gyroscope	N. Houshangi, and Farouk Azizi
1250	ISORA-220	Motion trajectories for wide area surveying with a rover based distributed spectrometer	E. Tunstel, G. Anderson, and E. Wilson

ABSTRACTS

Tracking #ISORA-123

This paper proposes the development of an RFID system to aid in the navigation of autonomous mobile robots. The use of the system to enable a mobile robot to estimate its pose is described. The paper presents a method to obtain fine orientation readings, a task neglected by former works. We also analyze one uncertainty source of this approach. Experimental and simulation results are presented in the paper to demonstrate the effect of the method. Finally, we present a possible alternative method to adapt to non-constant speed movement.

Tracking #ISORA-69

Mobile robots for harsh environments provide useful means for automating the collection of research data in the field by reducing human involvement. MARVIN II has been designed and constructed to autonomously collect radar measurements to determine properties of the polar ice sheets. This paper discusses the lessons learned from a number of field experiments with its predecessor MARVIN, and how these lessons influenced the new design of MARVIN II.

Tracking #ISORA-158

The objective is to accurately determine mobile robots position and orientation by integrating information received from odometry and an inertial sensor. The position and orientation provided by odometry are subject to different types of errors. To improve the odometry, a fiber optic gyroscope is used to give the orientation information that is more reliable. The information from odometry and gyroscope are integrated using Unscented Kalman Filter (UKF). The position and orientation determined based on the UKF are compared with the results obtained from the commonly used Extended Kalman Filter (EKF).

Tracking #ISORA-220

A mobile ground survey application that employs remote sensing as a primary means of area coverage is highlighted. It is distinguished from mobile robotic area coverage problems that employ contact or proximity-based sensing. The focus is on a specific concept for performing mobile surveys in search of biogenic gases on planetary surfaces using a distributed spectrometer — a rover-based instrument designed for wide measurement coverage of promising search areas. A behavior-based navigation approach is briefly discussed. Algorithms for executing circular and spiral survey trajectories are presented for wide-area distributed spectroscopy and evaluated based on area covered with respect to distance traveled.

Session	Room	Time	Session Title	Chair	Co-chair
M-AM2 Track IFMIP	BALLROOM C	1150 -1310	INFORMATION SECURITY AND HARDWARE IMPLEMENTATIONS I	P. Kitos	J. Gomez
Presentation Time	Paper No.	Paper Title			Corresponding Author
1150	IFMIP-41	HW/SW Co-design for Accelerating Public-Key Cryptosystems over GF(p) on the 8051 u-controller			K. Sakiyama, I. Verbauwhede and B. Prenee
1210	IFMIP-42	Design of a Compact Modular Exponentiation Accelerator for Modern FPGA Devices			T. Alho, P. Hämäläinen, M. Hännikäinen, and T. Hämäläinen

1230	IFMIP-43	Differential Electromagnetic Attack on an FPGA Implementation of Elliptic Curve Cryptosystems	E. De Mulder, B. Ors, B. Preneel, and I. Verbauwhede
1250	IFMIP-184	Power Analysis Resistant SRAM	E. Konur, Y. Ozelci, and E. Arikan

ABSTRACTS

Tracking #IFMIP-41

Implementing large word length public key algorithms on small 8 bit u-controllers is a challenge. This paper presents a hardware/software co-design solution of a RSA and an Elliptic Curve Cryptosystem (ECC) over GF(p) on a 12 MHz 8-bit 8051 u-controller. The hardware co-processor has a modular arithmetic logic unit (MALU) of which the digit size (d) is variable. It can be adapted to the speed and bandwidth of the m-controller to which it is connected. The HW/SW co-design space exploration is based on the GEZEL system level design environment. It allows the designer to find the best performance-area combination for the digit size. A case study of a FPGA implementation for a 160-bit ECC over GF(p) (ECC-160p) shows that one point multiplication can be computed 40 times faster than an optimized SW implementation with the optimized digit size, d=4.

Tracking #IFMIP-42

We present a compact FPGA implementation of modular exponentiation accelerator suited for cryptographic applications. The implementation efficiently exploits the properties of modern FPGAs. The accelerator consumes 341 logic elements, 1 DSP block, and 13 604 memory bits in Altera Stratix EP1S40. It performs modular exponentiations with up to 2250-bit integers and scales easily to larger exponentiations. Excluding pre and post processing time, 1024-bit and 2048-bit exponentiations are performed in 28.03 ms and 212.09 ms, respectively. Due to its compactness, standard interface, and support for different clock domains, the accelerator can effortlessly be integrated into a larger system in the same FPGA.

Tracking #IFMIP- 43

This paper describes a differential electromagnetic analysis attack performed on a hardware implementation of an elliptic curve cryptosystem. We describe the use of the distance of mean test. The number of measurements needed to get a clear idea of the right guess of the key-bit is taken as indication of the success of the attack. We can find the right key-bit by using only 2000 measurements. Also we give a electromagnetic model for the FPGA we use in our experiments. The amplitude, the direction and the position of the current on the FPGA's lines with respect to the position of the antenna have an influence on the measured electromagnetic radiation in the FPGA's surrounding area.

Tracking #IFMIP-184

The power consumption of a standard CMOS SRAM during read/write operations is dependent on the address applied, the data accessed, and the type of access (read/write). The power analysis resistant SRAM structure presented in this work reduces the dependency of power consumption on data and address 10 times compared to standard SRAM at the expense of higher power and silicon area consumption. Modifications on the primitive SRAM cell, address decoding logic and write operation were made to reduce the dependency.

Session M-AM3 Track ISSCI	Room Erzsebet	Time 1150-1310	Session Title INTELLIGENT SYSTEMS DESIGN USING INFERENCE	Chair: L. Tummala	Co-Chair: G. Lee
Presentation Time	Paper No.	Paper Title			Corresponding Author
1150	ISSCI-15	An Adaptive Fitness Function for Evolutionary Algorithms Using Heuristics and Prediction			P. Tang and G. Lee
1210	ISSCI-212	An Intelligent Approach to Robotic Respiratory Motion Compensation for Radiosurgery and Other Interventions			C. Nguyen and K. Cleary
1230	ISSCI-47	Fuzziness and Imprecision in Software Engineering			M. Burgin, J. Debnath, and N. Debnath

1250	ISSCI-17	On the Use of Randomization for System of Systems (SoS) Design of Intelligent Machines	S. Rubin and G. Lee.
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ABSTRACTS

Tracking #ISSCI-15

A genetic algorithm usually performs a search over a complex and multimodal space and is an important component in several applications such as evolutionary learning and optimization. The search is dependent on several parameters including the fitness function, parent selection process, mutation rate and crossover rate. The fitness function is an important component in the evolutionary process since this performance metric is used to select the best individuals in a population that will then evolve through the mutation, crossover and reproduction process in successive generations. In this paper, a fitness function is developed that employs heuristic information based upon past history, current information and future knowledge; in particular, prediction and expectation are integrated into the fitness function. Simulation results show an improvement over classical fitness techniques.

Tracking #ISSCI-212

Robots have been employed to improve the precision and capabilities of physicians during surgical procedures. A typical medical robotic system is a complex system with precise motion capabilities realized by a feedback controlled manipulator. The robot can be controlled based on medical images or by the physician through a suitable user interface.. One current use of medical robots is to enhance radiosurgery by providing more precise and accurate delivery of ionizing radiation as in the CyberKnife system from Accuray Inc. In radiosurgery, the radiation dose must optimally fit the shape of the tumor while minimizing the destruction of normal tissue during radiation. The two main stages of a robotic radiosurgery system are the pre-operation planning stage and the robot motion control stage. Typical activities for the pre-operation stage include the lesion identification phase, which identifies the 3-D location of the targeted lesion and the planning phase which computes the optimal delivery of the radiation dose. The activities of the robot motion control stage coordinate the usage of sensory information that drives the robot motion to track a moving lesion while delivering the right dose of radiation. One of the current challenges in precision radiosurgery is treating tumors that move with respiration such as those in the lung and pancreas. Intelligent methods that employ fuzzy logic and neural networks to deal with systems that are unpredictable and hard to model have been successfully applied to control industrial and space robots. Fuzzy logic is based on the way the human deals with inexact information while neural networks are modeled after the physical architecture of the brain. These approaches may have great applicability for respiration compensation in medicine for applications such as radiosurgical treatment of moving tumors. In this paper, we explore at the system level the application of these approaches for respiration compensation.

Tracking #ISSCI-47

In this paper, we study how fuzziness in software engineering emerges and how to reflect this fuzziness measuring software qualities. Principal means in these processes are software metrics with values in categorical data represented by software metrics with values in fuzzy sets and linguistic variables. This study is aimed to support the development of high quality software. The process of program design as a transition from a problem to a program is studied. A classification of software metrics is developed with the aim of better structuring and optimization of the software fuzzy metric design. Processes of constructing new measures from existing ones often use aggregation operations. Here we study aggregation operations for fuzzy set based software metrics.

Tracking #ISSCI-17

This paper takes a System of Systems (SoS) approach to the realization of machine intelligence. Random differences are learned by the system, generalized, and made available for subsequent replay in design transformations. It is empirically demonstrated that cross-domain symmetries can play a major role in design generation in particular and in the design of SoSs in general. The fundamental theory of randomization is the science, which underpins the practice. The approach is illustrated by an example of the design of a refrigeration system.

Session M-AM4 Track ISAC	Room MARGIT	Time 1150-1310	Session Title OPTIMIZATION AND EDUCATION	Chair J. Pomares	Co-chair A. Preciado Ruiz
Presentation Time	Paper No.	Paper Title			Corresponding Author

1150	ISIAC-55	Output Feedback Stabilization and Optimization of Multivariable Dynamical Systems using Genetic Algorithms	N. Tej, S. N. Nejim, and N. B. Braiek
1210	ISIAC-140	Multi-Criteria Decision-Making Based on Combined Vague Sets in Electrical Outages Problems	K Banan
1230	ISIAC-236	A Web-based control of a real laboratory for process engineering education	M. Chaabene
1250	ISIAC-31	The Measurement of Similarity: A Tool for Modeling and Optimization	A. Dridi

ABSTRACTS

Tracking #ISIAC-55

The computation of the optimal constant output feedback gains for linear multivariable systems with respect to a quadratic performance criterion is discussed. The purpose of this paper is to determine an appropriate feedback matrix and to stabilize the system by minimizing a quadratic cost using Genetic Algorithm.

Tracking #ISIAC-140

The nature of electrical distribution systems is changing from simple markets towards competitive markets. The modern distribution system must simultaneously be reliable, flexible, and cost conscious. One of the main factors that affect the reliability of power systems is outages. With all efforts that have been done, the existence of outages is a reality. Management of electrical outages is a necessity and in outage times we need some appropriate decision makings. In this paper we propose an integrated, quantitative methodology based on vague sets to assist the distribution systems in making these decisions. This methodology allows information on the suppliers and customers to be expressed either qualitatively or quantitatively to use a multi-criteria decision making model and provide new functions to measure the degree of accuracy in the grades of membership of each alternative with respect to a set of criteria represented by vague values.

Tracking #ISIAC-236

Abstract Our time is branded by the orientation towards e-learning in several education fields. Yet, the remote teaching means satisfying the needs of specific engineering studies remain limited to simulated applications or virtual laboratories which involve a reduced assimilation of the taught material. This paper introduces a real laboratory control based on a Web embedded system and an interactive Web application. The laboratory is designed for process engineering education. In order to conceive a Web-based process management for learning features, five essential design issues have been investigated: requirement specification, architecture selection, system implementation, design of a Web-based human-computer interface, and an access control system for the interactive learning environment and work validation. A didactic lift is used as an engineering educational process to demonstrate our design methodology. A set of software modules is embedded in the local control system in order to be shared by multiple communicating users. Time delay due to Internet traffic has been overcome by using miniature Web server dedicated to the Web-based laboratory supervision and control. The experimental results have shown that the Internet-based real laboratory offers similar behavior to a local laboratory.

Tracking #ISIAC-31

These last years, the setting on line of all kinds of documents led to a volume of information available in constant evolution. This volume of information is more difficult to explore when it is dynamic and generated daily. A tool of assistance is necessary to assist users, in the case of complicated web sites in their consultation, and to take into account their preferences in a general way. The measurement of similarity of documents is a fundamental tool to extract information corresponding to the preferences of a user. To obtain a generic measurement of similarity, we propose to use directly the textual contents of the documents. This approach was studied in the world of the data processing and led in particular to the development of search engines. This measurement, associated to other tools such as a genetic algorithm to model the behavior of the user, can be used to propose a navigation to the user, in relation with its preferences, in this mass of information.

Session M-AM5 Track ISOMA	Room PARLAMANT	Time 1150-1310	Session Title MONITORING OF ORGANIZATIONAL MANAGEMENT AND SCHEDULING	Chair J. Marx-Gomez	Co-chair P. Golinska
Presentation Time	Paper No.	Paper Title			Author (s)
1150	ISOMA- 227	The Proposal for Breakdowns Monitoring System Design – Case Study			P. Golinska, M. Fertsh, J. Marx-Gomez, J. Oleskow
1210	ISOMA- 228	Monitoring the Operations Management Performance in Automotive Industry			P. Golinska, P. Pawlewski, M. Fertsh
1230	ISOMA- 20	On-line scheduling method of manufacturing system based on VS algorithm for reference pattern			J. A. Trujillo, C. Cárdenas, Z. J. Pasek, and E. Baeyens
1250		OPEN			

ABSTRACTS

Tracking #ISOMA-227

The background of this research is a case study conducted in the production planning department of an automobile industry company. The paper presents one of the project stages regarding the elaboration of system monitoring the breakdowns in production system in order to improve the reliability of production planning and control activities. The requirements for system monitoring of breakdowns in production system are also presented. This paper describes how a data warehouse of production system breakdown can be constructed.

Tracking #ISOMA-228

In the case that has been the basis for the project, the global manufacturer has a problems in fulfilling the due-to-order deliveries of final product in required by clients time horizon. In the paper the issue related to monitoring of production plans execution will be analyzed. Authors will also present briefly the theoretical background of research and will discuss main problems that has appeared by analyses of manufacturing system performance. The operational management performance measures elaborated by authors will be presented.

Tracking #ISOMA-20

In this paper, a Scheduling method is developed to provide planning for Manufacturing plants with multiple coordinating cells. The controls for reconfigurable manufacturing systems have to be capable not only of identifying exceptions on-line, but also simultaneously developing on-line strategies for unpredictable customer orders or inaccurate estimate of processing times. The approach exploits a complementary algorithm for (VS) reference pattern and Virtual Supervisor (VS), which has access to all system information during program execution and thus can readily monitor the overall system performance. The goal is to minimize expected part tardiness and earliness cost. A solution methodology based on a combined Lagrangian relaxation, VS-Patterns, Maxwell equations and temporal difference is developed to reduce the computation requirements for large problems. Sequences pattern shows that near optimal schedules can be obtained a dual solution for on-line implementation.

Session M-PM1 Track ISORA	Room Ballroom A&B	Time 1420-1540	Session Title INTELLIGENT AND COGNITIVE CONTROL FOR ROBOTICS	Chair K. Kawamura	Co-chair H. Blumenthal
Presentation Time	Paper No.	Paper Title			Author(s)

1420	ISORA-144	Emotional sensibility and behavioural control of real time robotic agents	C. Dominguez, H. Hassan, and A. Crespo
1440	ISORA-161	Evolving sensor morphology on a legged robot in niche environments	G. Parker, and P. Nathan
1500	ISORA-177	Benchmarking punctuated anytime learning for evolving multi agents team's binary controllers	H. Blumenthal, and G. Parker
1520	ISORA-238	From intelligent control to cognitive control	K. Kawamura, and S. Gordon

ABSTRACTS

Tracking #ISORA-144

Recent research in emotional systems has identified the important role of emotions in the control and the organisation of the behaviour of robotic systems. RTEA is a real-time emotional architecture for robotic agents. Emotions in RTEA modulate the thoughts' motivation that affect the final agent's behaviour. An emotional state is reached from the appraisal of a situation of the environment. The way this appraisal contributes to the emotional state and how this state affects the behaviour depends on the emotional sensibility. This paper focuses in the adjustment of the sensibility of the agent. A key point in the process of situation appraisal is the configuration of the contribution functions (CF). An adaptation of a multivariable optimisation method to find the optimal CF that affect the modulation of the emotion level and hence the robot anima, is proposed. The control of the robot behaviour depends on the precision of adjusting these CF. Experiments on mobile robotics show that the adjustment of the emotional sensibility produces stable and predictable behavioural control.

Tracking #ISORA-161

This paper discusses the issue of evolution of morphology and automatic design, specifically evolving sensor morphology on a legged hexapod robot in niche environments. The evolution of sensor morphology in different environments, in particular, type of sensor, angle of heading and its effect on controller complexity for a simulated hexapod robot is described. This automatic design method enables the system to decipher relevant stimuli in an environment, increases the efficiency of the robot and also indirectly alters the controller of the robot to take advantage of the characteristics of a given environment.

Tracking #ISORA-177

Punctuated anytime learning (PAL) is a system that can be used for evolving cooperative teams of agents. PAL applied to evolving multiple populations is a kind of cooperative coevolutionary algorithm (CCEA). Here we compare PAL to a canonical genetic algorithm (GA) on a widely used GA benchmarking optimization function called the Rosenbrock function. The Rosenbrock function was chosen for experimentation because it is a highly non-linear function and difficult to optimize. Results are shown from a variety of experiments with different dimensionalities of the Rosenbrock function. These findings are discussed in the context of evolving binary controllers for multi-agent cooperative teams of robots.

Tracking #ISORA-238

This paper describes our efforts to develop a robot with a robust sensorimotor intelligence using a multiagent-based robot control architecture and a biologically inspired intelligent control. Such control is called cognitive control. Features of cognitive control addressed in this paper include short-term memory for environmental learning, long-term memory for behavior learning and task execution using working memory.

Session M-PM2 Track IFMIP	Room BALLROOM C	Time 1420 -1540	Session Title SOFT COMPUTING I	Chair N. Takagi	Co-chair H.Tatsumi
Presentation Time 1420	Paper No. IFMIP-136	Paper Title Maximal p-partite structure of fuzzy graph			Author (s) T. Starostina

1440	IFMIP-94	Rectilinear Jigsaw Puzzles: Theory and Algorithms	K. Kimoto Y. Murai H. Tsuji, and S. Tokumasu
1500	IFMIP-126	A Consideration on Rotation Invariant Character Recognition	H. Takayuki and N. Takagi
1520	IFMIP-171	Marking in Space and Acquisition of Environmental Information by Data-Carrier for the Visually Impaired	H. Tatsumi, Y. Murai, M. Miyakawa and S. Tokumasu

ABSTRACTS

Tracking #IFMIP-136

In this paper a conception of maximal p-partite structures of fuzzy graph applying to classification problem based on fuzzy graph model is considered. A short problem statement and graph model for this problem are described. A conception of p-partite structure and p-partite degree of fuzzy graph is suggested. A possible way to decision of classification problem using fuzzy graph model and maximal p-partite degree classification criterion is described. Some properties of fuzzy p-partite structure and estimations of p-partite degree of fuzzy graph are given.

Tracking #IFMIP-94

In previous papers, rectilinear jigsaw puzzles have been described as a specialized placement problem such that this has at least one solution to placement, but generally not that many. Instead of adopting the well-known iterative method to solve this problem, a new game-theoretic algorithm is developed by translating the problem to one of checkmate in games analogous to chess or shogi. By extending the game-theoretic algorithm, a much faster algorithm for large puzzles is developed by introducing various heuristics on the placement of pieces. We also proved through numerical experiments that this worked efficiently.

Tracking #IFMIP-126

This paper discusses an off-line character recognition method that focuses on partial structures of characters. Objects to be recognized are the Arabic numbers. The characteristic features of our method are (1) this method gives rotation free character recognition, because the method is based on structure analysis of input patterns, and (2) this method does not require any learning sample set. The efficiency of the method is shown through computer experiments.

Tracking #IFMIP-171

We are conducting a research project aimed at building an information secured environment for the visually impaired, especially in our campus, by combining data-carrier technology and networks. As visually impairedness badly suffocates detection of changes in environment, we need to use some interface to convey environmental information to the visually impaired. Changes in the surroundings could be recognized, if not by using sight, by recognizing changes of landmarks. So we attach RFID-tags to objects placed at any point in the surroundings, in which we keep secure (=correct) information concerning the environment. In this way we can turn any location in the surroundings into a "landmark", meaning that the location can be treated by a computer as a secure point in space, because we can keep correct information in this RFID-tag. Here we describe our information acquisition scheme and information securing support partly by using autonomous robots for the visually impaired designed in the projects

Session M-PM3 Track ISSCI	Room Erzsebet	Time 1420-1540	Session Title INTELLIGENT SYSTEMS FOR CALIBRATION, INSPECTION AND DETECTION	Chair: G. Lee	Co-Chair: L. Tummala
Presentation Time	Paper No.	Paper Title			Corresponding Author
1420	ISSCI-60	Application of Computing Architecture and Analysis to Real-Time Railroad Track Inspection			H. Sholl, R. Ammar, I. Greenshields, D. Pagano

1440	ISSCI-59	Automated Anomaly Detection Using Time-Variant Normal Profiling	J.-Y. Kim, R. E. Gantenbein
1500	ISSCI-129	Intelligent On-line Sensor Planning for Surface Inspection	Q. Shi, N. Xi and W.- H. Sheng
1520	ISSCI-90	Automated System for Calibration and Validation of Automotive Test Instrumentation	M. Scott, E. Creasman, and D. C. Pheanis

ABSTRACTS

Tracking #ISSCI-60

Prevention of failures in track has continued to be a major railroad need. The problem is worsening, due to technical/cost limitations in inspection technology coupled with continuing increase in track usage/stress. Typically, railroads use an ultrasonics, on-track, computer-based, regularly scheduled, real-time inspection. However, the system development emphasis has been focused primarily on the ultrasonics, while incorporating more computer science based data analysis could help gain insight and reduce testing errors. Based upon applied research at the University of Connecticut, this paper describes the pattern recognition needs, and proposes a specific solution approach.

Tracking #ISSCI-59

Anomaly detection provides automated detection of unauthorized intrusion into a computer system by creating a profile of user behavior, then raising an alert when a user attempts an activity that does not fit his/her profile. Previous approaches assume that a user's command sequences will not vary significantly over time and so tend to flag unusual but safe activities as anomalies. We propose the use of timevariant normal user profiles that assume a user will change activities over time. The approach combines string-matching algorithms from machine intelligence and sequence alignment algorithms from biomedical informatics to dynamically evaluate user behavior.

Tracking #ISSCI-129

This paper introduces a novel on-line range sensor planning system, which is developed for 3D dimensional inspection in automotive industry. For active, triangulation-based range sensors, shadow and reflection often cause problems in measuring an automotive part. A feedback based on-line view planning system is proposed to solve those problems. The system can recursively generates viewpoints according to the measured data until the obtained point clouds meet the pre-determined requirements. General framework of the designed system is introduced, and the experimental results are also presented.

Tracking #ISSCI-90

We describe the design and implementation of an automated calibration system for the thermocouple/voltage module of an automotive data-acquisition system. The automated calibration system tests and calibrates sixteen thermocouple/voltage signal-conditioning cards, with a combined total of 320 data channels, over the data-acquisition system's operating range from -40°C through $+85^{\circ}\text{C}$. The system collects initial measurements to document on-arrival performance, calibrates each channel, and then collects final measurements to verify each channel's post-calibration function, all within an eight-hour period. The system also automatically identifies channels that fail calibration and flags them for repair. The automated system has eliminated more than 96% of the previous labor cost for calibrations, allowing us to recover the entire cost of development and equipment in less than one year.

Session	Room	Time	Session Title	Chair	Co-chair
M-PM4 Track ISAC	MARGIT	1420-1540	ADVANCE CONTROL AND FILTERING - I	A. Madni	A. Aghdam
Presentation Time	Paper No.	Paper Title			Corresponding Author
1420	ISAC-22	Managing Configuration Control in an Automotive Sensor Mass Customization			A. Madni, L. Costlow, and J. LaBoskey

1440	ISIAC-163	Digital Filter Order Reduction	V. R. Dehkordi and A. Aghdam
1500	ISIAC-134	Improved Adaptive Dynamic Control of a Polymerization Process	J. K. Tar, I. J. Rudas, and K. Kosuge
1520	ISIAC-164	A method to Obtain the Infinity-Norm of Systems using the Routh Table	A. Aghdam

ABSTRACTS

Tracking #ISIAC-22

As BEI Technologies, Inc. transitioned from a low-volume, high-cost aerospace and defense supplier to a high-volume, low-cost automotive supplier) after the® for the Systron Donner quartz rate sensor gyroscope (GyroChip mid-1990s, a need to effectively manage mass customization without replicating the production line became an economic imperative. This paper describes the tools and techniques utilized to not only solve the problem economically, but provide several significant side-benefits as well. Starting from zero high-volume mass customization experience in 1996, Systron Donner can today accommodate dozens of configurations on the same high volume production line. In addition, the line can accommodate multiple small runs (dozens to hundreds of units per day) on the line concurrent with the normal production (several thousand units per day). These benefits are supplemented by additional capabilities to achieve traceability down to the component level, screen units with a performance grading technique, permanently store all manufacturing and test data, provide integrated statistical process control information, ensure proper process step sequencing and ensure correct labeling and shipment.

Tracking #ISIAC-163

In this paper, a method is proposed to reduce the order of IIR filters by means of control theory. Using the state space representation of the filter and the controllability and observability gramians of a FIR filter in a closed form, balanced realization method is used to reduce the order of the filter. For IIR filters, long division is used first to find a FIR model for the filter. The balanced realization technique is then utilized to find the reduced order model for the resultant FIR model used to approximate the IIR filter. The reduced-order model obtained for IIR filter consists of the approximation errors in both balanced realization procedure, as well as the long division process. A method is given to obtain an upper bound for the infinity norm of error between the original IIR filter and the FIR model derived from the long division. A bound on the norm of the overall approximation error is then obtained by adding the long division error to the model reduction error of balanced realization.

Tracking #ISIAC-134

In this paper an appropriate paradigm of multi-variable dynamic systems of strong non-linear coupling, a polymerization process is considered. Since the state propagation of the various internal degrees of freedom cannot directly be controlled, and the desired output is nonlinear function of these quantities, adaptive control is needed even in the possession of the exact dynamic model. Only a single input variable is used as the control signal and a single output variable is observed. Considering the details of the dynamics of the transitions between different steady states the role of choosing proper sampling rate is analyzed. The conclusions are justified by simulation results.

Tracking #ISIAC-164

In this paper, a method is proposed to compute the infinity-norm of the systems that are single-input single-output (SISO), linear time-invariant (LTI), strictly proper and finite-dimensional. The method uses state-space model of the system and applies one of the special conditions of the Routh table to a polynomial obtained from the system model. The proposed method is simple and provides an analytical solution for the infinity-norm of systems. The frequency corresponding to the infinity-norm of the system can also be determined. The method can also be used to determine the sensitivity of the infinity-norm to the parameters of the system.

Session	Room	Time	Session Title	Chair	Co-chair
M-PM5 Track IFMIP	BALLROOM C	1420- 1540	MEDICAL ENGINEERING I	S. Kobashi	Y. Hata

Presentation Time	Paper No.	Paper Title	Corresponding Author
1420	IFMIP-95	Adaptive Brain Tissue Classification	S. Kobashi, M. Matsui, N. Inoue, K. Kondo, and Y. Hata
1440	IFMIP-185	Diagnostic System of Breast Cancer based on Imaging Data of Mammography using Fuzzy Logic	S. Arita, T. Nomura, H. Sonoo
1500	IFMIP-199	Development of three dimensional endoscope by Thin Observation by Bound Optics(TOMBO)	K. Yamada, S. Ishida, R. Shougenji, and J. Tanida
1520	IFMIP-189	Automated Gyral Identification Using Interpolated Sulcal Curves	S. Sueyoshi, S. Kobashi, K. Kondo, and Y. Hata

ABSTRACTS

Tracking #IFMIP-95

Classification of brain tissues assists for detecting brain tumors and for quantifying the cerebral atrophy. Almost of conventional methods assign the same class to voxels that have same MR signal independent of their locations. So, their methods are unsuitable for MR images with intensity nonuniformity (INU) artifact. This article proposes an automated method that locally classifies the brain tissues by adapting a fuzzy model that represents transit of MR signals on a line that draws from the gray matter to the white matter. Also, this article evaluates and discusses the proposed method and compares with the conventional method.

Tracking #IFMIP-185

The number of patients with breast cancer is recently increasing in Japan. It is very important to find the patients quickly with accuracy. In this paper, we deal with the imaging data of the mammography of 40 patients concerning with breast cancer and analyze the clinical finding. We constructed the diagnostic system of breast cancer based on evaluation of findings of the mammography using the Fuzzy inference. From the results obtained by application of this system to clinical practice, it was suggested that this system was effective to judge whether malignant or benign tumor.

Tracking #IFMIP-199

The three dimensional endoscope by Thin Observation by Bound Optics (TOMBO) is presented. The system consists of a micro-lens array, a signal separator and a photo-detector array. Digital processing of the captured multiple images is used to extract the surface profile. Preliminary experiments were executed on an evaluation system to verify the principles of the system and to clarify the issues related to its implementation.

Tracking #IFMIP-189

Atrophy of the human brain is observed as the progress of dementia. The atrophy occurs at the different rate on each gyrus. Estimating the atrophy for each gyrus helps us for the purpose of distinguish diagnosis. To estimate the atrophy for each gyrus, gyri on the cortical surface should be identified. This paper aims to propose a fully automated method for identifying the gyri in three-dimensional (3-D) human brain magnetic resonance (MR) images. To evaluate the proposed method, it was applied to identify the superior frontal gyrus, the middle frontal gyrus, the precentral gyrus and the central gyrus. Experimental results showed that the proposed method correctly identified the appropriate gyri.

Session M-PM6 Track ISORA	Room Ballroom A&B	Time 1540-1700	Session Title ROBOT SENSOR FUSION AND ENVIRONMENT INTERACTION	Chair A. Howard	Co-chair P. Sridhar
Presentation Time	Paper No.	Paper Title			Author(s)
1540	ISORA-62	Fuzzy logic selection of surface feature observations for small proximity operations			A. Howard
1600	ISORA-89	Hierarchical data aggregation in spatially correlated distributed sensor networks			P. Sridhar, A. Madni, and M. Jamshidi
1620	ISORA-254	.A Novel Tiered Sensor Fusion			H. Seraji
1640	ISORA-255	<i>m</i> -Valued Quantum Representations and Operations of Elementary Cellular Automata			A. Al-Rabadi

ABSTRACTS

Tracking #ISORA-62

In this paper, we discuss the development of an autonomous system capable of maintaining surface feature references within sensor view by recommending spacecraft trajectory adjustments based on predefined criteria. The ability to localize with respect to terrain features is a necessary component for increasing the reliability of spacecraft position estimation during small body operations. The proposed algorithm uses the concept of fuzzy logic to maintain satisfaction of a number of feature selection criteria, which, when satisfied, allow consistent updating of feature observations. We provide details of the algorithm in this paper, and present results from integrating the algorithm into a small body descent simulator.

Tracking #ISORA-89

The central idea of using sensor networks for monitoring events and conditions is to exploit the distributed nature provided by tiny and low powered devices. Multiple sensors can be used collaboratively to monitor events or space more effectively than a single sensor. Several applications can be envisioned with sensor networks ranging from military and commercial applications to environment and earth sciences. Typical examples include: traffic monitoring of vehicles, military reconnaissance and surveillance, target tracking, cross-border infiltration, habitat monitoring and structural monitoring, to name a few. These sensors in general are prone to failure due to their inherent characteristics. In this paper, we propose a robust fault tolerant data aggregation scheme in sensor networks.

Tracking #ISORA-252

According to a Gartner study, fifty percent of all RFID projects fail. The reasons for this are varied. One major factor is frequently traceable to the early (planning) stage of the RFID project: a lack of process-based expertise and operating experience when it comes to identifying and evaluating the potential of RFID deployments. The availability of useful models (encompassing procedural know-how and/or how-to documents) is frequently limited. In current models, strategic aspects, risk assessments and process-based cause-and-effect chains are treated as secondary considerations. As a result, deficiencies in the process flow persist past the introduction of RFID technology and desired synergy effects fail to materialize. In this paper, we seek to explore these issues and develop conceptual approaches for the systematical identification and evaluation of the potential of RFID applications

Tracking #ISORA-255

This paper introduces the *m*-valued Swap-based quantum computations (QC) of ECA. The fundamental *m*-valued quantum representation of: (1) *m*-valued orthonormal computational basis states that quantum decision trees (QDTs) and (2) *m*-valued orthonormal composite basis states QDTs are also introduced as quantum modeling for the representations and operations of QECA dynamics. The new *m*-valued quantum representations and their associated operations can play an important role in the automated design of future QECA circuits that consume minimal power in the quantum domain.

Session M-PM7 Track IFMIP	Room BALLROOM C	Time 1540-1700	Session Title INFORMATION SECURITY AND HARDWARE IMPLEMENTATIONS II	Chair P. Kitos	Co-chair J. Gomez
Presentation Time	Paper No.	Paper Title			Author(s)
1540	IFMIP-152	Platform Independent Security Architecture in Multi-Processor System-on-Chip ICs for Use in Mobile Phones and Handheld Devices			A. Ashkenazi, D. Akselrod, and Y. Amon
1600	IFMIP-100	IPv6 Security Threats and Possible Solutions			D. Zagar and K.Grgic
1620	IFMIP-102	Improving the Secure Socket Layer by Modifying its Authentication Function			R. Haraty
1640		OPEN			

ABSTRACTS

Tracking #IFMIP-152

A platform independent security architecture for use in Multi-Processor System-on-Chip integrated circuits, primarily oriented for mobile phones and handheld devices, is presented. The suggested architecture provides an enhanced security protection scheme for use in smartphones, PDAs, as well as other similar systems. Sensitive data storage facilities, cryptographic engines, and physical protection mechanisms such as debug port access control are presented and described in detail. The proposed secure architecture has been incorporated as a part of an application processor which in turn is embedded in a number of smartphone and handheld products. System operation is discussed and hardware realization and experimental results of the proposed architecture are described.

Tracking #IFMIP-100

In comparison to IPv4, IPv6 provides many improvements considering simplicity, routing speed, quality of service and security. IPv6 brings significant improvements in mechanisms for assuring a higher level of security and confidentiality of the transmitted information. Nevertheless, it is still necessary to take care of network security. This paper analyzes how actual security threats and different types of attacks affect IPv6 networks. IPv6 specific security issues and issues due to different transition mechanisms are also analyzed. Certain security tests have been done and their comments have been given. Finally, some possible solutions for a number of security threats in IPv6 networks have been given.

Tracking #IFMIP-102

Secure Socket Layer (SSL) is a cryptographic protocol widely used to make a secure connection to a web server. SSL uses three interdependent cryptographic functions to perform a secure connection. The first function is authentication. It is used to allow the client to identify the server and optionally allow the server to identify the client. The most common cryptographic algorithm used for this function is RSA. If we double the key length in RSA to have more secure communication, then it is known that the time needed for the encryption and decryption will be increased approximately eight times. In this paper, we propose a modification of RSA from the domain of integers to the domain of Gaussian arithmetic to be applied to the first function of SSL that would give more secure communication. This modification would use only double the time needed for the usual implementation of RSA with key size in bits.

Session M-PM8 Track ISSCI	Room Erzsebet	Time 1540-1700	Session Title INTELLIGENT SYSTEMS FOR SOFT COMPUTING APPLICATIONS	Chair: L. Tummala	Co-Chair: G. Lee
Presentation Time	Paper No.	Paper Title			Author(s)
1540	ISSCI-145	Software Interface Development Environment (WIDE): Software Tool for Automatic Generation of Web Application Interfaces			S. Okamoto, S. Dascalu, D. Egbert.

1600	ISSCI-209	Frameworks for a Human Centered Collaborative Commerce System	S.-Y. Kim, W. Smari, and W. K McQuay
1620	ISSCI-147	Design of e-learning Objects for CALL in SYNTACTICS	N. Armitage and C. Bowerman
1640	ISSCI-153	Simulation Software for Naval Surface Warfare Training	S. Dascalu and S. Buntha

ABSTRACTS

Tracking #ISSCI-145

Using web applications has become a common solution to access and manipulate information remotely. Platform and device independency can be achieved most efficiently using matured web standards. By combining available standards and web technology, interactive web applications can be created, which can potentially take the place of current desktop applications. However, building even basic web applications is limited to expert software developers. Even though end-users have a desire to create one, the hurdle to learn and combine multiple technologies altogether is often too high for their needs and skills. In this paper we present the Web Interface Development Environment (WIDE), a new software application to assist end-users develop web applications visually using navigation charts, and thus minimize their development efforts. Using WIDE, end-users can incrementally prototype and develop full applications more intuitively.

Tracking #ISSCI-209

In the past few years, collaborative commerce (or c-Commerce) and human-centric systems have been research subjects of keen interest in Web-based technologies and have become a major focus for many organizations. C-Commerce creates and supports dynamic collaborative environments over the Internet or other public information networks (PINs). It offers many levels of collaborative interactions and enables the organizations and individuals to work simultaneously, cooperatively as well as independently. Recently, it has become increasingly important to integrate human-centered designs in collaborative systems to achieve user-oriented environments. This paper presents Human-centered C-Commerce System (HCCS), an architectural framework for collaborative commerce with integration of some human aspects. We discuss its architecture and describe each component of the proposed system. Using an intelligent c-Commerce system, such as HCCS, will enhance collaboration between users and organizations effectively.

Tracking #ISSCI-147

The production of electronic course content for delivery on Virtual Learning Environments which employ the growing number of standards and specifications in this area are intended to enable the electronic teaching material to be re-used. This is accomplished by providing clearly defined approaches to describing and organising content so that the material can be made available and discovered on a number of learning platforms. However this confuses the re-use of the object with pedagogic re-use. We look at this issue, call for a greater use of software engineering expertise and the return of control of content creation to the classroom tutor. To this end we also present Syntactics - a computer-aided language learning (CALL) system which focuses on a novel form of electronic re-use of content.

Tracking #ISSCI-153

This paper presents a prototype simulation software system that provides support for centralized command and control in naval surface warfare. To build this prototype, we have designed the modes of operation for the system and have created algorithms needed for its execution. These algorithms include intercepting an enemy target platform and calculating an escape route. A detailed graphical user interface interface with easy-to-use options for the user facilitates the interaction with the computer by navy commanders and tactical action officers. The software was designed and developed using a systematic engineering approach, supported by the Unified Modeling Language as specification and design notation. The paper provides background information on naval surface warfare, describes the main elements of the prototype's software model, and details the system's interface and modes of operation. Several directions of future work are also presented in the paper.

Session	Room	Time	Session Title	Chair	Co-chair
M-PM9 Track ISAC	MARGIT	1540-1700	ADVANCE CONTROL AND FILTERING - II	F. Y. Hadaegh	J. S. Benitez-Read

Presentation Time	Paper No.	Paper Title	Author(s)
1540	ISIAC-298	Parrallel Estimation and Control Architectures for Formation Flying Spacecraft in Deep-Space	F. Y. Hadaegh and R. S. Smith
1600	ISIAC-88	Comparison of PD and LQR Methods for Spacecraft Attitude Control Using Star Trackers	S. Beatty
1620	ISIAC-166	PC-DSP System for Testing a Reactor Power Control Algorithm and a Rod Driver Prototype	J. S. Benitez-Read
1640	ISSCI-399	Velocity Control of Electric Propulsion Space Vehicles Using Heliocentric Gravitational Sling	B. B. Kumar Reddy, A. Homaifar, and A. C. Esterline
1700	ISIAC-133	On Finite-Precision Effects in Lattice Wave-Digital Filters	I. M. Alvarez-Gomez, J.D. Oses, and A. Alvarez-Vellisco

ABSTRACTS

Tracking #ISIAC- 166

A simulator of a reactor control system is presented. The hybrid simulator is based on a PC that contains the reactor dynamical model and a DSP TMS320C50 that executes the control algorithm. The control objective is to bring the reactor power from its source level (from mW to a few W) up to a full power level of 1 MW. The input signals to the DSP controller are the power error expressed in percentage and the reactor period that represents the time the reactor requires, at every sampling time, to increase the power by a factor e . The controller output that usually represents external reactivity has to be converted to the corresponding displacement of the reactor control rod. A reactor control rod driver prototype has been designed and built, and it is to be tested with the PS-DSP system.

Tracking #ISIAC-88

The work contained herein is a comparison of spacecraft attitude control methodologies that use reaction wheels for torque actuation and star trackers to infer spacecraft orientation and angular rate. A Kalman filter was used to estimate Euler angles and angular rate using the measurements from three star trackers. Using the linearized equations of motion for a rigid body in space, the linearized stability, effectiveness and robustness of a linear quadratic regulator (LQR) control design were compared with that of a proportional-derivative (PD) control design. The goal of the study was to determine the degree to which the optimal gains calculated with the LQR control law improve the performance of a spacecraft attitude control system in comparison to the non-optimal gains calculated with the PD control law.

Tracking # ISIAC-399

The objective of this research is to determine a near optimal fuel efficient control strategy for an electric propulsion space vehicle to attain a predefined velocity at the target. The control strategy is represented as a chromosome and micro genetic algorithms are used to find the best solution. The control strategy uses the space vehicle's reverse thrust and the sling effect caused by the Sun.

Tracking #ISIAC-133

Digital filters are a basic building block in many Soft Computing applications, specifically in those that require Signal Processing Techniques to obtain feature vectors representative of the real-world problem. Practical implementation of digital filters implies using finite-length registers for filter coefficients storing. It is known that if we wanted to achieve ideal filtering performances, infinite-length filters would be needed. But, such filters are impossible to construct by using infinite precision models. In this paper, in order to minimize the above mentioned errors, an application for the design and analysis of LWDF (Lattice Wave Digital Filters) has been developed in MATLAB®. The simulation results are satisfactory and show the importance of using the above mentioned application when analyzing the quantization effects in digital filters, before carrying out their practical implementation.

Session M-PM10 Track ISOMA	Room PARLAMANT	Time 1540-1700	Session Title KNOWLEDGE EXTRACTION	Chair N. Vojdani	Co-chair S. Resch
Presentation Time	Paper No.	Paper Title			Author(s)
1540	ISOMA- 179	An Efective Image Based Surface Roughness Estimation Aproach Using Neural Network			A. A. Akbari, A. Milani-Fard, A. G. Chegini
1600	ISOMA 252	- A Process and Knowledge-Based Model to Identify and to Evaluate the Potential of RFID Applications			N. Vojdani, J. Spitznagel and S. Resch
1620	ISOMA-23	Semantic-Based Authoring of Technical Documentation			R Setchi
1640	ISOMA- 299	Agent-Based Technology as a Tool for The Integration of Manufacturing Systems			J. Oleśków
1700	ISOMA- 77	To Go Beyond From the Local Optimality: Developing 5-Axis Response Surface Graph Based On Orthogonal Array (Oa) L9			B. K. Ane

ABSTRACTS

Tracking #ISOMA-179

The accurate measurement of surface roughness is essential in ensuring the desired quality of machined parts. The most common method of measuring the surface roughness of machined parts is using a surface profile-meter with a contact stylus, which can provide direct measurements of surface profiles. This method has its own disadvantageous such as workpiece surface damage during the mechanical contact between the stylus and the surface. In this paper we propose a contactless method using image processing and artificial neural network as a pattern classifier. Having trained the network for any specific workpiece with 10 sample patterns, the system would be learn how to approximate the actual surface roughness with 3D texture features of the surface image. The input parameters of a training model are, RaArea, RqArea defined parameter for gray level of surface image, arithmetic mean value, and standard deviation of gray levels from the surface image, without involving cutting parameters (cutting speed, feed rate, and depth of cut). Experimental results show effectiveness of this estimation method.

Tracking #ISOMA-252

According to a Gartner study, fifty percent of all RFID projects fail. The reasons for this are varied. One major factor is frequently traceable to the early (planning) stage of the RFID project: a lack of process-based expertise and operating experience when it comes to identifying and evaluating the potential of RFID deployments. The availability of useful models (encompassing procedural know-how and/or how-to documents) is frequently limited. In current models, strategic aspects, risk assessments and process-based cause-and-effect chains are treated as secondary considerations. As a result, deficiencies in the process flow persist past the introduction of RFID technology and desired synergy effects fail to materialize. In this paper, we seek to explore these issues and develop conceptional approaches for the systematical identification and evaluation of the potential of RFID applications

Tracking #ISOMA-23

Authoring of technical documentation is a knowledge-intensive activity that requires knowledge of various domains and information from several product life-cycle phases. This paper presents two complementary semantic-based methods for creating product support documentation and delivering it to the user. The first approach is based on using Concurrent Engineering and Product Data Management (PDM) technology. The second approach uses ontologies to capture the semantic complexity of the product support domain. Promising direction for further research is the integration of these two approaches.

Tracking #ISOMA-299

Agent-based technology provides a natural way to design and implement efficient manufacturing environments. In this paper we emphasize features of state-of-the-art manufacturing systems. Furthermore we present fundamentals of agent based systems and an agent-based framework for the coordination and integration of manufacturing systems. It models each stage or process as an autonomous agent. Each agent is a software entity that has a set of protocols which govern the operations of the manufacturing entity, a knowledge base, an inference mechanism and an explicit model of the

problem to solve. The protocols specify what action an agent will take based on its local state and the messages received from other agents.

Tracking #ISOMA-77

Response Surface Method (RSM) is a useful optimization technique for quality and productivity improvement in industry which consists of a collection of statistical techniques for modeling and analysis of problems in which one or more responses are influenced by several variables. The objective is to find the relationship between the response(s) and several variables, and to optimize the response(s) based on the path of steepest ascent (Box and Wilson, 1951; Hick, 1964; Myers and Montgomery, 1971). Myers and Carter (1973) introduced an algorithm for determining conditions of x_1, x_2, \dots, x_k that maximize a primary response function subject to having an equality constraint on a secondary response function. Khuri and Conlon (1981) introduced another approach to multi-response optimization which composed of several distance functions (metrics) to measure the overall closeness of the response functions to achieving their respective optimal values at the same set of operating conditions. Taguchi (1987) recommends a multivariate successive approximation method which makes use of orthogonal arrays when there are several parameters and a small number of observed data. Park (1996) found that the fitted second-order model is in most cases adequate to approach the relationship between a response and a number of independent variables. Experimental design for fitting a second-order response surface must involve at least three levels of each variable. In this regard, the $3k$ factorial is the proper factorial experiment. For $k=2$, this design is well suited to fitting second-order models in term of both the numerical model and the response surface graph. However, when a large number of variables are under study, we will cope with problems, such as the number of observation required is excessive, the response is unable depicted graphically and high possibility to fall into the trap of 'local optima'. To date, since the effort of Amago (2001), there is no research activity has been organized to further develop or to improve the capability of RSM as a systematic multi-response numerical tool. Capability of RSM to depict the response is still limited in 3-dimensional response surface graph which consist of 2 variables, x_1 and x_2 . Coping with the problem of 'local optima', this research is dedicated to construct a transformation algorithm on the basis of the desirability function (Derringer and Suich, 1980) in order to enable fitting and analysis of the n th-order model which involves 4 variables, x_1, x_2, x_3 and x_4 . The algorithm is developed based on design of orthogonal array (OA) L9 and graphically depicted into 5-axes response surface by maintaining orthogonality property of the design. Analyzing response and interaction amongst the 4 variables simultaneously is to improve the capability of RSM in predicting the true optimal response in terms of "global optima".

Time	BREAK	Ballroom Foyer
1720-1820	Life Time Achievement Session – 1 Homayoun Seraji Chair: M. Jamshidi	Ballroom A&B
	DINNER OPEN	

TUESDAY JULY 25, 2006

0800-0900	Keynote MON-3: T. Vamos Chair: M. Jamshidi	Ballroom A&B
0900-1000	Keynote TUE-2: Pal Michelberger Chair: I. Rudas	Ballroom A&B
1000-1020	BREAK	Ballroom Foyer
1020-1120	Keynote TUE-3: Michael Athans Chair: A. Elkamel	Ballroom A&B

TUESDAY PARALLEL SESSIONS

Time	ISORA Session T-AM1 Room: Ballroom A&B	IFMIP Session T-AM2 Room: Ballroom C	ISSCI Session T-AM3 Room: Erzsebet	ISIAC Session T- AM4 Room: Margit	IFMIP Session T-AM5 Room: Parlamant
1120-1240	ROBOTIC ACTUATORS AND APPLICATIONS	SOFT COMPUTING II	MILITARY APPLICATIONS OF SOFT COMPUTING METHODS	CONTROL APPLICATIONS	MEDICAL ENGINEERING - II

Time	ISORA Session T-PM1	IFMIP Session T-PM2	ISSCI Session T-PM3	ISIAC Session T-PM4	IFMIP Session T-PM5
1340-1500	UAV PERCEPTION AND NAVIGATION	CONTENT-BASED VIDEO SIGNAL PROCESSING AND VLSI ARCHITECTURES I	EXPERIENCE MINING AND MANAGEMENT IN DESIGN, CONTROL & AUTOMATION	DIAGNOSTIC, IMAGE, AND SIGNAL PROCESSING	MULTIMEDIA AND EXPERT SYSTEM
Time	ISORA Session T-PM6	IFMIP Session T-PM7	ISSCI Session T-PM8	IFMIP Session T-PM9	ISSCI Session T-PM10
1520-1640	ROBOT DYNAMICS AND CONTROL	CONTENT-BASED VIDEO SIGNAL PROCESSING AND VLSI ARCHITECTURES II	WEB – SOFTWARE MANAGEMENT	COMPUTATIONAL INTELLIGENCE FOR IMAGE PROCESSING	NEURAL NETS APPLICATIONS-I

Session T-AM1 Track ISORA	Room Ballroom A&B	Time 1120-1240	Session Title ROBOTIC ACTUATORS AND APPLICATIONS	Chair D. Tesar	Co-chair K. Khorasani
Presentation Time	Paper No.	Paper Title			Author(s)
1120	ISORA-168	Neural network based actuator faults diagnosis for attitude control subsystem of an unmanned space vehicle			I. Al-Dein and K. Khorasani
1140	ISORA-116	Stability analysis of a four rotor helicopter Authors:			J. Toledo, L. Acosta, M. Sigut, and J. Felipe
1200	ISORA-253	Alternative approach to use of pulse width modulation			D. Zrilic
1220	ISORA-58	Computer aided design of switch reluctance motors for use in robotic actuators			P. Ashok, and D. Tesar

ABSTRACTS

Tracking #ISORA-168

The main objective of this paper is to develop a neural network-based fault detection and isolation scheme (FDI) for the attitude control subsystem (ACS) of a satellite. Towards this end, two neural networks architectures are considered. First, a dynamic neural network residual generator is constructed based on the Dynamic Multilayer Perceptron (DMLP) network in order to fulfill the detection task. A generalized embedded structure for the dynamic neuron model is considered in the DMLP network. Second, a static neural classifier is developed based on the Learning Vector Quantization (LVQ) network to serve as an isolation technique. Based on a given set of input-output data pairs collected from a 3-axis ACS of a satellite, the networks parameters are adjusted to minimize a performance index specified by the output estimation error. The proposed neural FDI structure is applied for detecting and isolating various faults in the reaction wheel (RW), that is often used as an actuator in the ACS of a satellite, and its performance and capabilities is investigated and compared to a model-based observer residual generator that is to detect various fault scenarios.

Tracking #ISORA-116

In this paper the lifting operators are presented and applied to a multifrequency system to carry out the analytical study of the system stability without using non-linear operators. A four rotor helicopter prototype has been constructed with the idea of studying the results obtained with different strategies in order to find the one that allows to reach the best control of the helicopter. The prototype is provided with different types of sensors for determining its position and orientation with respect to the floor. These sensors send information to the control system at different frequencies, which justifies the use of the lifting methodology in order to simplify the analytical study of the closed-loop system stability.

Tracking #ISORA-254

There are many requirements placed on the new generation of micro and macro robots, such as communication between robots, allowing coordinate actions, cognitive capabilities, smart behavior etc. Usually a pulse-width modulation (PWM) is widely used in different area of control systems, such as robotics, industrial process control, power control systems, etc. A PWM circuit converts a DC voltage into a series of pulses, so that the pulse duration is directly proportional to the value of DC voltage. In spite of wide use of PWM, there are disadvantages of using PWM such as the possibility of generating radio-frequency interferences (RFI). In addition, when control by frequency modulation (FM) is desired the ON-period of PWM pulse is kept constant, but the frequency is varied in order to bring regulation. It is difficult to make the ON-period below a certain time duration. When the limit is reached, control by a PWM becomes impossible. The value of a minimum ON-period depends on the transistor switch. Due to the varying pulse width, PWM is unusable for time division multiplexing (TDM). Usually these problems are encountered when a 555 IC timer is employed as PWM. In this paper we propose to alternative methods for PWM.

Tracking #ISORA-58

The Switched Reluctance Motor (SRM) is emerging as a strong contender to the permanent magnet synchronous motor as a prime mover of choice in robotic actuators. This paper describes a design synthesis tool for switched reluctance motors. First, a review of the currently existing design tools is presented. The paper then details a parametric design synthesis procedure that requires the formulation of analytical relationships that involve SRM performance and design parameters. The analytical relationships (rules of thumb for design) thus developed can be used along with parametric reduction techniques to work towards and optimal design.

Session T-AM2 Track IFMIP	Room BALLROOM C	Time 1120-1240	Session Title SOFT COMPUTING II	Chair N. Takagi	Co-chair H. Tatsumi
Presentation Time	Paper No.	Paper Title			Corresponding Author
1120	IFMIP-172	An Indoor-Walk-Guide Simulator based on a Haptic Interface			Y. Murai, H. Tatsumi, M. Miyakawa, and S. Tokumasu
1140	IFMI-194	The Independence of Axioms of B. Russell's Logical System of Axioms			T. Ninomiya
1200	IFMIP-68	A consideration on sum-of-products forms with non-convex fuzzy truth values			N. Takagi
1220	IFMIP-97	Evolution of Multiple States Machines for Recognition of Online Cursive Handwriting			R. Halavati, S. Bagheri, Shouraki, and S. Hassanpour

ABSTRACTS

Tracking #IFMIP-172

By combining 3-D shape modeler (a program which can generate 3-D shapes by graphics in a computer) and haptic-sensible devices, we are developing a touch-sensible system in order to help a blind person understand 3-D shapes. Here we report on a pathway simulator which simulates a guiding of a pathway through haptic recognition. We can use a tactile map for the visually impaired to explain a pathway. However, it can be sensed only at the limited area of the finger-tips, and therefore lacks on-site feelings. On the other hand, if we could simulate a pathway by haptic method, i.e., if we simulate sense of his palm against resisting forces caused by a gliding long cane hold in his palm, we believe

it might give on-site feeling of the pathway. The purpose of the haptic pathway simulator is to present special information by haptic method along the path.

Tracking #IFMIP-194

By using the Method of Indeterminate Coefficients, we can examine the independence of each axiom of a system of axioms. In this paper, we treat the Russell’s classical logical system of axioms. We examine whether each axiom is independent or not from the others and show the results.

Tracking #IFMIP-68

Many types of fuzzy truth values have been proposed, such as numerical truth values, interval truth values, triangular truth values, trapezoid truth values and so on. Recently, a new type of fuzzy truth values (which we call multi-interval truth values) have been proposed and studied. The characteristic feature of multi-interval truth values is that not all of them are convex fuzzy truth values. This fact makes their algebraic structures complex. So, this paper clarifies some of the properties on functions defined over multi-interval truth values, when the number of variables and the number of non-convex multi-interval truth values are restricted.

Tracking #IFMIP-97

Recognition of cursive handwritings such as Persian script is a hard task as there is no fixed segmentation and simultaneous segmentation and recognition is required. This paper presents a novel comparison method for such tasks which is based on a Multiple States Machine to perform robust elastic comparison of small segments with high speed through generation and maintenance of a set of concurrent possible hypotheses. The approach is implemented on Persian (Farsi) language using a typical feature set and a specific tailored genetic algorithm and the recognition and computation time is compared with dynamic programming comparison approach.

Session T-AM3 Track ISSCI	Room Erzsebet	Time 1120-1240	SessionTitle MILITARY APPLICATIONS OF SOFT COMPUTING METHODS	Chair: H. Tadjine	Co-Chair: V.-E. Neagoe
Presentation Time	Paper No.	Paper Title			Author(s)
1120	ISSCI-87	A Feature-Based Face Recognition Approach Using Gabor Wavelet Filters Cascaded with Concurrent Neural Modules			V.-E. Neagoe, J. Mitrache, S. Preotesiou
1140	ISSCI-240	Multistage Neural Supporting System for Time Domain Detectors			S. Harneit, M. Reuter, H. H. Tadjine,
1200	ISSCI-241	Moisture Effects in Soils Using a Frequency Domain Metal Detector			B. Rosendo Valez, S. Harneit, M. Reuter, V. Skorupskaite
1220	ISSCI-245	Velocity Control of Electric Propulsion Space Vehicles Using Heliocentric Gravitational Sling			N. Armitage, C. Bowerman

ABSTRACTS

Tracking #ISSCI-087

We propose a face recognition model consisting of the following stages: facial feature localization (23 essential points, corresponding to eyes, mouth, nose, and face boundary) ; feature representation by Gabor Wavelet based Filtering (GWF); dimensionality reduction using Principal Component Analysis (PCA); neural classification using Concurrent Self-Organizing Maps (CSOM). For the ORL face database, we obtain a recognition score of 96%.

Tracking #ISSCI-240

In this work we propose an end-user supporting system for humanitarian demining tasks to semiautomatically classify signals of time domain metal detectors. Our multi-stage system consists of a first module to smooth the raw signals,

followed by a neural feedforward net to classify the metal content of the localized object at each sensor position. The resulting output activities of this net are accumulated to spatial vectors, which are propagated to a second feedforward net. Its resulting output activities are visualized in a 3D-end user interface and may be analyzed by different signal processing routines to be sensitive to changing soils and environmental conditions.

Tracking #ISSCI-241

It is known by experienced deminers that the existence of moisture in soils complicates the detection of buried land mines. This work describes the influence of water in two different sample soil types (sand and clay soil) on the magnetic field induced by a mine surrogate and thus on the quality of the detector's audible signal when using a frequency domain metal detector (FDM). The results of our studies show that with increasing moisture content the signal amplitude of the received response voltage in both operating frequencies is diminished, and that the level of diminution depends on the type of soil. To investigate the influence of different soils and moisture levels a comprehensive measurement activity has been accomplished. The received data has been smoothed and evaluated statistically. For this purpose firstly the voltage intervals defined by the overall extreme values of the pure soil measurements are evaluated, so the intervals include all inhomogeneities of the ground, and compared with other different test scenarios containing mines. Also obtained is the result that the extremal intervals of the wet soils converge to the corresponding intervals of dry soils when desiccating. As a first try to categorize mines buried in different depths, moisture levels and soils, a neural classifier being composed of a self organizing feature map to merge and categorize the spatial complex signal vectors in an unsupervised training mode followed by an backpropagation net to ease the interpretation of its classification results has been developed and applied to the test data.

Tracking #ISSCI-245

The objective of this research is to determine a near optimal fuel efficient control strategy for an electric propulsion space vehicle to attain a predefined velocity at the target. The control strategy is represented as a chromosome and micro genetic algorithms are used to find the best solution. The control strategy uses the space vehicle's reverse thrust and the sling effect caused by the Sun.

Session T-AM4 Track ISIAC	Room MARGIT	Time 1120-1240	Session Title CONTROL APPLICATIONS	Chair L. E. Costlow	Co-chair J. Vuong
Presentation Time	Paper No.	Paper Title			Author(s)
1120	ISIAC-248	VHDL Implementation For a Fuzzy Logic Controller			P. Vuong, A. Madni and J. Vuong
1140	ISIAC-244	Frequency-Mismatch-Tolerant Silicon Vibratory Gyroscope without Vacuum Package for Automotive Applications			A. Madni, H. Zhang, Q. Zou, E. S. Kim, and L.E. Costlow
1200	ISIAC-106	Evolution of a Communication Protocol Between a Group of Intelligent Agents			H. Khasteh, S. B. Shouraki, R. Halavati, and E. Khameneh
1220	ISIAC-19	A Comparative Study of RSA Based Digital Signature Algorithms			R. Haraty

ABSTRACTS

Tracking #ISIAC-248

This paper describes the implementation for a basic fuzzy logic controller in Very High speed integrated-circuit Hardware-Description Language (VHDL). It is not intended as an introduction to fuzzy logic control methodology; instead, we try to demonstrate the implementation of a fuzzy logic controller through the use of the VHDL code. Use of the hardware description language (HDL) in the application is suitable for being implemented into an Application Specific Integrated Circuit (ASIC) and Field Programmable Gate Array (FPGA). The main advantages of using the HDL approach are rapid prototyping, and allowing usage of powerful synthesis tools such as Xilinx ISE, Synosys, Mentor Graphic, or Cadence to be targeted easily and efficiently.

Tracking #ISIAC-244

This paper describes a low-cost silicon vibratory gyroscope that tolerates a relatively large mismatch between the driving-mode and sensing-mode frequencies. The gyroscope is based on beam-mass structure and realized by one

silicon proof mass and two beams for the driving and sensing mode. Piezoelectric actuation is used to produce a large driving mode vibration displacement (about 100 μm about 32 V_{peak-to-peak}). Two tiny sensing beams are separated from the vertical silicon beam to increase the sensitivity while keeping the sensing-mode resonant frequency high. Piezoresistive and piezoelectrical sensing mechanisms are applied to two different gyroscopes. The gyroscope operating at 1-4 kHz is capable of sub-degree-per-second angular rate sensitivity without any vacuum package.

Tracking #ISIAC-106

One of the very important issues in multi-agent systems is the communication protocols between agents. In existing applications, a communication protocol is usually defined between agents. But defining a protocol between agents causes some problems, for example it is possible that an agent recognizes a subject, but because of no definition of such a subject in their protocol, they can not express anything about it. In this paper, we propose a new method for evolution of a communication protocol between intelligent agents. Finally, the experimental results will be discussed with expressing future works and conclusions.

Tracking #ISIAC-19

In 1978 the powerful and practical RSA public-key scheme was produced. It is the most widely used public-key cryptosystem. Its security is based on the intractability of the integer factorization problem and on solving the RSA problem of finding the e^{th} -root of an integer c modulo n , where n is the product of large distinct primes. El-Kassar et al., modified the RSA public-key encryption scheme from the domain of natural integers, \mathbb{Z} , to two principal ideal domains, namely the domain of Gaussian integers, $\mathbb{Z}[i]$, and the domain of the rings of polynomials over finite fields, $\mathbb{F}[x]$, by extending the arithmetic needed for the modifications to these domains. In this work we implement the classical and modified RSA cryptosystem to compare and to test their functionality, reliability and security. To test the security of the algorithms we implement attack algorithms to solve the factorization problem in \mathbb{Z} , $\mathbb{Z}[i]$, and $\mathbb{F}[x]$. After factorization is found, the RSA problem could be solved by finding the private key using the extended Euclidean algorithm.

Session T-AM5 Track IFMIP	Room PARLAMANT	Time 1120-1240	Session Title MEDICAL ENGINEERING -II	Chair S. Kobashi	Co-chair Y. Hata
Presentation Time	Paper No.	Paper Title			Author(s)
1120	IFMIP-162	Automated Three-Dimensional Evaluation of Canal Fit and Fill of the Stem in the Femoral Bone from CT Image			K. Nagamune, N. Shibamura, Y. Hata, and M. Kurosaka
1140	IFMIP-96	Eddy Current System for Finding Distal Transverse Screw Hole of Intramedullary Nail			M. Endo
1200	IFMIP-210	Camera system for the three-dimensional display based on the reconstruction of parallax rays			H. Takahashi, K. Yamada, and E. Shimizu
1220	IFMIP-115	Cell migration imaging and its functional analysis			T. Kushibiki, T. Sano, and K. Awazu

ABSTRACTS

Tracking #IFMIP-162

Total hip arthroplasty is a well established reconstruction technique for deteriorated hip functions. Canal fit and fill ratio, which indicates stability of the stem implanted into the femoral bone, were proposed. However, almost of all the conventional methods were semi-automatic or manual segmentation of the stem, the cortex bone, and the cancellous bone, which can cause variation of the analysis result and wasting massive evaluation time. The canal fit and fill of the stem should be evaluated in three-dimension in order to adapting to actual situation. The objective of this study is to propose an automated three-dimensional evaluation of canal fit and fill of the stem in CT image. The result could automatically segment the stem, the cortex bone, and the cancellous bone. In addition, three-dimensional canal fit and fill were evaluated.

Tracking #IFMIP-96

This paper describes an eddy current system for finding distal transverse screw holes of an intramedullary nail. Although conventional X-ray method can visualize and find screw holes in the bone, it has a serious problem of X-ray exposure. Therefore, we require a system to find screw holes with no X-ray exposure. This paper solves this problem by using the eddy current system and applying our proposed method which is calculated local maximum values of the searching signal obtained the eddy current system. Characteristics of screw holes are shown in the waveform and the amplitude of the searching signal. As the result, the screw hole positions could be identified within error of 1.3 mm when the distance between the probe and the intramedullary nail d is 4 mm.

Tracking #IFMIP-210

This paper describes the ray-space based camera system for the three-dimensional (3D) display based on the reconstruction of parallax rays. The ray-space representation is one of image-based rendering techniques. It uses images of real objects to recreate photo realistic images of complex shaped objects without any explicit geometric model. By using similarities between a reference plane in ray-space representation and the screen of this 3D display, parallax rays for reconstructing a 3D image, which we can observe at arbitrary viewing point, compose of amount of some parallax images. As an experimental result, a 3D image of a real object is reconstructed.

Tracking #IFMIP-115

A new type of cell-cultivation system based on laser processing has been developed for the on-chip cultivation of living cells. We introduce a "laser cell-chip", on which migration of cells, such as stem cells, tumor cells or immunocompetent cells, can be observed. A sheet prepared from epoxy resin was processed by KrF excimer laser (248 nm, 1.6 J/cm²) for preparation of microgrooved surfaces with various groove width, spacing, and depth. A laser cell-chip can make kinetic studies of cell migration depending on the concentration gradient of a chemoattractant. In this study, megakaryocytes were used for the migration on a groove of laser cell-chip by the concentration gradient of the stromal cell derived factor

Session T-PM1 Track ISORA	Room Ballroom A&B	Time 1340-1500	Session Title UAV PERCEPTION AND NAVIGATION	Chair J. Martinez de Dios	Co-chair A. Barrientos
Presentation Time	Paper No.	Paper Title			Author(s)
1340	ISORA-104	Neural networks training architecture for UAV modeling			A. Barrientos, S. Martin, P. Gutierrez, J. del Cerro
1400	ISORA-239	Multi sensorial systems for the generation of disassembly trajectories			J. Pomares, S. Puente, G. Garcia, and F. Torres
1420	ISORA-216	Automatic detection of windows thermal heat losses in buildings using UAVs			J. Martinez de Dios, and A. Ollero
1440	ISORA-217	A technique for stabilization of infrared images taken with hovering UAVs			J. Martinez de Dios, and A. Ollero

ABSTRACTS

Tracking #ISORA-104

This work proposes the use of hybrid models of supervised neural networks for modeling of a dynamical complex system and analyze different training architectures, in this case a scale helicopter, whose attitude and position identification is performed. This model will be useful for the development and utilization of the helicopter as Unmanned Aerial Vehicle (UAV). Throughout this work the supervised hybrid networks is examined, as well as the characterization of the treatment of the training commands, with which the present results are achieved.

Tracking #ISORA-239

The disassembly of products for they reuse is an important field of research. One aspect that appears when a product is been disassembled is the uncertainty in the trajectories for the removal of a component from the rest of the product. In order to reduce this lack of information, a multi-sensorial system is proposed. This system uses visual and force-sensor information to avoid the unknown factors in the disassembly plan and correct the trajectories generated which are based on the model of the product. This paper also describes the structure of a de-manufacturing system that can perform the desired disassembly task.

Tracking #ISORA-216

This paper presents a set of infrared perception techniques for automatic detection of heat losses in windows by using autonomous and teleoperated helicopters. The paper focuses on the processing of infrared images paying special attention to the segmentation, estimation of temperature and classification of thermal heat losses in infrared images. It also presents briefly the main characteristics of the UAV platform used in the experiments. The paper includes results of experiments of infrared building inspection carried out in December 2005.

Tracking #ISORA-217

This paper presents a technique based on Fourier-Mellin transform for the stabilization of sequences of infrared images taken with hovering Unmanned Aerial Vehicles. The strength of the proposed technique is that relies on the global structure of the image for performing the stabilization, which is appropriate when dealing with images where it is difficult to find clear and repeatable features. The technique has been efficiently implemented for real-time application. The paper presents some experimental results that illustrate the performance of the technique.

Session T-PM2 Track IFMIP	Room BALLROOM C	Time 1340-1500	Session Title CONTENT-BASED VIDEO SIGNAL PROCESSING AND VLSI ARCHITECTURES I	Chair D. Xu	Co-chair E. Merenyi
Presentation Time	Paper No.	Paper Title			Author(s)
1340	IFMIP-82	A Combined PCA/SNAKE Model For Precise Object Contour Extraction			C. Li, Y. Li, D. Zhang, and Y. Liu
1400	IFMIP-83	Tracking Multiple Video Objects in Complex Scenes			Y. Liu, Y. Li, and D. Zhang
1420	IFMIP-84	A Scheme for Object-Based Video Segmentation			Y. Luo, D. Xu, I. French, and N. Tsoligkas
1440	IFMIP-85	A Motion Model Based Video Stabilisation Algorithm			N. Tsoligkas, D. Xu, I. French, and Y. Luo

ABSTRACTS

Tracking #IFMIP-82

An extended PCA algorithm to extract moving objects is presented in this paper. In the algorithm, three frames are sufficient for the extraction of for rigid or non-rigid objects. In order to obtain a precise contour of moving object, a Snake Model is adopted to process the object detection results. In our experiments, a range of image sequences is used to test the combined PCA/Snake model. The results show that the proposed algorithm can extract the moving objects accurately and its speed is improved over the conventional PCA model.

Tracking #IFMIP-83

Tracking multiple objects is an essential task for many video applications. One of the key technical issues for effectively tracking the objects is to deal with the shadows and occlusions in video scenes. In this paper, an adaptive shadow suppression method, which combines chrominance and texture features, is proposed. Moreover, in order to handle the occlusions effectively, the relationship between the bounding boxes of object at previous and present time has been taken into account, so that the color distributions of objects are recorded when they merge and the identity of each object is certified by the Bhattacharyya distance when they separate. Experimental results on tracking objects in various video sequences demonstrate the robustness and efficiency of the proposed algorithm.

Tracking #IFMIP-84

This paper presents a new video segmentation scheme, which consists of two stages: initial segmentation and motion estimation. In the initial segmentation, the watershed transformation followed by a region adjacency graph guided region merging process is used to partition the first video frame into spatial homogenous regions. Then the motion of changed region is estimated. Based on the highly efficient quadratic motion model, the motion estimation is undertaken using Gauss-Newton Levenberg-Marquardt method to minimize the least-square error function. Experimental results show the proposed scheme provides high performance in terms of segmentation accuracy and video compression ratio.

Tracking #IFMIP- 85

Video sequences often suffer from jerky movements between successive frames. In this paper we present a stabilisation method to extract the information from successive frames and to correct the undesirable effects. In the method, the optical flow is computed and the estimated motion vectors using the Horn-Schunck algorithm are passed to the model-fitting unit that stabilizes and smoothens the video sequence. A synchronization module supervises the whole system. The measures based on the fidelity of the system (PSNR) are given to demonstrate the stabilisation and efficiency of the system.

Session T-PM3 Track ISSCI	Room Erzsebet	Time 1340-1500	Session Title EXPERIENCE MINING AND MANAGEMENT IN DESIGN, CONTROL & AUTOMATION	Chair: K. Badie	Co-Chair: M. T. Mahmoudi
Presentation Time	Paper No.	Paper Title			Author(s)
1340	ISSCI-74	Generating Fuzzy membership Function through Meta-function: An experience mining approach			M. Sami, and K. Badie
1400	ISSCI-75	Composing Methods: An Approach to Generating New Methods for Complex Engineering Issues			M. Tayefeh Mamoudi, K. Badie, M. Y. Khales
1420	ISSCI-76	A Perspective-Oriented Approach for Information Mining & Its Contribution to Design, Control & Automation Issues			K. Badie, M. Tayefeh Mahmoudi
1440	ISSCI-180	Experience fusion as integration of distributed structured knowledge			A. Holland and M. Fathi.
1500	ISOMA-112	Organizational Experience Management Through Knowledge Maps- An ontological Approach			K. Neshatian, M. Kharrat, and S.Babazadeh

ABSTRACTS

Tracking #ISSCI-074

One of the main issues concerning the design of a fuzzy logic system is generation of the membership functions for the linguistic variable values. Regarding this point, in this paper we present a new approach for generation of FMF for a new user emphasizing on the important role of other users FMFs, which have been generated in past experiences, and the genealogical factors which form the users background with respect to the given linguistic variable value. In order to generate a new FMF, we have made use of Case-Based Reasoning and in the meantime have introduced the notion of Meta-Function as a flexible framework for FMF generation.

Tracking #ISSCI-075

Concept composition has been proposed as an approach for generating new ideas based on linking the attributes values of the frames of the concepts related to the significant entities such as theories, methods and objects as well. In this paper, having reviewed the objectives behind concept composition, some examples will be discussed regarding the way concept composition can be successfully used in handling complex engineering issues.

Tracking #ISSCI-076

In this paper, some perspectives are suggested for information mining from extraction viewpoint, based upon which the essential methodology for mining can be systematically determined in response with the user's objectives. The ideas developed in this paper can help the organizational knowledge managers and the knowledge engineers in design, control and automation environments, develop potential intelligent tools for improving/enhancing the performance of the related issues on the basis of the information existing in the related engineering reports.

Tracking #ISSCI-180

In this paper we address and discuss the problem of learning and fusion of graphical models using structure learning algorithms. We present a new enhanced parameterized structure learning and experience fusion approach. A concurrent fusion method to aggregate expert knowledge stored in distributed knowledge bases or probability distributions is also described. Experimental results of a case study show that our approach can improve the efficiency of learning structure algorithms for knowledge fusion applications.

Tracking #ISOMA-112

This work deals with some important issues in knowledge management, concerning the problem of wide distribution of experience in large knowledge-creating organizations. We propose a practical methodology for representation of experience resources across different location and over a variety of different types. An integrated ontology-based model has been used to capture many aspects of organizational experience like experience types, distribution of experience resources, and related processes. This work has been done both from a declarative perspective to conceptualize main notions of the field, and from a procedural perspective to encompass associated processes.

Session	Room	Time	Session Title	Chair	Co-chair
T-PM4 Track ISAC	MARGIT	1340-1500	DIAGNOSTIC, IMAGE, AND SIGNAL PROCESSING	A. Preciado-Ruiz	S. Descalu
Presentation Time	Paper No.	Paper Title			Author(s)
1340	ISAC-117	Alarm System With Probabilistic Reject of False Alerts			A. Preciado-Ruiz F. J. Ruiz-Cid
1400	ISAC-120	Robust Fault Detection for an Induction Machine			M.-L. Benloucif and H. Balaska
1420	ISAC-26	On Fault Isolation by Functional and Hardware Redundancy			R. F. Garcia, J. P. Castelo, A. P. Pazos, and J. L. C. Rolle
1440	ISAC-46	Online Fault Diagnosis of Dynamical Systems in a Collaborative Sensor Network.			H. Snoussi
1500	ISAC -53	An Optimization Model for the Network Traffic and the Net Band- Width Based on the Automatic Treatment of Information			M. Dridi and A. Hajjam

ABSTRACTS

Tracking #ISAC-117

ABSTRACT A home security system is designed to detect illegal intruders and to warn the home owner. When home owners are sleeping or they are not at home, the alarm system is started in order to monitor the house and trigger the alarm if there is an illegal intruder. However, the alarm system can be activated by a pet sending a false alert. In this work a probabilistic technique is presented in order to reduce false alerts provoked by domestic animals. The system uses standard passive infrared sensors to determine the mass and the speed of a target under its influence to determine a point in a mass-speed space where only those measurements which are most likely to come from a human being can trigger the alarm.

Tracking #ISAC-120

This paper presents an application of model-based residual generation for fault detection and isolation (FDI) to an induction machine. A scheme of observers with nonlinear decoupling is used for residual generation. The resulting residuals are robust to load torque disturbances and to parameter uncertainties such as moment of inertia and friction while being sensitive to stator and rotor electrical faults.

Tracking #ISAC-26

The aim of the work is to exploit some aspects of the functional and hardware redundancy in fault detection and isolation tasks using back-propagation neural networks as functional approximation devices to be used as residuals generators which will be evaluated by means of rule based strategies. Implementation procedure is carried out with the

facilities supplied by a FOUNDATION™ Fieldbus compliant tool, which manage databases, neural network structures and training algorithms under mentioned standard.

Tracking #ISIAc-46

In this contribution, we propose an efficient collaborative strategy for online change detection, in a distributed sensor network. The collaborative strategy ensures the efficiency and the robustness of the data processing, while limiting the required communication bandwidth. The observed system is assumed to have a finite set of states, including the abrupt change behavior. For each discrete state, the system is assumed to evolve according to a linear state-space model. An efficient Rao-Blackwellized collaborative particle filter (RB-CPF) is proposed to estimate the probability of occurrence of the system state change, within a Bayesian framework. The Rao-Blackwellization procedure combines a sequential Monte Carlo filter with a bank of distributed Kalman filters. The sensor network has a circular architecture where each smart sensor is able to exchange sufficient statistics and soft decisions with its two nearest neighboring sensors. The local fusion is based on the selection with replacement (resampling) algorithm.

Session T-PM5 Track IFMIP	Room PARLAMANT	Time 1340-1500	Session Title MULTIMEDIA AND EXPERT SYSTEMS	Chair S. Saadat	Co-chair N. Kubota
Presentation Time	Paper No.	Paper Title			Author(s)
1340	IFMIP-218	Human-Friendly Interface Based on Visual Attention for Multiple Mobile Robots			N. Kubota, D. Koudu, S. Kamijima, K. Taniguchi, and Y. Nogawa
1400	IFMIP-201	SSM and Expert Systems: Towards Representation and Visualization			D. Johnston
1420	IFMIP-202	Is Voice Recognition the solution to keyboard-based RSI ?			S. Mills
1440	IFMIP-213	Are Students Aware of Ergonomics of Computer Uses?			S. Saadat

ABSTRACTS

Tracking #IFMIP-218

This paper discusses human-friendly interface of a teleoperated mobile robot. We consider a human interface which is a simple with intuitive operation capability reduce to confusion of an operator. When operating a complicated system, easy operations are required in each step of the operation. Also in teleoperation, in order to tell an operator the situation of workspace, it is necessary to put up information by the suitable method. This paper proposes a teleoperating system using touch panel for two teleoperated mobile robots to improve the ease of operation and a method of calling operator's attention based on image processing.

Tracking #IFMIP-201

In this paper we discuss the use of Checkland's Soft Systems Methodology as a knowledge engineering tool to develop expert systems which can ultimately structure, represent and visualise normative positions within organizations.

Tracking #IFMIP-202

To determine whether voice recognition is the solution to keyboard-based RSI and to assess its impact and that of other alternative equipment to the standard keyboard and mouse, a survey was undertaken of individuals with RSI. From a total of 77 respondents, 63 (81%) indicated experience of voice recognition. Comprehensive training was required for the majority but was wholly inadequate or not widely available. Regarding usability, the software could be used in a wide range of applications, but did not provide hands-free access and recognition problems meant continuous error correction was necessary. Programming and graphic work were further highlighted where the software was ineffective. In conclusion the fieldwork indicated that current voice recognition packages cannot eliminate a keyboard and mouse and can only be considered part of the solution if used in conjunction with an ergonomic keyboard and adaptive support equipment.

Tracking #IFMIP-213

This study explores the extent of awareness of an undergraduate of the principles and practice of workstation ergonomics. The level of work-related upper limb disorders (WRULDs), which can be a consequence of computer workstation use, was

explored to highlight the extent that the problem was present in those about to enter (or re-entering) the workplace. The survey results shown that the level of reported symptoms is high while the level of awareness of good workstation ergonomics is low; that undergraduates' use of computers exposes them to the known risks associated with computer use; that there were a number of possible relationships between current postural practice and the level of reported symptoms.

Session T-PM6 Track ISORA	Room RRRRR	Time 1520-1640	Session Title ROBOT DYNAMICS AND CONTROL	Chair C. Kapoor	Co-chair M. Eghtesad
Presentation Time	Paper No.	Paper Title			Authors
1520	ISORA-155	2 DOF control configuration applied to 1992 benchmark problem			C. Pedret, R. Vilanova, I. Serra, and R. Moreno
1540	ISORA-141	Adaptive robust control of the Stewart Gough platform as a six DOF parallel robot			A. Ghobakhloo, M. Eghtesad, and M. Azadi
1600	ISORA-142	Neural network control of two electrically driven cooperating 6 DOF robot			H. Jafarian, M. Eghtesad, and A. Tavasoli
1620	ISORA-64	Benefiting from underutilized task specific resources for industrial robotic systems			J. Sevier, C. Kapoor, and D. Tesar

ABSTRACTS

Tracking #ISORA-155

The 2-DOF Observer-Controller configuration is based on a right coprime factorization of the plant and makes use of an observer-based feedback control scheme combined with a prefilter controller. A two-step design procedure is accomplished: first, we can design to guarantee stability robustness and some levels of performance in terms of disturbance rejection; second, we can design the prefilter controller to guarantee open-loop processing of the reference commands. The first step is carried out by solving a constrained Hinf optimization problem using the right coprime factorization of the plant in an active way. The second step is done by assuming a Reference Model and by solving a Model Matching Problem. The design procedure is exemplified by means of the 1992 ACC Benchmark Problem.

Tracking #ISORA-141

In this paper an adaptive-robust tracking control design for a Stewart-Gough platform is presented. The Stewart-Gough platform is a six DOF parallel robot manipulator with a force-to-weight ratio and positioning accuracy far exceeding those of a conventional serial-link arm. The adaptive-robust control scheme can be thought of as combining the best qualities of the adaptive and the robust control schemes. Simulation results, in presence of disturbance, illustrate the performance of the proposed control algorithm.

Tracking #ISORA-142

In this paper, the problem of dynamic modeling and neural network control of two 6 DOF elbow manipulators handling a rigid object is studied when actuator dynamics is also considered in the system dynamics. First, kinematics and dynamics of the mechanical subsystem and the relation between different forces acting on the object using different Jacobians are derived. It is shown that the dynamic model of two robots has the same properties that the dynamic model of a single robot has; this permits to use the control schemes, which are used for control of a robot, to control two cooperating robots. Then the actuator dynamics of each robot is included into dynamic equation of two robots and a third order matrix equation is obtained. At the end, a neural network controller scheme is developed for this third order dynamics and the related Lyapunov function is established. This controller guarantees asymptotic tracking of the object desired trajectory.

Tracking #ISORA - 64

The 6 degrees of freedom (DOF) industrial manipulator has become a commodity with nominal design variation among brands. Functional differentiation is often achieved through motion planning and task integration software. This paper leverages past research in redundant systems and their control using performance criteria to manage under-utilized resources to improve the task performance of industrial robotic applications. These extra resources are then utilized to improve manipulator performance for existing trajectories such as a trajectory developed with a teach pendant, or to create

new motion trajectories. A palletizing simulation is used as a simple example to illustrate the resource identification and optimization procedure.

Session T-PM7 Track IFMIP	Room BALLROOM C	Time 1520-1640	Session Title CONTENT-BASED VIDEO SIGNAL PROCESSING AND VLSI ARCHITECTURES II	Chair D. Xu	Co-chair E. Merenyi
Presentation Time	Paper No.	Paper Title			Corresponding Author
1520	IFMIP-86	SVD-Based Image De-Noising With The Minimum Energy Model			Z. Shi, Z. Zhang, and Y. Tang
1540	IFMIP-101	Intelligent Image Prospecting System for Image/RPI Mission			I. Galkin, G. Khmyrov A., Kozlov, B. Reinisch, and S. Fung
1600	IFMIP-92	An object detection and extraction method using stereo camera			Y. Mito, M. Morimoto, and K. Fujii
1620	IFMIP-151	Contextual and Non-Contextual Features Extraction and Selection Method Microcalcifications Detection			A. Vega-Corona, M. Sánchez-García, M. González-Romo, J. Quintanilla-Dominguez, J. M. Barrón-Adame

ABSTRACTS

Tracking #IFMIP-86

This paper proposes a new solution integrating energy function into singular value decomposition (SVD) for image de-noising. The singular values on the diagonal matrix obtained through SVD represent different components in image. By selecting the proper singular values that represent signal and discarding the ones that represent noise, the additive noise of an image can be eliminated effectively. In order to obtain the optimal number of the singular values for image reconstruction and to eliminate the noise, the paper presents a minimum energy model. This model is used to obtain the optimum number for de-noising through calculating the minimum in the defined energy curve. The experiment results show that the established model is effective in the circumstance that the image has simple/regular structure/pattern.

Tracking #IFMIP-101

The Radio Plasma Imager (RPI) onboard NASA's IMAGE spacecraft has acquired over 1.2 million plasmagrams, images of remote sensing of the Earth's magnetosphere. Plasmagram archive is a classic-example dataset posing unrealistic demands of manual labor in order to analyze each collected image for useful features. We present an intelligent data prospecting system based on a bio-plausible model of the pre-attentive vision whose purpose is to draw attention of human analysts to the most interesting data. Presence of weak signatures in the RPI plasmagrams makes this dataset an excellent testbed for sensitive image prospecting techniques. We discuss our progress to date.

Tracking #IFMIP-92

In this paper, we propose a new method for detecting and extracting moving objects from moving stereo camera. Our purpose is not only estimating motion of the camera and objects, but also extracting colors and shapes of detected objects from stereo video streams. Camera motions are calculated from three-dimensional optical flow, and the moving object is detected using images corrected in accordance with the camera motion. The experimental results show that, when the camera movements are straight or rotation, the camera motion and the objects movements could be estimated (total error rate of 4~30%) by our method. Also the color and shapes of the moving object could be extracted.

Tracking #IFMIP-151

In this paper a method to extract and build patterns to model microcalcifications from digitized mammography is presented. The proposed method consist in a combination of two steps, in the first one, a feature extraction method is applied using multiscale wavelet image processing, combined with Self Organizing Neural Network to solve the segmentation image problem. In the second one, a feature selection method is considered applying a Generalized Regression Neural Networks (GRNN) in order to obtain an optimal input vector for a classifier design applications. The results has been successful, having a short feature vector.

Session T-PM8 Track ISSCI	Room Erzsebet	Time 1500-1620	Session Title WEB – SOFTWARE MANAGEMENT	Chair: J. Velagic	Co-Chair: R. Manjunath
Presentation Time	Paper No.	Paper Title			Corresponding Author
1500	ISSCI-035	OWA and PCA Integrated Assessment Model in Software Project			D.-Y. Yeh, C.-H. Cheng, H.-W. Yio
1520	ISSCI-044	A Classifying Web Page Templates Model Based on Fuzzy K-Means Clustering Method			H.-M. Lee, C.-H. Mao, Y.-J. Shih, P.-J. Chen
1540	ISSCI-118	Fuzzy Trust Inference in Trust Graphs and its Application in Semantic Web Social Networks			M. Lesani, S. Bagherie
1600	ISSCI-159	A Novel Compromise Optimization Approach for Evaluating the Strategy of R&D Consortia			H.-K. Chiou, G.-H. Tzeng, C.-C. Wan

ABSTRACTS

Tracking #ISSCI-035

This research proposed the OWA and PCA integrated assessment model for easily overcoming the complexity and for appropriately evaluating the performance of software project. First, the amount of evaluation data was reduced by PCA. As a result, the number of criteria was cut down, but the originally contained information was preserved. Next, OWA was employed to analytically obtain the weights of resultant criteria. In empirical validation, three software projects of one famous hospital in Taiwan were selected as the objects to examine the model appropriateness. Furthermore, a comparison was taken to reveal the superiority of this model.

Tracking #ISSCI-036

This paper presents a natural language processing based automated system for generating UML diagrams after analyzing the given business scenario. A new model is presented for analyzing the natural languages and extracting the relative and required information from the given storyline by the user. User writes the requirements in simple English in a few paragraphs and the designed system has conspicuous ability to analyze the given script. After compound analysis and extraction of associated information, the designed system draws various UML diagrams as activity diagrams, sequence diagrams, class diagrams and Uses cases diagrams. Other conventional CASE tools require a lot of extra time and efforts from the system analyst during the process of creating, arranging, labeling and finishing the UML diagrams. The designed system provides a quick and reliable way to generate UML diagrams to save the time and budget of both the user and system analyst.

Tracking #ISSCI-044

Thousands of web pages rapidly expand every day, and the diversifications of web templates make us difficult to extract the contents of web pages. In this study, we proposed a classifying web page templates model based on fuzzy k-means clustering method. This model can automatically collect the web pages, generate several kinds of web pages templates, provide the different kinds of web content (e.g. hyperlink, image, text) templates for users' requests. Via the proposed model, we can not only classify the web pages templates more easily and efficiently, but also extract the appropriate web information on demands conveniently.

Tracking #ISSCI-118

Social networks let the people find and know other people and benefit from their information. Semantic Web standard ontologies support social network sites for making use of other social networks information and hence help their expansion and unification, making them a huge social network. As social networks are public virtual social places much information may exist in them that may not be trustworthy to all. A mechanism is needed to order coming news, reviews and opinions about a definite subject from users according to each user preference. There should be a feature for users to specify how much they trust a friend and a mechanism to infer the trust from one user to another that is not directly a friend of the user so that a recommender site can benefit from these trust ratings for showing trustworthy

information to each user from her or his point of view from not only her or his directly trusted friends but also the other indirectly trusted users. This work suggests using fuzzy linguistic terms to specify trust to other users and proposes an algorithm for inferring trust from a person to another person that may be not directly connected in the trust graph of a social network. The algorithm is implemented and compared to the previous one. While according to the imprecise nature of trust concept the writing and reading a linguistic expression for trust is much more natural than a number for users, the results show that the algorithm offers more precise information than the previously used algorithm. As the trust graphs and inference are viewed abstractly, they can be well employed in other multi agent systems.

Tracking #ISSCI-159

In this paper we propose a novel approach of multicriteria optimization and compromise solution for solving multiple objective decision making problems. This method assumes that optimal compromise solution should have the shortest distance from the positive ideal solution as well as the longest distance from the negative ideal solution. We use the membership function of fuzzy set theory to express the satisfaction level, and use max-min operation for this bi-objective programming problem. To implement this proposed approach, evaluating the strategies of R&D consortia in Taiwan is solved by use of our procedure.

Session T-PM9 Track IFMIP	Room BALLROOM C	Time 1520-1640	Session Title COMPUTATIONAL INTELLIGENCE FOR IMAGE PROCESSING	Chair N. Kubota	Co-chair S. Hashimoto
Presentation Time	Paper No.	Paper Title			Author(s)
1520	IFMIP-124	Image Component Analyses by Various Representations of Max-Plus Algebra Based Wavelet Transform			H. Nobuhara
1540	IFMIP-130	Affine Modeling of Targets in Video Sequences By Particle Filters			K. Kawamoto
1600	IFMIP-208	Visual Navigation of a Partner Robot Using Cellular Neural Network			S. Hashimoto, F. Kojima, and N. Kubota
1620	IFMIP-219	An Utterance System of a Partner Robot Based on Interaction and Perception			N. Kubota and H. Kojima

ABSTRACTS

Tracking #IFMIP-124

Image component analyses by various representation of max-plus algebra based wavelet transform is proposed, where analysis and synthesis operations of the wavelets are defined by max (or min) and standard sum. In the case of proposed wavelets, various component results can be generated by changing the size/shape of the sampling window used in the analysis/synthesis process. The proposed wavelets especially can reserve edge information on compressed images due to the non-linear operations (max and min); therefore, they are efficient for predictive frames used in video compression and reconstruction. In the experiments, various image component analyses results and video compression and reconstruction by the proposed wavelets are shown.

Tracking #IFMIP-130

We proposes an affine template matching with a statistical approach, namely particle filtering, for tracking objects of interest in video sequences. The widely used Kalman filter can not directly address the dynamics with affine transformation because of nonlinearity. In contrast, particle filter are capable of dealing with nonlinear and non-Gaussian state space models using Monte Carlo approximation. Decomposing affine transformation into six geometric parameters, we naturally model visual motion of targets by a state space model. Experimental results with real video sequences are shown to evaluate the performance.

Tracking #IFMIP-208

This paper discusses the visual navigation of a partner robot. In this paper, we apply a cellular neural network to extract various features from the sequential images. Furthermore, extracted features are classified by self-organizing map. Experimental results will show that proposed method can extract effective features for the clustering of the human behavior.

Tracking #IFMIP-219

Recently, robotic technologies for natural communication with a human have been discussed for the future of human society. A partner robot requires various capabilities for the social interaction based on verbal communication and non-verbal communication. To realize the verbal communication with a human, the robot should acquire the environmental knowledge and behaviors for human interactions. In this paper, we propose an utterance system using perceptual information and interaction with a human. The perceptual information is extracted by image processing based on steady-state genetic algorithm. Furthermore, we conduct several experiments on natural communication with a human.

Session T-PM10 Track ISSCI	Room Erzsebet	Time 1520-1640	Session Title NEURAL NETS APPLICATIONS I	Chair: J. Anton	Co-Chair: J. Velagic
Presentation Time	Paper No.	Paper Title			Author(s)
11:50-12:15	ISSCI-48	Design of Ship Controller and Ship Model Based on Neural Network Identification Structures			J. Velagic
12:15-12:40	ISSCI-113	Mcdm Methods for Territorial Services Planning in an Andine Rural Area			J. Anton, J. Grau, A. Tarquis, D. Sanchez.
12:40-13:05	ISSCI-175	Elman NN And Time Series In Forecasting Models for Decision Making			C. Andreeski, P. Vasant, M. Stankovski, G. Dimirovski
13:05-13:30	ISSCI-178	A Neural Data Fusion Model for Hydrological Forecasting			V. E. Neagoe, C. Tudoran, G. Strugaru

ABSTRACTS

Tracking #ISSCI-048

This paper proposes a computationally efficient artificial neural network models for identification of both fuzzy logic ship controller and nonlinear ship model. The first objective demonstrates how to use nonlinear network to identify fuzzy controller and compare control surfaces of these two controllers as well as performance indices. The second objective is to use a nonlinear network to identify nonlinear plant in recursive on-line mode and the third one is to integrate designed two neural networks in one control scheme to test resulting system response in closed loop system.

Tracking #ISSCI-113

Three alternatives have been considered for the management of solid wastes in small andine cities of the Provincia de Salta, Argentina, {Direct Filling, Sanitary Filling+Compost and Transport out of the City}, by discrete Multi-Criteria Decision Making Methods MCDM after a team defined and elicited a comprehensive set of criteria. The schemas are presented with ELECTRE-I, PROMETHEE and A.H.P. methods up to results, followed by conclusions.

Tracking #ISSCI-175

This paper examines and compares analytical tools in analysis of economic statistical data, econometric modeling, and neural network, soft-computing modeling, as representation models for time series processing in forecasting, decision and control. In addition, a novel forecasting model using Elman networks is proposed. A comprehensive experiment in applying the latter modeling has been carried out, some specific applications software developed, and a number of benchmark series from the literature processed. This paper reports on comparison findings as well on the use of our application software package which encompasses routines for regression, ARIMA and NN analysis of time series. The comparison analysis is illustrated by a sample example known as difficult to model via any technique.

Tracking #ISSCI-178

This paper examines and compares analytical tools in analysis of economic statistical data, econometric modeling, and neural network, soft-computing modeling, as representation models for time series processing in forecasting, decision and control. In addition, a novel forecasting model using Elman networks is proposed. A comprehensive experiment in applying the latter modeling has been carried out, some specific applications software developed, and a number of benchmark series from the literature processed. This paper reports on comparison findings as well on the use of our

application software package which encompasses routines for regression, ARIMA and NN analysis of time series. The comparison analysis is illustrated by a sample example known as difficult to model via any technique.

TUESDAY JULY 23, 2006		
1800-2230	Gala Banquet – Equestrian Show + Gypsy Band (Buses leave Hilton Hotel at 1730) Extra Euro65 Dinner Ticket is needed for students	Lazar Equestrian Park (45 km Outside Budapest)

Wednesday July 26, 2006

0800-0900	Keynote WED-1: Takeshi Yamakawa Chair: L. Koczy	Ballroom A&B
0900-1000	Keynote WED-2: Asad Madni Chair: Y. Hata	Ballroom A&B
1000-1020	BREAK	Ballroom Foyer
1020-1120	Keynote WED-3: Charles Weisbin Chair: S. Nahavandi	Ballroom Foyer

WEDNESDAY PARALLEL SESSIONS					
Time	ISORA Session W-AM1 Room: Ballroom A&B	IFMIP Session W-AM2 Room: Ballroom C	ISSCI Session W-AM3 Room: Erzsebet	ISSCI Session W-AM4 Room: Margit	IFMIP Session W-AM5 Room: Parlamant
1120-1240	ROBOTICS AND AUTOMATION EDUCATION AND APPLICATIONS	MEDICAL ENGINEERING III	FUZZY MODELLING I	TRACKING - ROBOTS	NEURAL NETS APPLICATIONS-II
Time	ISORA Session W-PM1	IFMIP Session W-PM2	ISSCI Session W-PM3	ISSCI Session W-PM4	IFMIP Session W-PM5
1320-1440	SPECIAL APPLICATIONS IN ROBOTICS	MEDICAL ENGINEERING IV	FUZZY MODELLING II	SOFT-COMPUTING METHODS	INTERACTION AND INTELLIGENCE
Time	ISORA Session W-PM6	IFMIP Session W-PM7	ISSCI Session W-PM8	IFMIP Session W-PM9	IFMIP Session W-PM10
1500-1620	SENSING AND TRACKING CONTROL FOR AUTONOMOS ROBOTS	IMAGE PROCESSING	SOFT COMPUTING IN SPACE APPLICATIONS	MULTIMEDIA AND ALGORITHM	SIGNAL- IMAGE PROCESSING

Session W-AMI Track ISORA	Room Ballroom A&B	Time 1120-1240	Session Title ROBOTICS AND AUTOMATION EDUCATION AND APPLICATIONS	Chair D. Ahlgren	Co-chair I. Verner
Presentation Time	Paper No.	Paper Title			Author(s)
1120	ISORA-246	Engineering education via robotics, mechatronics, and automation projects			D. Cox and A. Schonning
1140	ISORA-108	Design and implementation of a navigation system for a low cost electric vehicle			J. Felipe, L. Acosta, J. Toledo, M. Sigut, J. Mendez, and E. Gonzalez
1200	ISORA-243	Education through robotics at the United States Air Force Academy			D. Pack and A. Klayton
1220	ISORA-93	Education design experiments in robotics			I. Verner, and D. Ahlgren

ABSTRACTS

Tracking #ISORA-246

Engineering educational projects with regional industry have influenced creation of Florida's First Coast Manufacturing Innovation Partnership. The development of the joint industry-academia collaboration has the primary goals of project-centered innovations for technology transfer, training the regional workforce with relevance to industry, and sustainability of technology transfer through creation of high-technology jobs. By providing an experiential education in manufacturing systems automation and design in undergraduate engineering curriculum, engineering students are better prepared upon entering the workforce. Projects comprising the development of the Manufacturing Innovation Partnership are outlined which describe project-centered engineering education in design and manufacturing systems engineering.

Tracking #ISORA-108

The goal of this paper is to present a complete kinematic and dynamic model of an electric vehicle. This vehicle has been mechanically modified in order to adapt it for the autonomous navigation task. In addition to this, the car positioning system, consisting of a GPS for determining the vehicle position and a digital compass for obtaining its orientation, is also described. This information, together with the desired path, is used by the control system with the purpose of carrying out the autonomous navigation.

Tracking #ISORA-243

This paper discusses the use of robotics in the electrical and computer engineering curricula at the United States Air Force Academy. One of our important educational goals is to endow graduates with engineering fundamentals and the important hardware and software engineering skills associated with designing, programming, constructing, debugging, and testing complex systems. To support this goal, we embed multiple opportunities into the curricula for students to learn and practice the requisite skills, gradually increasing the complexity as students advance. Collectively, robotics is incorporated into our curricula at two levels. At the fundamentals level, we use robots to teach basic concepts such as digital logic, analog-to-digital conversion, digital-to-analog conversion, programming, and power management. These concepts then form the basis for the development of more advanced skills such as microcontroller interfacing and control, and circuit design. At the more advanced level, robotics provides students with opportunities to work on sophisticated systems. System design provides valuable experience in partitioning difficult design problems from both the hardware and software perspectives, and facilitates the development of effective teamwork skills. The two-level approach has shown to be effective in meeting our educational goals.

Tracking #ISORA-93

We propose the Education Design Experiment (EDE) as a framework for education and research in robotics and we discuss its implementation in Trinity College Fire-Fighting Home Robot Contest (TCFFHRC) projects. We show how evaluation of robot contest projects leads to upgrading of contest assignments, which in turn inspire teams to develop innovative fire-fighting robots. The paper presents results of the TCFFHRC evaluation surveys as well as the theoretical Olympiad, both challenging assignments guided by new contest rules.

Session W-AM2 Track IFMIP	Room BALLROOM C	Time 1120-1240	Session Title MEDICAL ENGINEERING III	Chair K. Nagamune	Co-chair Y. Hata
Presentation Time	Paper No.	Paper Title			Author(s)
1120	IFMIP-98	Fuzzy Extraction System of Heart Pulse Using an Ultrasonic Oscillosensor			Y. Kamozaki, T. Sawayama, K. Taniguchi, and Y. Hata
1140	IFMIP-99	Fuzzy Evaluation System of Velocity and Thickness by Multi-Direction Ultrasonic Probe			J. Yasui, S. Kobashi K. Kondo, and Y. Hata
1200	IFMIP-221	The Study of Three-Dimensional Measurement From an Endoscopic Images With Stereo Matching Method			T. Nagakura
1220	IFMIP-34	Automatic Liver Diseases Diagnosis for CT Images Using Kernel-based Classifiers			C.-C. Lee, Y.-C. Chiang, and S.-H. Chen

ABSTRACTS

Tracking #IFMIP-98

Unconstrained patients health monitoring systems are required in the field of medicine and nursing. Our developed ultrasonic oscillosensor can detect the vibration of human vital by setting to the under of the bed. This paper proposes an extraction method of the heart rate by using this sensor. Our method extracts the weakly detected heart pulse by enveloping the obtained data. Since our method employs fuzzy membership functions, it can adapt to extract the heart rate for various heart frequencies. As the result, we were able to successfully extract the heart rate for four volunteers.

Tracking #IFMIP-99

Development of an ultrasonic device to image the hardness of tissues is important for a cancer diagnosis. Conventional methods cannot precisely measure the size of object, because the sound speed of an object is unknown. We propose a fuzzy inference system for ultrasonic imaging based on the velocity of materials. This method consists of three stages. In the first stage, the surface of the object and the bottom are decided by using a fuzzy inference. In the second stage, we measure the thickness and the velocity of the material simultaneously by ultrasonic pulse-echo method using Multi-Direction probe. In the third stage, the velocity data and the boundary data are integrated to visualize the object. As the result, our method could visualize object shape within error rate of 6 %.

Tracking #IFMIP-221

In these days, the early cancer is treated by endoscopic mucosa resection. So a pathological information of a depth direction of mucosal tissue is important. For a precise endoscopic diagnosis of a depth direction of mucosal tissue is used by ultrasound endoscope. And OCT and confocal endoscope will be used in the future. However the development of an image sensor is very fast, it could measure the depths of mucosa with a conventional endoscope. We studied that a probability of three dimensional measurement with a conventional endoscope.

Tracking #IFMIP-34

In this paper, a kernel-based classifier for automatic liver diseases diagnosis of CT images is introduced. Three kinds of liver diseases are identified including cyst, hepatoma and cavernous hemangioma. The diagnosis scheme includes two steps: features extraction and classification. The features, derived from gray levels, co-occurrence matrix, and shape descriptors, are obtained from the region of interests (ROIs) among the normal and abnormal CT images. In our observation, some features are appropriate for the classification for some specific diseases, and other features are suited for other diseases. Therefore, a 3-layer hierarchical scheme is adopted in the classifier. Different layer adopts different features. In the first layer, the classifier decides

whether a detected case is benign or malignant. In the second layer, the malignant cases, hepatoma will be identified. In the third layer, cyst and cavernous hemangioma will be further distinguished. Finally the receiver operating characteristic (ROC) curve is used to evaluate the performance of the diagnosis system. If the case can not be identified by the system, the decision will be left to the specialists. In our experiment, the average distinction rate is about 78%.

Session W-AM3 Track ISSCI	Room Erzsebet	Time 1120-1240	Session Title FUZZY MODELLING I	Chair: K. Botzheim	Co-Chair: L. T. Koczy
Presentation Time	Paper No.	Paper Title			Author(s)
1120	ISSCI-222	Bacterial memetic algorithm for fuzzy rule base optimization			C. Cristiano, J. Botzheim, T. Gedeon, A. E. Ruano
1140	ISSCI-223	Learning Weights from Observations for Fuzzy Signatures			B. Sumudu, U. Mendis, T. D. Gedeon, L. T. Koczy
1200	ISSCI-226	Information Retrieval Estimation via Fuzzy Probability			Z. Huang, T. D. Gedeon
1220	ISSCI-225	Driver Assisting by inverse time to collision			V. E. Balas

ABSTRACTS

Tracking #ISSCI-222

In our previous works model identification methods were discussed. The bacterial evolutionary algorithm for extracting a fuzzy rule base from a training set was presented. The Levenberg-Marquardt method was also proposed for determining membership functions in fuzzy systems. The combination of the evolutionary and the gradient-based learning techniques, – the bacterial memetic algorithm – was also introduced. In this paper an improvement of the bacterial memetic algorithm is shown for fuzzy rule extraction. The new method can optimize not only the rules, but it can also find the optimal size of the rule base, too.

Tracking #ISSCI-223

We investigate the issue of obtaining weights, which are associated with aggregation in fuzzy signatures, from real data. Our approach will provide a way to extract the relevance of lower levels to the higher levels of the hierarchical fuzzy signature structure. We also handle the non-differentiability of max-min aggregation functions for gradient based learning. A mathematically proved method, which is found in the literature to approximate the derivatives of max–min functions, has been used. Experiments for weights extraction with SARS and non-SARS patients data show that our weighted aggregation model for fuzzy signatures not only performs better in separating SARS and non-SARS patients, but also separating non-SARS data into further significantly distinguished and ordered available categories.

Tracking #ISSCI-226

Fuzzy logic has been recognized as a useful approach in support of information retrieval. It helps identify partially matched documents for a given query so that ranking the relevant documents becomes straightforward. Unfortunately, research on fuzzy information retrieval only focuses on the relevant estimation of the retrieved documents but lacks the estimation of imprecise probability of obtaining such relevant documents. This paper makes use of fuzzy probability (FP) to estimate the possibility of probability of retrieving documents with a certain level of relevance. It first reviews the FP calculation method proposed in Huang and Shi, then presents an enhanced FP calculation method. In addition, a novel FP calculation method is proposed. Realistic examples are provided to demonstrate the use of the fuzzy probability estimation.

Tracking #ISSCI-225

The paper is proposing a specific indicator, the inverse time to collision TTC-1, useful when analyzing the highway traffic. The advantage of TTC-1 vs TTC is a direct and continuous dependence with the collision risk. TTC-1 could be used as an input in car following algorithms. Because the automate driving is yet in a research stage, a feasible application for TTC-1 would be rather assisting the driver of the following car at the choice of the distance gap towards the first car.

Session W-AM4 Track ISSCI	Room Erzsebet	Time 1120-1240	Session Title TRACKING -ROBOTS	Chair: I. Song	Co-Chair: B. Lacevic
Presentation Time	Paper No.	Paper Title		Author(s)	
1120	ISSCI-049	Stable Nonlinear Position Control Law for Mobile Robot Using Genetic Algorithm and Neural Network		B. Lacevic, J. Velagic.	
1140	ISSCI-052	Tracking Style Adjustment in Automatic Cruise Control		A. Tahirovic, Z. Avdagic	
1200	ISSCI-054	Autonomous and Deterministic Supervised Fuzzy Clustering		K. M. Lim, C. K. Loo	
1220	ISSCI-195	Design of a Navigator for the Optimized Path-Tracking of Underwater ROVs using a Nero-Genetic Fuzzy Controller		H. Kashani, M. H. Saghafi, M. Fathy, and M. Soriani	

ABSTRACTS

Tracking #ISSCI-049

In this paper we proposed a new stable control algorithm for mobile robot trajectory tracking. The stability conditions are guaranteed by Lyapunov theory. The control parameters of backstepping algorithm are adjusted using genetic algorithm. Some of them are represented by unknown functions which are generated by neural network. The performance of the proposed controller is investigated using a kinematic model of a nonholonomic mobile robot. The efficient position tracking performance are obtained but the velocities not exceed the given velocities inputs at the start of the motion. In order to avoid these, we propose the extension of backstepping position controller by adding a new control law, which provides velocity servo inputs. Simulation results show the good quality of both velocity and position tracking capabilities of a mobile robot.

Tracking #ISSCI-052

The possibility of using different kind of cruise control algorithms in the vehicle tracking style adjustment was shown in this paper. These vehicle tracking styles ranged from extremely comfort to extremely sportive ones and differ from each other respect to acceleration signals of the tracking vehicle. First, short overview of a neural network based algorithm was shown in order to achieve desired level of the tracking comfort. Also, the possibility of the tracking style adjustment was presented using Pipes and linear optimal control model. The appropriate parameter space regions for different level of comfort have been found with respect to the given cost function of the tracking style.

Tracking #ISSCI-054

For several decades, clustering problem has been widely discussed. One of the famous methods that deal with it is supervised fuzzy clustering algorithm. This algorithm allows each rule to represent more than one output with different probabilities for each output. To achieve this, it utilizes the output label of each data. But, user had to predefine the number of clusters by trial and error, which means randomly initialized. In addition, random initialization created stochastic nature. Hence, we propose modification of the algorithm and global k-means algorithm is used to overcome these serious drawbacks. Global k-means algorithm can autonomously determine the optimum number of clusters and give deterministic clustering result. The proposed algorithm is experiment on benchmark data sets and real power plant diagnosis applications.

Tracking #ISSCI-195

This paper proposes a sub-time-optimum soft-computing based controller to follow a desired path with a desired velocity by mobile robots with identified dynamical behavior. This method consists of a fuzzy controller where a trained Neural Network sets its membership functions values in On-line mode. Training of the Network is done by a Genetic Algorithm for various vehicle initial positions and different path convexities in Off-line. After the training of the network, during vehicle motion, it retrieves sub-optimized fuzziness values and sends them to the fuzzy control algorithm according to the vehicle position. Meanwhile, the influential of the path convexity is considered in fuzziness of membership functions. This method leads us to make almost the best decision for the mobile robot at each moment. This method is applied to an Underwater Remotely Operated Vehicle (ROV) to develop an autopilot for its control system. Simulation results show good performance of the method in this specific problem.

Session W-AM5 Track ISSCI	Room Erzsebet	Time 1120-1240	Session Title NEURAL NETS APPLICATIONS II	Chair: K. Kimoto	Co-Chair: S. Beatty
Presentation Time	Paper No.	Paper Title			Author(s)
1120	ISSCI-24	System FDI Using Frequency Techniques Implemented with NN's			R. Ferreira, J. P. Castelo, A. P. Pazos, J. C. Rolle
1140	ISSCI-30	Using Mutation to Improve Discrete Particle Swarm Optimization For Single Machine Total Weighted Tardiness Problem			C.-L. Huang, C.-H. Tung
1200		OPEN			
1220		OPEN			

ABSTRACTS

Tracking #ISSCI-24

Most of non-linear type 1 and type 2 control systems suffers from lack of detectability when model based techniques are applied on FDI tasks. This research work presents an strategy based on frequency techniques which includes massive neural networks based functional approximation on a parity space approach. As consequence of such technique on non-linear plants of types one and two, useful results were achieved.

Tracking #ISSCI-30

This study uses a random transposition for a dynamic mutation operator similar to those used in evolutionary algorithms to optimize the problem of the total weighted tardiness for single machine. Results show that the PSO with mutation strategy has good performances in convergence and hit ratio for finding the best objective value.

Session W-PM1 Track ISORA	Room Ballroom A&B	Time 1320-1440	Session Title SPECIAL APPLICATIONS IN ROBOTICS	Chair A. Agah	Co-chair O. Izmirlı
Presentation Time	Paper No.	Paper Title			Authors
1320	ISORA -9	Hand rehabilitation support system based on self-motion control with a clinical case report			H. Kawasaki, H. Kimura, S. Ito, Y. Nishimoto, H. Hayashi, and H. Sakaeda
1340	ISORA-70	A haptic display for robotic rehabilitation of stroke			P. Natarajan, W. Liu, J. Oechslin, A. Agah
1400	ISORA-109	Vision based autonomous robot self docking and recharging			U. Kartoun, H. Stern, Y. Edan, C. Feied, J. Handler, M. Smith, and M. Gillam
1420	ISORA-174	Choosing a charging station using sound in colony robotics			G. Parker, and O. Izmirlı

ABSTRACTS

Tracking #ISORA-9

This paper presents a virtual reality-enhanced hand rehabilitation support system with a symmetric master-slave motion assistant for independent rehabilitation therapies. This system consists of a hand exoskeleton device and a lateral symmetric master-slave motion assistant system joined with a virtual reality (VR) environment. Since most disabilities caused by cerebral vascular accidents or bone fractures are hemiplegic, we adopted a symmetric master-slave motion

assistant system in which the impaired hand is driven by the healthy hand on the opposite side. Furthermore, a VR environment displaying an enjoyable exercise was introduced. To verify the effectiveness of this system, a clinical trial was executed using one subject.

Tracking #ISORA-70

The effects of stroke are debilitating on the American population. Past studies of robot-aided motor training for survivors have proven to be effective in upper limb motor recovery. However, survivors also suffer from loss or impairment of sensation. Sensory impairment is an important predictor for motor recovery of stroke survivors. Studies have suggested that sensory inputs during robot-aided motor training might be critical for the creation and promotion of cortical reconstruction due to brain plasticity during post-stroke recovery. This paper presents a new haptic display for the handle of the InMotion2 robot in order to enhance cutaneous sensory inputs for stroke survivors during hand motion. The sensory enhancement is realized through pins attached to servomotors mounted inside the robot handle that vibrate and contact the middle and index fingers, the palm, and the thumb during motor training. Each servomotor is independently controlled using a computer via parallel port with a Field-Programmable Gate Array (FPGA) board as the hardware interface.

Tracking #ISORA-109

This paper presents a method for autonomous recharging of a mobile robot, a necessity for achieving long-term robotic activity without human intervention. A recharging station is designed consisting of a stationary docking station and a docking mechanism mounted to an ER-1 Evolution Robotics robot. The docking station and docking mechanism serve as a dual-power source, providing a mechanical and electrical connection between the recharging system of the robot and a laptop placed on it. Docking strategy algorithms use vision based navigation. The result is a significantly low-cost, high-entrance angle tolerant system. Iterative improvements to the system, to resist environmental perturbations and implement obstacle avoidance, ultimately resulted in a docking success rate of 100 percent over 50 trials.

Tracking #ISORA-174

This research is part of a study that is researching methods for supplying power to autonomous robots in remote locations. One possibility is to provide autonomous charging stations fueled through solar power. This paper reports preliminary results for a system being proposed to help a robot determine which station, among those available, would be its best source of power. The system uses distinct sound frequency bands to determine the available stations and uses the characteristics of sound and the environment as a type of analog computer to help compute, considering each station's distance and available energy, the best station to track towards.

Session W-PM2 Track IFMIP	Room BALLROOM C	Time 1320-1440	Session Title MEDICAL ENGINEERING IV	Chair Y. Hata	Co-chair S. Kobashi
Presentation Time	Paper No.	Paper Title			Author(s)
1320	IFMIP-138	Non-Rigid Registration of Multidetector CT Images for Pulmonal Tissue Elasticity Imaging			Y. Yanagida, S. Kobashi, K. Kondo, and Y. Hata
1340	IFMIP-149	Estimation of Rotator Cuff by Fuzzy Inference Using MRI Images			S. Yogo, S. Kobashi, K. Kondo, and Y. Hata
1400	IFMIP-114	Model-Based Human Ear Identification			E. Jeges and L. Mate
1420	IFMIP-214	Human Hand Detection for Gestures Recognition of a Partner Robot			N. Kubota and M. Abe

ABSTRACTS

Tracking #IFMIP-138

Elasticity imaging is a new approach to diagnose the state of tissues in vivo. Almost of elasticity imaging methods have been studied using ultrasound. However, such ultrasound systems can not be applied to the pulmonal tissues because the lung is fulfilled with air and ultrasound is refracted at the boundary of the lung. This paper proposes a novel tissue

elasticity imaging method using multidirecor computed tomography (MDCT). The present method estimates the elasticity based on image registration between the inspiratory MDCT image and the expiratory MDCT image of the same subject. Use of the elasticity imaging for the lung will help for diagnosing the lung emphysema, the breast cancer or the other pulmonal diseases that cause the change of elasticity.

Tracking #IFMIP-149

It is known that shoulder joint is relatively unstable in human body. It is often that rotator cuff injury of shoulder is caused by bruise on shoulder and age-related deterioration of rotator cuff. Rotator cuff injury has been diagnosed by magnetic resonance imaging (MRI). However, it is difficult to detect small rotator cuff injury from MRI images because physicians determine the disease with considering symptom of patients. Additionally, structure of shoulder is very complicate. To resolve these problems, we propose a method that estimates rotator cuff from MRI images using fuzzy inference.

Tracking #IFMIP-114

Nowadays the viability of ear biometrics and the uniqueness of ears is beyond question, but reliable technical solutions have not yet been presented. As opposed to face recognition, in which a model-based approach is widely used, surprisingly little effort has been put into using ear models in automatic recognition, even though ear shape is more robust than facial characteristics, being unaffected by emotional expressions. In this paper we would like to introduce our model-based scheme for ear feature extraction, implementation of which has proved that the method is strong enough to be applicable in an identity tracking system.

Tracking #IFMIP-214

This paper proposes a human hand detection method for gesture recognition used for communication of a robot with a human. A human hand motion can be recognized as a different meaning according to a situation in the communication between the human and robot. First, we propose a steady-state genetic algorithm for extracting a time series of human hand position, and next, a gestures recognition method of a robot composed of a spiking neural network and self-organizing map. Finally, we discuss the effectiveness of the proposed method through several experimental results.

Session W-PM3 Track ISSCI	Room Erzsebet	Time 1320-1440	Session Title FUZZY MODELLING II	Chair: G. Dimirovski	Co-Chair: K. Botzheim
Presentation Time	Paper No.	Paper Title			Author(s)
1320	ISSCI-11	Automatically Constructing Grade Membership Functions for Students' Evaluation for Fuzzy Grading Systems			S.-M. Bai, S.-M. Chen
1340	ISSCI-16	Design of Self-Organized Robust Wise Control Systems Based on Quantum Fuzzy Inference			S. Ulyanov, L. Litvintseva.
1400	ISSCI-176	A Fuzzy Cost Function Optimization in Product Mix Selection Problem			P. Vasant, C. Andreeski, N. Barsoum, T. Kolemisevska, G. Dimirovski.
1420	ISSCI-215	An Improvement to the Possibilistic Fuzzy c-Means Clustering Algorithm			B. Ojeda-Magana, R. Ruelas, M. A. Corona-Nakamura, D. A. de la Fuente
1440	ISSCI-14	Sociometry Analysis System Applying Fuzzy Theory			K. Shinkai, H. Yamashita, S. Kanagawa, H. Uesu

ABSTRACTS

Tracking #ISSCI-11

In recent years, some methods have been presented for applying the fuzzy set theory in education grading systems. In this paper, we present a method to automatically construct the grade membership functions of lenient-type grades, strict-type grades and normal-type grades, given by teachers, for students' evaluation. Based on the constructed grade membership functions, the system performs fuzzy reasoning to infer the scores of students. The proposed method provides a useful way to evaluate students' answerscripts in a smarter and fairer manner.

Tracking #ISSCI-016

This report presents a generalized design strategy of intelligent robust control systems based on quantum/soft computing technologies that enhance robustness of fuzzy controllers by supplying a self-organizing capability. It is demonstrated that fuzzy controllers prepared to maintain control object in the prescribed conditions are often fail to control when such a conditions are dramatically changed. We propose the solution of such kind of problems by introducing a generalization of strategies in fuzzy inference from a set of pre-defined fuzzy controllers by new Quantum Fuzzy Inference based systems. We stress our attention on the robustness features of intelligent control systems.

Tracking #ISSCI-176

The modern trend in industrial application problem deserves modeling of all relevant vague or fuzzy information involved in a real decision making problem. In this paper the usefulness of the proposed S-curve membership function is established using a real life industrial production planning of a chocolate manufacturing unit. The unit produces 8 products using 8 raw materials, mixed in various proportions by 9 different processes under 29 constraints. A solution to this problem establishes the usefulness of the suggested membership function for decision making in industrial production planning. The objective of this paper is to find the optimal cost to produce 8 products using modified S-curve membership function as a methodology. The fuzzy linear programming approach is used to solve this problem. The optimal cost function is obtained respect to two major factors of degree of satisfaction and vagueness.

Tracking #ISSCI-215

In this work we propose to use the Gustafson-Kessel (GK) algorithm within the PFCM (Possibilistic Fuzzy c-Means), such that the cluster distributions have a better adaptation with the natural distribution of the data. The PFCM, proposed by Pal et al. on 2005, is founded on the fuzzy membership degrees of the FCM and the typicality values of the PCM. Nevertheless, this algorithm uses the Euclidian distance which gives circular clusters. So, incorporating the GK algorithm and the Mahalanobis measure for the calculus of the distance, we have the possibility to get ellipsoidal forms as well, allowing a better representation of the clusters.

Tracking #ISSCI-14

The sociometry analysis is one of the measurement and evaluation methods of social structure which we could effectively analyze by the fuzzy theory. According to the data obtained from some simple questionnaires, we could measure fuzzy relation among the members of a group and observe its human structure by applying fuzzy graph. In this paper, we would not only discuss the fuzzy sociometry analysis system, but also describe the decision method applying the fuzzy decision.

Session W-PM4 Track ISSCI	Room Margit	Time 1320-1440	Session Title SOFT-COMPUTING METHODS	Chair: R. A. Haraty	Co-Chair: A. Howard
Presentation Time	Paper No.	Paper Title			Author(s)
1320	ISSCI-018	SDDSR: Sequence Driven Dynamic Source Routing for Ad hoc Mobile Networks			R. A. Haraty, W. Kdouh
1340	ISSCI-027	FD on Systems Type 1 and 2 Using Conditional Observers			R. Ferreira, J. P. Castelo, A. P. Pazos, J. C. Rolle.
1400	ISSCI-061	Adapting Human Leadership Approaches for Role Allocation in Human Robot Navigation			A. Howard, G. Cruz
1420	ISSCI-193	On Convergence Rate of a Class of Genetic Algorithms			L. Ming, Y. Wang, Y.-M. Cheung

ABSTRACTS

Tracking #ISSCI-18

Mobile ad-hoc networks are becoming more popular as the use of mobile computers is increasing. The biggest challenge facing such networks is continuous and random change in the topology. Table driven routing protocols were not designed for such networks. For this reason new routing protocols that can handle continuous change of topology were created. Two popular protocols are Dynamic Source Routing (DSR), and Ad-hoc On-demand Distance Vector (AODV). DSR has the advantage of making heavy use of routing information to reduce the routing load, whereas AODV has the advantage of using sequence numbers, which guarantees that at all times we are using non-stale routing entries. In this paper, we present the implementation of Sequence Driven Dynamic Source Routing (SDDSR). SDDSR is an on-demand routing protocol, which builds upon DSR and AODV. We use the NS-2 simulator to show the experimental results of the new protocol. The results showed better packet delivery as well as less routing load.

Tracking #ISSCI-27

Most of non-linear type 1 and type 2 control systems suffer from lack of detectability when model based techniques are applied on FDI tasks. This research work presents a strategy based on conditional observers implemented by means of massive neural networks based models applied on a parity space approach. Conditional observers are modeled using a novel neural network based approach. As a consequence of such technique on non-linear plants of types one and two, useful results were achieved.

Tracking #ISSCI-61

In this paper, we propose to examine the practices of leadership defined in human relationships and model their use in maximizing performance for human-robot interaction scenarios. This process involves first defining the human-robot space of interaction and mapping the situational context in which human leadership styles are most fitting. We then determine which behavior, for both the human and robot, is most appropriate in order to understand the proper roles for human-robot integration. From there, we model the necessary robot behavior for increasing efficiency in human-robot interaction schemes. We conclude by discussing experimental results derived from allocating roles in representative human-robot navigation scenarios.

Tracking #ISSCI-193

Convergence rate study for genetic algorithms is a very important but very difficult task. The existing results can be classified into two types. One type is based on Doeblin condition in which some parameters should be estimated. The other type needs to estimate the eigenvalues of the state transition matrix. However, these parameters are difficult to estimate. In this paper, we first formulate a model for a class of genetic algorithms, then we analyze the convergence rate of this class of genetic algorithms in a different way, and prove the convergence rate is linear based on property of Markov chain.

Session W-PM5 Track IFMIP	Room Parlamant	Time 1320-1420	Session Title INTERACTION AND INTELLIGENCE	Chair N. Kubota	Co-chair S. Hashimoto
Presentation Time	Paper No.	Paper Title			Corresponding Author
1320	IFMIP-131	Natural Interaction Using Human Motion Recognition Towards Joint Attention for Human Vehicle			J. Nakazato, E. Sato, T. Yamaguchi, and F. Harashima
1340	IFMIP-200	Learning from Failure: The Benefit of Systems Thinking for Multimedia			P. Bennetts
1400	IFMIP-160	Autonomous Robot Control With Handwritten Character Recognition			T. Yamanoi, H. Toyoshima, Y. Fujiwara, H. Takayanagi, S. Ohnishi, and E. Sanchez
1420	ISORA-204	Development of a Muscle Suit For the Upper Limb Motion Support			H. Kobayashi, H. Suzuki, and M. Iba

ABSTRACTS

Tracking #IFMIP-131

In this research, we focused on using pointing behavior for a natural interface. We investigated to find a system that recognizes users' intentions by using their gestural information in particular situations. The system recognizes objects or the pointing direction, and decides its own action by automatically considering context. In the first, the user moved a robot or an object by using a virtual room interface. In the second, the user pointed out a specific parking space in which the system was to park a car.

Tracking #IFMIP-200

This paper asks whether the emphasis of many computer professionals and academics towards engineering and rationality, in the area of IS development is wholly appropriate. The paper will suggest that it would help if, in fact, stakeholders had a wider focus. To justify this assertion, the paper examines the history of the technology used for IT and the issues identified in the literature as being perceived to have been factors leading to failure. These failures are observed not only in the systems as a whole, but in the interfaces included in it. Many of these interfaces are now addressed through multimedia. However, despite representing a mechanized and perhaps relatively error free approach, anecdotal evidence suggests that what is created could be more useful, particularly in terms of flexibility. The issues associated with difficulties for information systems development are being addressed through methods based on social science. Given the overlap between information systems, HCI and multimedia, this paper suggests that it may be beneficial to include such approaches within multimedia. The paper will recognize the evolution in technology; education; system ideas and organizations together with their competitive environment over the last 40 years or so. The paper will show that the new approaches to the development of information systems are also useful within HCI and multimedia. This is addressed through a consideration of the use of Activity Theory in the development of HCI.

Tracking #IFMIP-160

This paper treats image processing techniques with CCD cameras for control of an autonomous robot. The robot control system uses 3D vision technique. It can be tele-controlled from a PC by giving intelligent commands. And it also autonomously moves by recognition of hand written characters.

Tracking #ISORA-204

A "muscle suit" that will provide muscular support for the paralyzed or those otherwise unable to move unaided is being developed as a wearable robot. The lack of a metal frame and use of McKibben artificial muscle allow the muscle suit to be lightweight, making it realistic to use in daily life. Although all motion for the upper limb by the armor-type muscle suit with the mechanical joints and hard frame is realized, shoulder joints has difficulty in smooth motion because of DOF limitation. To overcome the limitation, new link mechanism is proposed and smooth motion for shoulder is achieved.

Session W-PM6 Track ISORA	Room Ballroom A&B	Time 1500-1620	Session Title SENSING AND TRACKING CONTROL FOR AUTONOMOUS ROBOTS	Chair S. Nahavandi	Co-chair J. Herve
Presentation Time	Paper No.	Paper Title			Author(s)
1500	ISORA-242	3D target tracking using multiple calibrated cameras			M. Wan, and J. Herve
1520	ISORA-235	Solution to robotic landmine detection through use of path planning and motor control			Z. Najdovski, C. Mawson, H. Trinh, and S. Nahavandi
1540	ISORA-234	Using autonomous mobile agents for efficient data collection in sensor networks			T. Black, V. Mak, P. Pathirana, and S. Nahavandi
1600		OPEN			

Tracking #ISORA-242

We present the architecture of a system for tracking multiple targets, using multiple cameras with possibly overlapping fields of views, to determine the 3D location and orientation of the targets. A separate tracker is assigned to each new

target. That tracker uses the information provided by 2D pattern matchers about the location of the target in the cameras' video streams to update its estimate of the target's 3D state. An extended Kalman Filter (EKF) is used to maintain each target's 3D state. New targets are detected by employing an adaptive background subtraction algorithm. We present examples of results of our tracker for outdoor scenes.

Tracking #ISORA-235

Low cost robotic detectors are a promising new approach to combat the disturbing landmine crisis. In this paper a low-cost robotic solution is proposed, we present several control techniques used to improve the precision of the robotic motion. A P and PD controller is applied, and it is concluded that a cascaded control system provides a more stable and accurate response. Two search patterns for landmine detection are considered, rectangular and spiral, these are used to analyse the effectiveness of the control system.

Tracking #ISORA-234

Sensor networks are emerging as the new frontier in sensing technology, however there are still issues that need to be addressed. Two such issues are data collection and energy conservation. We consider a mobile robot, or a mobile agent, traveling the network collecting information from the sensors themselves before their onboard memory storage buffers are full. A novel algorithm is presented that is an adaptation of a local search algorithm for a special case of the Asymmetric Traveling Salesman Problem with Time-windows (ATSPTW) for solving the dynamic scheduling problem of what nodes are to be visited so that the information collected is not lost. Our algorithms are given and compared to other work.

Session W-PM7 Track IFMIP	Room BALLROOM C	Time 1320-1440	Session Title IMAGE PROCESSING	Chair E. Merenyi	Co-chair S. Kobashi
Presentation Time	Paper No.	Paper Title			Author(s)
1320	IFMIP-192	Data Hiding on 3D Meshes Based on Dither Modulation			H.-T. Wu and Y.-M. Cheung
1340	IFMIP-103	A Guidance System for an Electric Vehicle in Non-Structured Roads			J. Felipe, P. A. Toledo, L. Acosta, J. Toledo, and M. Sigut
1400	IFMIP-128	Self-Location Estimation of a Moving Camera Using the Map of Feature Points and Edges of Environment			T. Adachi, K. Kondo, S. Kobashi, and Y. Hata
1420	IFMIP-12	A New Approach to Automation that Takes Account of Adaptive Nature of Pilot Maneuver			E. Itoh and S. Suzuki

ABSTRACTS

Tracking #IFMIP-192

In this paper, data hiding on 3D meshes is investigated based on dither modulation. We present two algorithms to embed the data imperceptibly into polygonal meshes by modulating the distance from the mesh surface to mesh centroid and the one from a vertex to the centroid of its traversed neighbors, respectively. In these two algorithms, the embedded data are invariant to rotation, uniformly scaling and translation, as well as slight distortion of the cover mesh to a certain degree. On the other hand, if the cover mesh is maliciously modified, the embedded data will be changed accordingly so that the proposed algorithms can be utilized for authentication applications. Further, to improve the security of using dither modulation, a component is added into the modulation to make the quantization step statistically undetectable. The two algorithms are compared in terms of complexity, capacity and security, and their common characteristics are discussed as well. Experimental results show their efficacies.

Tracking #IFMIP-103

In this paper, the development of a guidance system for electric vehicles in a non-structured roads environment is presented. The roads lack of any kind of horizontal signs. The vehicle will circulate in the "Instituto Tecnológico de Energías Renovables" (ITER) environment, within the framework of the project entitled "25 Bioclimatic Houses". The vehicle path will take place in the outside with non-controlled illumination conditions and a route plenty of upward and

downward slopes and curves. A guidance system based on a binocular head of two degrees of freedom is proposed. The cameras orientation in such way that the road appears centered in the captured images, allows for making the prototype guidance.

Tracking #IFMIP-128

Applications as visual navigation of mobile robot with image sensor and mixed/augmented reality have been investigated actively. Many of these techniques require the localization of human or robot. In this report, we propose a novel method for estimating the position of a camera by using edge and feature point information in time-series of images. The technique can be applied to the indoor environment and the environment spatial model including feature points is obtained by tracking background feature points with the position of camera. The prediction model image is generated based on trajectory of the moving camera from the spatial model and the camera position is estimated by correction of model image from comparison with the input image.

Tracking #IFMIP-12

This paper proposes a new architecture named Human As a Control Module (HACM) architecture to harmonize automation and adaptive nature of pilot maneuver. HACM architecture treats a pilot as a single module of controller in flight. By using the proposed architecture, it becomes possible to reduce or eliminate inappropriate pilot maneuvers caused by cognitive or decision making process and deliberate acts taken by hijackers. Additionally, the architecture can protect piloting based on pilots' exceptional assessment of the situation. In this research, HACM architecture is applied to Pilot Induced Oscillation (PIO) problem and the effectiveness of the architecture is confirmed.

Session W-PM8 Track ISSCI	Room Erzsebet	Time 1520-1640	Session Title SOFT COMPUTING IN SPACE APPLICATIONS	Chair: R. A. Ribeiro	Co-Chair: A. Falcao
Presentation Time	Paper No.	Paper Title			Author(s)
1520	ISSCI-78	Comparison of Mamdani and Sugeno Fuzzy Inference Systems for a Space Fault Detection Application			J. Jassbi, P. Serra, R. A. Ribeiro and A. Donati
1540	ISSCI-81	CESADS – Centralised ESTRACK Status and Diagnostic System			R. Raminhos, A. Falcao, L. Correira.
1600	ISSCI-132	New Data Preparation Process – A Case Study for an EXOMARS Drill			B. R. Santos, P. T. Fonseca, M. Barata, R. A. Ribeiro
1620	ISSCI-253	Evaluating the Technological Innovation of a Firm Using Fuzzy Schemes			I. Y. Lu

ABSTRACTS

Tracking #ISSCI-078

This work provides a comparison between the performances of Sugeno-type versus Mamdani-type fuzzy inference systems. The main motivation behind this research was to assess which approach provides the best performance for a Space Fault Detection application, developed in 2002 for gyroscope fault detection of the ESA satellite ENVISAT. Due to the importance of performance in online systems we compare the application, developed with Mamdani model, with a Sugeno formulation using three types of tests: processing time for both systems, robustness in case of noise; and sensitivity analysis of the systems' behaviors when we change input: data changing from min to max. The results showed that Sugeno model performed better in all three tests, hence we may conclude that replacing a Mamdani system with an equivalent Sugeno system could be a good option to improve the overall performance of a fuzzy inference system.

Tracking #ISSCI-81

This paper presents CESADS, a knowledge-based Monitoring and Diagnostic system targeted at preventing space link losses in satellite control missions. CESADS integrates fuzzy knowledge and rules. It is composed of a Server and four clients, for knowledge acquisition, space link assessment and monitoring, reporting and management. An Operational Prototype was developed for the European Space Tracking Network of the European Space Agency, using Kiruna ground- station to demonstrate CESADS concept and philosophy.

Tracking #ISSCI-132

This paper addresses the data preparation process for a drill fuzzy monitoring tool. The objective is to describe how to automatically generate fuzzy variables, for a drill monitoring system, using inferred nominal values and their dispersion for each variable. Here, we focus on the knowledge discovery tasks that encompass data extraction, data cleaning, data transformation and then the construction of the fuzzy variables.

Tracking #ISSCI-253

Technology innovation capability (TIC) is an elusive and complex concept that is difficult to determine. Measuring TICs requires simultaneous consideration of multiple quantitative and qualitative criteria. By adopting a fuzzy measure and non-additive fuzzy integral method, this study evaluates the performance of synthetic TICs in hi-tech firms. The analytical results indicated that the non-additive fuzzy integral is an effective, simple and suitable method for identifying the primary criteria influencing TICs at hi-tech firms, especially when evaluation criteria are interactive and interdependent. The proposed approach is an effective method for assessing the TICs of a firm and obtains useful information regarding hierarchical TIC frameworks.

Session W-PM9 Track IFMIP	Room Ballroom C	Time 1500-1620	Session Title MULTIMEDIA AND ALGORITHM	Chair G. Gomez	Co-chair E. Merenyi
Presentation Time	Paper No.	Paper Title			Corresponding Author
1500	IFMIP-249	Automatic buried objects detection in different soils based on active contours			H. H.Tadjine and M. Reuter
1520	IFMIP-154	Adaptive Search Window for Object Tracking in the Crowds using Undecimated Wavelet Packet Features			M. Khansari, H. R. Rabiee, M. Asadi, P. Khadem Hamedani, and M. Ghanbari
1540	IFMIP-267	An Integrated Data Acquisition and Processing System for Assessing Flow Disturbance Due to Arterial Constriction			K. Shujaee , S. Mohammadi, N. Talukder and R. George
1600	IFMIP-266	Fuzzy Bayesian models for Classification and Diagnosis in Generalized Cardiology Discipline			H. Rahnama, A. Sadeghian and W. Melek

ABSTRACTS

Tracking #IFMIP-249

An efficient approach to detect and to localise buried objects using a continuous wave metal detector in different soils is presented. The algorithm can minimise the distracting influence from the soil and localise the buried objects with better precision. This approach used an external force called virtual electric field, to guide the deformation process to active contours boundaries which correspond exactly to the buried objects with and a computed multichannel gradient applied to the obtained metal detector images. The quality of the results can be significantly improved by employing this approach. This can be very useful for higher level vision processing.

Tracking #IFMIP-154

In this paper, we propose an adaptive object tracking algorithm in crowds. The amplitudes of Undecimated Wavelet Packet Tree coefficients for some selected pixels at the object border are used to create a Feature Vector (FV) corresponding to each pixel. The algorithm uses these FVs to track the pixels of small square blocks located at the vicinity of the object boundary. The search window is adapted by analyzing the texture information of the scene and finding the direction and speed of the object motion. Experimental results show a good object tracking performance in crowds includes object translation, rotation, scaling and partial occlusion.

Tracking #IFMIP-267

Arterial constriction (stenosis) causes flow disturbance the level of which depends on the severity of constriction or degree of stenosis (DOS). Ultrasound Doppler signals obtained from poststenotic flow contain different frequencies depending on the mean flow velocity and velocity disturbance, the latter causing spectral broadening. A disturbance index defined as the ratio of quantified spectral broadening to mean frequency during a short sampling period around peak flow or in early deceleration phase, the so-called relative disturbance (RD), is expected to depend on DOS. Experiments were performed *in vitro* using pulsatile flow in a silicon rubber tube of 0.635 cm internal diameter as arterial model and silicon rubber stenosis models of different DOS. An 8-MHz pulsed Doppler ultrasound system was used to obtain Doppler (audio) signals from which the corresponding values of RD were calculated using Matlab software. The actual software were developed for an integrated system for data acquisition and processing in order to determine correlations between RD and DOS.

Tracking #IFMIP-266

There has been a steady progress in creating expert systems capable of diagnosis; however, there exists no generic expert system structure capable of accurately representing medical knowledge and extracting diagnosis in a specific multidisease medical discipline. This paper aims to justify a standard methodology that can be used in creating a generic expert system model for generic medical domains.

Session W-PM10 Track ISSCI	Room Erzsebet	Time 1500-1620	Session Title SIGNAL- IMAGE PROCESSING	Chair: M. Reuter	Co-Chair: D. Andina
Presentation Time	Paper No.	Paper Title			Author(s)
1500	ISSCI-057	A Novel Noise Immune Fuzzy Approach to Speaker Independent, Isolated World Speech Recognition			R. Halavati, S. B. Shouraki, M. Razaghpour, A. Cholakian
1520	ISSCI-071	Evolving Neural Network Topologies for Object Recognition			C. Taylor, A. Agah
1540	ISSCI-119	A New Voice Recognition Topology Based on the Human Auditory Cortex			D. Shahgoshtasbi
1500	ISSCI-121	Singularity And Multifractal Characterization of Signals With Wavelets. Application To Clay Soil Images			J. Pinuela, D. Andina

ABSTRACTS**Tracking #ISSCI-057**

This paper presents a novel approach to isolated word speech recognition using fuzzy modeling which is specifically designed to ignore noise. The task is based on conversion of speech spec-trogram into a linguistic fuzzy description and comparison of this representation with fuzzy lin-guistic descriptions of words. The method is tested on single speaker and multiple speaker tests and the results are compared with a widely used speech recognition approach, showing much higher noise resistance.

Tracking #ISSCI-071

This paper examines the use of genetic algorithms and neural networks to generate neural network topologies. The data set consists of digital images of objects taken from different angles. A successful neural network topology had been trained on this data, so it was investigated whether the genetic algorithm could evolve a neural network topology capable of learning the training data. The genetic algorithm is used to evolve populations of neural network topologies. The neural network is trained using each of the topologies, and the remaining error in training is used to provide a fitness value for each of the topologies. Thus, the fitness function is the neural network itself.

Tracking #ISSCI-119

Human brain consists of 4 lobes where each lobe has a special task. Each lobe is divided into several cortexes each of them constructed of millions of neurons. The brain functionality depends on these neurons and their interconnections. One of these cortexes is auditory cortex which is constructed of 6 layers and deals with the processing of auditory information transmitted from ear to the brain. The artificial neural network presented in this paper consisting of four modular parts recognizes the frequency of the human voice. The first part of the network eliminates frequencies which have weak intensities. The second part recognizes the pitch or the first harmony of the voice. The third part prepares inputs based on other harmonies of the frequency for the last part, and the last part which is an associative memory neural network, maps the input set to a desired output set.

Tracking #ISSCI-121

In the field of multiscale analysis of signals, including images, the wavelet transform is one of the most attractive and powerful tools due to its ability to focus on signal structures at different scales. Wavelet Transform at different scales is successfully applied to image characterization (which can be applied to a watermarking scheme) and multiscale singularity detection and processing. In this work we show further research of computation of multifractal properties such as the multifractal spectrum applied to dye stained images of natural terrain. This can be useful for statically describing preferential flow path geometry.

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Mahmoudi, Maryam Tayefeh, Iran
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WAC 2006 Author Index

LEGEND: M-AM3 Monday morning sessions No. 3; T-PM4 Tuesday afternoon session 4;
MON-3 The 3rd keynote of Monday; OC, Opening ceremony; ACHIEV-2 Achievement session
no. 2; BNQT – Tuesday banquet

Abe, M., W-PM2
 Acosta, L., T-AM1
 Acosta, L., W-AM1
 Acosta, L., W-PM7
 Adachi, T., W-PM7
 Agah, A., M-AM1
 Agah, A., W-PM1
 Agah, A., W-PM10
 Aghdam, A., M-PM4
 Ahlgren, D., W-AM1
 Akbari, A. A., M-PM10
 Akers, E., M-AM1
 Akins, T., M-AM1
 Al-Dein, I., T-AM1
 Alho, T., M-AM2
 Al-Rabadi, A., M-PM6
 Alvarez-Gomez, I. M., M-PM9
 Alvarez-Vellisco, A., M-PM9
 Ammar, R., M-PM3
 Amon, Y., M-PM7
 Anderson, G., M-AM1
 Andina, D., W-PM10
 Andreeski, C., T-PM10
 Andreeski, C., W-PM3
 Ane, B. K., M-PM10
 Anton, J., T-PM10
 Arikan, E., M-AM2
 Arita, S., M-PM5
 Armitage, N., M-PM8
 Armitage, N., T-AM3
 Asadi, M., W-PM9
 Ashkenazi, A., M-PM7
 Akselrod, D., M-PM7
 Ashok, P., T-AM1
 Athans, M., TUE-3
 Avdagic, Z., W-AM4
 Awazu, K., T-AM5
 Azadi, M., T-PM6
 Azizi, F., M-AM1
 Babazadeh, S., T-PM3
 Badie, K., T-PM3
 Baeyens, E., M-AM5
 Bagheri, S., T-AM2
 Bagherie, S., T-PM8
 Bai, S. M., W-PM3
 Balas, V. E., W-AM3
 Balaska, H., T-PM4
 Banan, K., M-AM4
 Barata, M., W-PM8
 Barrientos, A., T-PM1
 Barrón-Adame, J. M., T-PM7
 Barsoum, N., W-PM3
 Beatty, S., M-PM9
 Benitez-Read, J. S., M-PM9
 Benloucif, M. L., T-PM4
 Bennetts, P., W-PM5
 Black, T., W-PM6
 Blumenthal, H., M-PM1
 Botzheim, J., W-AM3
 Bowerman, C., M-PM8
 Bowerman, C., T-AM3
 Braiek, N. B., M-AM4
 Buntha, S., M-PM8
 Burgin, M., M-AM3
 Cárdenas, C., M-AM5
 Castelo, J. P., T-PM4
 Castelo, J. P., W-AM5
 Castelo, J. P., W-PM4
 Chaabene, M., M-AM4
 Chegini, A. G., M-PM10
 Chen, P. J., T-PM8
 Chen, S. H., W-AM2
 Chen, S. M., W-PM3
 Cheng, C. H., T-PM8
 Cheung, Y. M., W-PM4
 Cheung, Y. M., W-PM7
 Chiang, Y. C., W-AM2
 Chiou, H. K., T-PM8
 Cholakian, A., W-PM10
 Cleary, K., M-AM3
 Corona-Nakamura, M. A., W-PM3
 Correira, L., W-PM8
 Costlow, L. E., T-AM4
 Costlow, L. E., M-PM4
 Cox, D., OC, MON-2, MON-3
 Cox, D., W-AM1
 Creasman, E., M-PM3
 Crespo, A., M-PM1
 Cristiano, C., W-AM3
 Cruz, G., W-PM4
 Dascalu, S., M-PM8
 de la Fuente D. A., W-PM3
 De Mulder, E., M-AM2
 Debnath, J., M-AM3
 Dehkordi, V. R., M-PM4
 del Cerro, J., T-PM1
 Dimirovski, G., T-PM10
 Dimirovski, G., W-PM3
 Dominguez, C., M-PM1
 Donati, A., W-PM8
 Edan, Y., W-PM1
 Egbert, D., M-PM8
 Eghtesad, M., T-PM6
 Eghtesad, M., T-PM6
 Endo, M., T-AM5
 Esterline, A. C., M-PM9
 Falcao, A., W-PM8
 Fathi, M., T-PM3
 Fathi, M., ACHIEV-2
 Fathy, M., W-AM4
 Feied, C., W-PM1
 Felipe, J., T-AM1
 Felipe, J., W-AM1
 Felipe, J., W-PM7
 Ferreira, R., W-AM5
 Ferreira, R., W-PM4
 Fertsh, M., M-AM5
 Fonseca, P. T., W-PM8
 French, I., T-PM2
 Fujii, K., T-PM7
 Fujiwara, Y., W-PM5
 Fung, S., T-PM7
 Galkin, I., T-PM7
 Gantenbein, R. E., M-PM3
 Garcia, G., T-PM1
 Garcia, R. F., T-PM4
 Gedeon, T. D., W-AM3
 Gedeon, T., W-AM3
 George, R., W-PM9
 Ghanbari, M., W-PM9
 Ghobakhloo, A., T-PM6
 Gillam, M., W-PM1
 Golinska, P., M-AM5
 Gomez, J., M-PM7
 Gonzalez, E., W-AM1
 González-Romo, M., T-PM7
 Gordon, S., M-PM1
 Grau, J., T-PM10
 Greenshields, I., M-PM3
 Grgic, K., M-PM7
 Gutierrez, P., T-PM1
 Halavati, R., T-AM2
 Halavati, R., T-AM4
 Halavati, R., W-PM10
 Hadaegh, F., ACHIEV-1, M-PM9
 Hämäläinen, P., M-AM2
 Hämäläinen, T., M-AM2
 Handler, J., W-PM1
 Hännikäinen, M., M-AM2
 Harashima, F., W-PM5
 Haraty, R. A., W-PM4
 Haraty, R., M-PM7
 Haraty, R., T-AM4
 Harneit, S., T-AM3
 Hashimoto, S., T-PM8
 Hassan, H., M-PM1
 Hassanpour, S., T-AM2
 Hata, Y., M-PM5
 Hata, Y., W-AM2
 Hata, Y., WED-2
 Hata, Y., W-PM2
 Hata, Y., W-PM7
 Hayashi, H., W-PM1

Herve, J., W-PM6
 Holland, A., T-PM3
 Homaifar, A., M-PM9
 Houshang, N., M-AM1
 Howard, A., M-PM6
 Howard, A., W-PM4
 Huang, C. L., W-AM5
 Huang, Z., W-AM3
 Iba, M., W-PM5
 Inoue, N., M-PM5
 Ishida, S., M-PM5
 Ito, S., W-PM1
 Itoh, E., W-PM7
 Izmirli, O., W-PM1
 Jafarian, H., T-PM6
 Jamshidi, M., OC, M-PM6
 Jamshidi, M., TUE-1
 Jamshidi, M., TUE-3
 Jamshidi, M., BNQT
 Jassbi, J., W-PM8
 Jeges, E., W-PM2
 Johnston, D., T-PM5
 Kamozaki, Y., W-AM2
 Kanagawa, S., W-PM3
 Kapoor, C., MON-3
 Kapoor, C., T-PM6
 Kartoun, U., W-PM1
 Kashani, H., W-AM4
 Kawamoto, K., T-PM8
 Kawamura, K., M-PM1
 Kawasaki, H., W-PM1
 Kdouh, W., W-PM4
 Khadem Hamedani, P., W-PM9
 Khales, M. Y., T-PM3
 Khameneh, E., T-AM4
 Khansari, M., W-PM9
 Kharrat, M., T-PM3
 Khasteh, H., T-AM4
 Khmyrov, G., T-PM7
 Khorasani, K., T-AM1
 Kim, E. S., T-AM4
 Kim, J.-Y., M-PM3
 Kim, S.-Y., M-PM8
 Kimoto, K., M-PM2
 Kimura, H., W-PM1
 Kitos, P., M-PM7
 Klayton, A., W-AM1
 Kobashi, S., M-PM5
 Kobashi, S., W-AM2
 Kobashi, S., W-PM2
 Kobayashi, H., W-PM5
 Koczy, L. T., W-AM3
 Koczy, L., WED-1
 Kojima, F., T-PM8
 Kojima, H., T-PM8
 Kolemisevska, T., W-PM3
 Kondo, K., M-PM5
 Kondo, K., W-AM2
 Kondo, K., W-PM2
 Kondo, K., W-PM7
 Kobashi, S., W-PM7
 Konur, E., M-AM2
 Kosuge, K., M-PM4
 Koudu, D., T-PM5
 Kamijima, S., T-PM5
 Kozlov, A., T-PM7
 Kubota, N., T-PM5
 Kubota, N., T-PM8
 Kubota, N., W-PM2
 Kumar Reddy, B. B., M-PM9
 Kurosaka, M., T-AM5
 Kushibiki, T., T-AM5
 LaBoskey, J., M-PM4
 Lacevic, B., W-AM4
 Lee, C. C., W-AM2
 Lee, G., M-AM3
 Lee, G., M-PM3
 Lee, G., M-PM8
 Lee, H. M., T-PM8
 Lesani, M., T-PM8
 Li, C., T-PM2
 Li, Y., T-PM2
 Lim, K. M., W-AM4
 Litvintseva, L., W-PM3
 Liu, W., W-PM1
 Liu, Y., T-PM2
 Loo, C. K., W-AM4
 Lu, I. Y., W-PM8
 Luo, Y., T-PM2
 Madni, A., M-PM4
 Madni, A., M-PM6
 Madni, A., T-AM4
 Madni, A., WED-2
 Mak, V., W-PM6
 Manjunath, R., T-PM8
 Mao, C. H., T-PM8
 Martin, S., T-PM1
 Martinez de Dios, J., T-PM1
 Martinez de Dios, J., T-PM1
 Marx-Gomez, J., M-AM5
 Mate, L., W-PM2
 Matsui, M., M-PM5
 Mawson, C., W-PM6
 McQuay, W. K., M-PM8
 Melek, W., W-PM9
 Mendez, J., W-AM1
 Mendis, U., W-AM3
 Michaelberger, P., TUE-2
 Milani-Fard, A., M-PM10
 Mills, S., T-PM5
 Ming, L., W-PM4
 Mito, Y., T-PM7
 Mitrache, J., T-AM3
 Miyakawa, M., T-AM2
 Miyakawa, M., M-PM2
 Mohammadi, S., W-PM9
 Moreno, R., T-PM6
 Morimoto, M., T-PM7
 Murai, Y., T-AM2
 Murai, Y., M-PM2
 Nagakura, T., W-AM2
 Nagamune, K., T-AM5
 Nahavandi, S., OC, W-PM6
 Nahavandi, S., WED-3
 Najdovski, Z., W-PM6
 Nakazato, J., W-PM5
 Natarajan, P., W-PM1
 Nathan, P., M-PM1
 Neagoe, V. E., T-AM3
 Neagoe, V. E., T-PM10
 Nejim, S. N., M-AM4
 Neshatian, K., T-PM3
 Nguyen, C. C., M-AM3
 Ninomiya, T., T-AM2
 Nishimoto, Y., W-PM1
 Nobuhara, H., T-PM8
 Nogawa, Y., T-PM5
 Nomura, T., M-PM5
 Oechslein, J., W-PM1
 Ohnishi, S., W-PM5
 Ojeda-Magana, B., W-PM3
 Okamoto, S., M-PM8
 Oleskow, J., M-AM5
 Oleśków, J., M-PM10
 Ollero, A., T-PM1
 Ollero, A., T-PM1
 Ors, B., M-AM2
 Oses, J. D., M-PM9
 Ozelci, Y., M-AM2
 Pack, D., W-AM1
 Pagano, D., M-PM3
 Parker, G., M-PM1
 Parker, G., W-PM1
 Pasek, Z. J., M-AM5
 Pathirana, P., W-PM6
 Pawlewski, P., M-AM5
 Pazos, A. P., T-PM4
 Pazos, A. P., W-AM5
 Pazos, A. P., W-PM4
 Pedret, C., T-PM6
 Pheanis, D. C., M-PM3
 Pinuela, J., W-PM10
 Pomares, J., T-PM1
 Preciado-Ruiz, A., T-PM4
 Preneel, B., M-AM2
 Preotesiou, S., T-AM3
 Puente, S., T-PM1

Quintanilla-Dominguez, J., T-PM7
 Rabiee, H. R., W-PM9
 Rahnama, H., W-PM9
 Raminhos, R., W-PM8
 Razaghpour, M., W-PM10
 Reinisch, B., T-PM7
 Resch, S. M-PM10
 Reuter, M., MON-1
 Reuter, M., T-AM3
 Reuter, M., W-PM9
 Ribeiro, R. A., W-PM8
 Rolle, J. C., W-AM5
 Rolle, J. C., W-PM4
 Rolle, J. L. C., T-PM4
 Rosendo Valez, B., T-AM3
 Ruano, A. E., W-AM3
 Rubin, S., M-AM3
 Rudas, I., OC, M-PM4
 Rudas, I., TUE-2
 Ruiz-Cid, F. J., T-PM4
 Ruelas, R., W-PM3
 Saadat, S., T-PM5
 Sadeghian, A., W-PM9
 Saghafi, M. H., W-AM4
 Sakaeda, H., W-PM1
 Sakiyama, K., M-AM2
 Sami, M., T-PM3
 Sanchez, E., W-PM5
 Sanchez, D., T-PM10
 Sánchez-García, M., T-PM7
 Sano, T., T-AM5
 Santos, B. R., W-PM8
 Sato, E., W-PM5
 Sawayama, T., W-AM2
 Schonning, A., W-AM1
 Scott, M., M-PM3
 Seraji, H., M-PM6
 Serra, I., T-PM6
 Serra, P., W-PM8
 Setchi, R., M-PM10
 Sevier, J., T-PM6
 Shahgoshtasbi, D., W-PM10
 Sheng, W.H., M-PM3
 Shi, Q., M-PM3
 Shi, Z., T-PM7
 Shibanuma, N., T-AM5
 Shih, Y. J., T-PM8
 Shimizu, E., T-AM5
 Shinkai, K., W-PM3
 Sholl, H., M-PM3
 Shougenji, R., M-PM5
 Shouraki, S. B., T-AM4
 Shouraki, S. B., W-PM10
 Shouraki, T-AM2
 Shujaee, K., W-PM9
 Sigut, M., T-AM1
 Sigut, M., W-AM1
 Sigut, M., W-PM7
 Skorupskaite, V., T-AM3
 Smari, W., M-PM8
 Smith, M., W-PM1
 Smith, R. S., M-PM9
 Snoussi, H., T-PM4
 Sonoo, H., M-PM5
 Soriani, M., W-AM4
 Spitznagel, J., M-PM10
 Sridhar, P., M-PM6
 Stankovski, M., T-PM10
 Stansbury, R., M-AM1
 Starostina, T., M-PM2
 Stern, H., W-PM1
 Strugaru, G., T-PM1
 Sueyoshi, S., M-PM5
 Sumudu, B., W-AM3
 Suzuki, H., W-PM5
 Suzuki, S., W-PM7
 Tadjine, H. H., T-AM3
 Tadjine, H. H., W-PM9
 Tahirovic, A., W-AM4
 Takagi, N., T-AM2
 Takahashi, H., T-AM5
 Takayanagi, H., W-PM5
 Takayuki, H., M-PM2
 Takagi, H., M-PM2
 Talukder, N., W-PM9
 Tang, P., M-AM3
 Tang, Y., T-PM7
 Tanida, J., M-PM5
 Taniguchi, K., T-PM5
 Taniguchi, K., W-AM2
 Tar, J. K., M-PM4
 Tarquis, A., T-PM10
 Tatsumi, H., M-PM2
 Tatsumi, H., T-AM2
 Tavasoli, A., T-PM6
 Tayefeh Mamoudi, M., T-PM3
 Taylor, C., W-PM10
 Tej, N., M-AM4
 Tesar, D., MON-3
 Tesar, D., T-AM1
 Tesar, D., T-PM6
 Tibor Vamos, T., TUE-1
 Tokumasu, S., M-PM2
 Tokumasu, S., T-AM2
 Toledo, J., T-AM1
 Toledo, J., W-AM1
 Toledo, J., W-PM7
 Toledo, P. A., W-PM7
 Torres, F., T-PM1
 Toyoshima, H., W-PM5
 Trinh, H., W-PM6
 Trujillo, J. A., M-AM5
 Tsoligkas, N., T-PM2
 Tsuji, H., M-PM2
 Tudoran, C., T-PM10
 Tummala, L., M-PM3
 Tummala, L., M-PM8
 Tung, C. H., W-AM5
 Tunstel, E., M-AM1
 Tzeng, G. H., T-PM8
 Uesu, H., W-PM3
 Ulyanov, S., W-PM3
 Vamos, T., TUE-1
 Vasant, P., T-PM10
 Vasant, P., W-PM3
 Vega-Corona, A., T-PM7
 Velagic, J., T-PM10
 Velagic, J., T-PM8
 Velagic, J., W-AM4
 Verbauwheide, I., M-AM2
 Verner, I., W-AM1
 Vilanova, R., T-PM6
 Vojdani, N., M-PM10
 Vukobratovic, M., MON-2
 Vuong, J., T-AM4
 Wan, C. C., T-PM8
 Wan, M., W-PM6
 Wang, Y., W-PM4
 Weisbin, C., WED-3
 Wilson, E., M-AM1
 Wu, H. T., W-PM7
 Xi, N., M-PM3
 Xu, D., T-PM2
 Xu, D., T-PM2
 Yamada, K., M-PM5
 Yamada, K., T-AM5
 Yamaguchi, T., W-PM5
 Yamakawa, T., WED-1
 Yamanoi, T., W-PM5
 Yamashita, H., W-PM3
 Yanagida, Y., W-PM2
 Yang, G., M-AM1
 Yasui, J., W-AM2
 Yeh, D. Y., T-PM8
 Yio, H. W., T-PM8
 Yogo, S., W-PM2
 Zadeh, L., MON-1
 Zagar, D., M-PM7
 Zhang, A. H., T-AM4
 Zou, Q., T-AM4
 Zhang, D., T-PM2
 Zhang, Z., T-PM7
 Zrilic, D., T-AM1