IEEE-CIS-Chapter Mexico

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Newsletter
IEEE Computational Intelligence Society - Chapter Mexico

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New Logo of IEEE CIS

Contents

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EDITORIAL

Dear members:
In this edition of the newsletter we present the new oficial Logo of the IEEE Computational Intelligence Society (see above), this logo was select after a competition made by the IEEE CIS Society last year. We invite you to participate in the main event of the Chapter the "International Seminar on Computational Intelligence 2006", to be held in Tijuana Mexico this year. Also, we invite you to participate in the special sessions at the WCCI'2006 and NAFIPS 2006. We renew the invitation to all members of the chapter to send us their contributions to be included in the next edition of the newsletter, which will be the May 2006 issue.

ARTICLE

System Holonic and Multi-Agent Systems

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Introduction

The term "holonic" is derived from the word "holon", which was introduced by Koestler (1967). The word holon is a combination from the Greek holos = whole, with the suffix -on which, as in proton or neutron, suggests a particle or part. These two observations impelled Koestler[10] to propose this word.

The first observation is from Herbert Simon [11] who concludes, from his 'parable of the two watchmakers,' that complex systems will evolve from simple systems much more rapidly if there are stable intermediate forms than if there are not. Simon's analysis reveals why every complex adaptive system is hierarchic (in a loose sense).

The second observation, made by Koestler while analysing hierarchies and stable intermediate forms in living organisms and social organisations, is that -- although it is easy to identify subwholes or parts -- "wholes" and "parts" in an absolute sense do not exist. This made Koestler propose the word "holon" to describe the hybrid nature of subwholes/parts in real-life systems; holons simultaneously are self-contained wholes to their subordinated parts, and dependent parts when seen from the inverse direction.

The new way of the intelligent systems and that can be focused to distributed processes industrial, is the intelligent agents, who process information of intelligent and increasing way.

1.1 Holonic Manufacturing Systems

Holonic manufacturing originated in the framework of Intelligent Manufacturing Systems (IMS) programme. IMS probably is the largest research programme ever launched on manufacturing. Prof. Yoshikawa from Tokyo University originally proposed it with the objective of creating a manufacturing science that can meet the needs of the next century. IMS was conceived as a ten-year precompetitive basic research programme, supported by the governments of the major industrialised countries, for their industries and academics to participate. In 1993-1994, Australia, Canada, the EC, EFTA, Japan, and the US have undertaken a feasibility study for IMS, which comprised six subprojects, or so-called "test cases". Since then, international co-operation continued with varying intensity. Since 1997, Europe again fully participates in the IMS projects.

The fifth IMS test case was entitled 'Holonic Manufacturing Systems: system components of autonomous modules and their distributed control,' also called HMS. After the IMS feasibility study, research on holonic manufacturing has mainly continued in Japanese domestic IMS projects and in some nationally funded projects in the rest of the world. K.U.Leuven (the PMA division) continues its efforts in a nationally funded research project called GOA/HMS -- Concerted Research Action on Holonic Manufacturing Systems. Lasting 4 years, this project combines PMA's knowledge in flexible shop floor control (Valckenaers, [12], non-linear process planning (Detand, [14]) , reactive scheduling (Valckenaers,[12] , Bongaerts [13]), and machine controllers (Kruth [15]) to develop a holonic architecture for production systems and implement two prototypes or testbeds. In 1997, HMS became one of the first fully endorsed IMS projects. Currently, K.U.Leuven participates in the International HMS Consortium via HANDS, the work package on assembly.

The task of the HMS consortium is to translate the concepts that Koestler developed for social organisations and living organisms into a set of appropriate concepts for manufacturing industries. The goal is to attain in manufacturing the benefits that holonic organisation provides to living organisms and societies, i.e., stability in the face of disturbances, adaptability and flexibility in the face of change, and efficient use of available resources. The HMS concept combines the best features of hierarchical and heterarchical organisation. It preserves the stability of hierarchy while providing the dynamic flexibility of heterarchy. [1]

1.2 Practical requirements for holonic manufacturing

As reasoning on autonomy, co-operation and complex adaptive systems may seem quite abstract, work on holonic manufacturing has considered from the beginning how these concepts lead to specific requirements for manufacturing systems.

From the outset, the prevalent software technology to implement the concepts of holonic manufacturing appeared to be intelligent co-operating agents, also called multi-agent systems (Wooldridge [16]). Multi-agent systems are also used in heterarchical control, and provide the software with opportunities for taking the initiative to take autonomous decisions.

Secondly, the hope to combine the best of hierarchical and heterarchical control formed a practical inspiration source for the research on holonic manufacturing. Holonic manufacturing systems shall combine the high and predictable performance promised by hierarchical systems with the robustness against disturbances and the agility of heterarchical systems.

Thirdly, holonic manufacturing shall address the problem of rising costs for the development and maintenance of complex software. It shall avoid the rigidity of hierarchical systems and shall fully support the system evolution to comply with changing requirements (e.g. new products, new or evolving technologies, unpredictable demands). Reuse of components shall reduce development costs, improve software quality and ease the migration towards a new paradigm like holonic manufacturing. Consequently, reconfigurability of the HMS is an important aspect.

Fourthly, to ease the operation of a holonic manufacturing system, this latter need to be self-configuring, learning and self-organising. The increased flexibility resulting from an agile and reconfigurable manufacturing system may put a high load on the system operators, such that the holons in a HMS shall assist the operator

to control the system: holons shall autonomously select appropriate parameters settings, find their own strategies and build their own structure. Fifthly, holonic manufacturing shall preserve a place for the human in the system, since he/she is the most flexible and intelligent component in the system.

Sixthly, holonic manufacturing shall consider an evolutionary approach to implement all the above requirements. Since the requirements are quite ambitious, it is more pragmatic to plan intermediate steps towards the fully intelligent manufacturing system. This provides a smoother migration path towards holonic manufacturing and ensures the ability of the system to support continuous adaptation, migration and evolution. [1]

1.3 Agents

Let's first deal with the notion of intelligent agents. These are generally defined as "software entities", which assist their users and act on their behalf. Agents make your life easier, save you time, and simplify the growing complexity of the world, acting like a personal secretary, assistant, or personal advisor, who learns what you like and can anticipate what you want or need. The principle of such intelligence is practically the same of human intelligence. Through a relation of collaboration-interaction with its user, the agent is able to learn from himself, from the external world and even from other agents, and consequently act autonomously from the user, adapt itself to the multiplicity of experiences and change its behaviour according to them. The possibilities offered for humans, in a world whose complexity is growing exponentially, are enormous [2][3][4][5].

1.4 FIPA (The Foundation of Intelligence Physical Agents)

FIPA specifications represent a collection of standards, which are intended to promote the interoperation of heterogeneous agents and the services that they can represent

The life cycle [7] of specifications details what stages a specification can attain while it is part of the FIPA standards process. Each specification is assigned a specification identifier [8] as it enters the FIPA specification life cycle. The specifications themselves can be found in the Repository [9]

The Foundation of Intelligent Physical Agents (FIPA) is now an official IEEE Standards Committee.

1.5 System Holonic and Multi-Agent Systems

An increasing complexity of intelligent manufacturing systems as well as the overall demands on flexible and fault-tolerant control of production processes stimulates development of two pillar, emerging technologies that will soon make an important breakthrough in the field of intelligent manufacturing and control. These two paradigms are the event-driven control strategy, typical for **holonic systems**, and the distributed information processing resulting in the **multi-agent systems.**

The research communities working in both fields approach the problem of intelligent manufacturing from different viewpoints and nearly independently. They use their specific terminology and techniques. The holonic system (HS) community is rooted in the concept of holons as presented by Koestler [10] and is strongly driven by the requirements of industrial control. The community is well organised around the international HMS (Holonic Manufacturing Systems) consortium.

Both the paradigms share some ideas and they differ in the other issues. Both the research communities do respect the same, very fundamental principles of holons' and agents' activities such as their *autonomy, cooperativeness and openness*. The architectures of either holons or agents are multi-layered, with more standardized architecture of head/kernel in the case of holons or body/wrappers as in agents. Both approaches explore this some kind of blackboards or brokers. There are similar trends in standardization quite evident (IEC 1499 standard in the case of HS, FIPA standard in the area of MAS).

On the other hand the approaches differ in the following: **Motivation:** The HS research is motivated by flexible manufacturing problems. On the opposite side, the MAS research is motivated by implementation of distributed computational systems and decentralised decision making.

Subject of research: The HS researchers are preferably oriented toward the low-level end of the manufacturing process, low-level communication and behavioural standards, integration, etc. Unlike HS people, MAS researchers aim at implementing social behaviour of intelligent entities, cooperation and coordination strategies, intelligent brokerage, learning from own experience, teamwork and coalition formation etc. From a very simple viewpoint, we can see the HS research stream providing platforms/frameworks for implementation of knowledge-driven higher level coordination and communication strategies based on the MAS research results.

Holarchy: The holarchy principle that allows creating a holon as an integrated set of more lower level holons is used in HS. This is not considered in the MAS field where autonomy and functional differences of individual agents are rather preferred. However, agents very often group themselves into hierarchically organized teams.

Human interface: Each holon is usually equipped with a human interface. Human interfaces in MAS are very often implemented as separate agents providing services to the community as a whole.

Conclusions

Designing and building agent systems is difficult. They have all the problems associated with building traditional distributed, concurrent systems and have the additional difficulties that arise from having flexible and sophisticated interactions between autonomous problem-solving components.

The big question then becomes one of how effective MASs can be designed and implemented. At this time, there are two major technical impediments to the widespread adoption of multiagent technology: (1) the lack of a systematic methodology enabling designers to clearly specify and structure their applications as MASs and (2) the lack of widely available industrial-strength MAS toolkits.2 Flexible sets of tools are needed that enable designers to specify an agent's problem-solving behavior, specify how and when agents should interact, and visualize and debug the problem-solving behavior of the agents and the entire system.

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CALL FOR PAPERS

International Seminar on Computational Intelligence 2006

IEEE CIS- Chapter Mexico
Tijuana, Mexico 2006
Hosted by: Tijuana Institute of Technology

General Chair: Prof. Dr. Patricia Melin,
Tijuana Institute of Technology –Mexico
Program Co-Chairs: Prof. Dr. Oscar Castillo, Tijuana Institute of Technology –Mexico
Prof. Dr. Eduardo Gomez-Ramirez La Salle University, Mexico,
www.hafsamx.org/cis-chmexico/seminar06

Description
The International Seminar will consist of papers describing research work that integrate different Computational Intelligence (CI) methodologies for the development of hybrid intelligent systems. CI methodologies at the moment include (at least) Neural Networks, Fuzzy Logic, Genetic Algorithms, Intelligent Agents, and Chaos Theory. The use of intelligent techniques, like neural networks, fuzzy logic and genetic algorithms, for real-world problems is now widely accepted. However, still the performance of any of these techniques can be improved, in many situations, by using them in conjunction with other techniques. For example, genetic algorithms can be used to optimize the design of a neural network for time series prediction, or fuzzy logic can be used to combine the information from expert neural modules, just to mention two cases. Also, mathematical methods, like the ones from Chaos and Fractal Theory, can be used in conjunction with intelligent techniques to improve the performance of hybrid systems for real-world applications. The international seminar will consist of papers addressing these hybrid approaches and similar ones, either theoretically or for real-world applications. Also, distinguished internationally recognized invited speakers will give lectures on the main areas of CI. The seminar is intended primarily for researchers and graduate students working on these research areas.

Registration
There will be no official cost of registration to the International Seminar. However, registration is strongly encouraged, as space will be limited to 50 participants in this seminar. For more information visit the future web page:

www.hafsamx.org/cis-chmexico/seminar06

IEEE World Congress in Computational Intelligence 2006

Vancouver, Canada, July 16-21, 2006
Special Sessions

Paper submission system for special session is still open until February 14th , 2006. We invite you to participate in the Special Sessions that the Mexico Chapter are organaized in the FUZZ 2006 and the IJCNN 2006.

For papers to FUZZ-IEEE the link is:
http://ieee-cis.org/conferences/fuzzieee2006/upload.php
in the "Main Research Topics" Select special Sessions: S.8 Hybrid Fuzzy Intelligent Systems (Castillo, Melin)

For papers to IJCNN the link is:
http://ieee-cis.org/conferences/ijcnn2006/upload.php
in the "Main Research Topics" Select special Sessions: S.d Hybrid Neural Intelligent Systems (Melin, Castillo)

NAFIPS 2006

Montreal, Canada, June 3-6, 2006
Special Session
Theory and Application of Type-2 Fuzzy Logic

Organized by: Prof. Jerry Mendel and Prof. Oscar Castillo

Description:
The aim of this special session is to present top quality research in the area of theory and applications of type-2 fuzzy logic. The session will also provide a forum for the academic community and industry to report on the recent advances on the type-2 fuzzy logic theory and application in the various domains of type-2 fuzzy logic. We expect high quality original research in the area. Topics include, but are not limited by:
Type-2 Theoretical Aspects
- Inferencing
- Relations
- Defuzzification
- Knowledge Representation

Type-2 Applications
- Robotics
- Control
- Decision Making

- Modeling
- Any other application area that uses type-2 fuzzy logic

For contributions for this special session send an e-mail to: ocastillo@tectijuana.mx

Journal Engeeniering Letters
Special Issue
" Hybrid Intelligent Systems using Neural Networks, Fuzzy Logic, and Genetic Algorithms"

Guest Editor: Prof. Dr. Oscar Castillo

Description
This Special Issue will consist of papers that integrate different Soft Computing (SC) methodologies for the development of hybrid intelligent systems for modeling, simulation and control of non-linear dynamical systems. SC methodologies at the moment include (at least) Neural Networks, Fuzzy Logic, Genetic Algorithms and Chaos Theory. Each of these methodologies has advantages and disadvantages and many problems have been solved, by using one of these methodologies. However, many real-world complex industrial problems require the integration of several of these methodologies to really achieve the efficiency and accuracy needed in practice. In this Special Issue, an overview of SC methodologies, and their applications to modeling, simulation and control, will be given in an introductory paper by the Guest Editors. Then, detailed methods for integrating the different SC methodologies in solving real-world problems will be given in the papers by the other authors in the Special Issue. The Special Issue will include applications on the following areas: Robotic Dynamic Systems, Control of Non-linear Plants, Manufacturing Systems, and Time Series Prediction.

Topics of interest (not limited to)

1. Successful new applications to real-world problems, related to control, of existing soft computing techniques that are found to achieve better results than conventional techniques. In this case, special attention should be given to the metrics used to compare SC techniques with conventional ones.
2. Developments of innovative hybrid methods combining SC techniques and conventional techniques to solve problems related to controlling non-linear dynamical systems. In this case, the problems to be considered in these papers may not be as complex as the ones in the previous point, but the authors have to explain very carefully how their proposed method could be used, in the future, to solve real-world problems.
3. Papers considering original research on new SC techniques are also welcome, but the authors would have to make a detailed description of how their proposed approach is compared with other related techniques.

Format and Submission Procedure
Papers and abstracts must be send by email, by the prospective authors, to the Guest Editor. The papers and abstracts must be send as a PDF or word attachment with their email message. The papers will then be distributed to the Reviewers for evaluation according to their originality, technical soundness, writing, etc. (At least three reviewers per paper). Based on the evaluations by the reviewers, the Guest Editor will select the Best papers for the Special Issue. Notifications of acceptance or rejection will then be send to the authors by email. The authors of accepted papers would then be asked to send their final papers in the appropriate format and also giving careful consideration to the comments and suggestions made by the reviewers. After receiving all of the accepted papers in their final form, the Special Issue will be formed by the Guest Editor and will be send to the Editor in Chief of the Journal for publication.

Important Dates
Call for Paper distribution:
November 1st, 2005
Paper Submission deadline:
February 15th, 2006
Acceptance of papers:
April 15th, 2006
Revised final manuscript due date:
June 15th, 2006
Publication:
December, 2006

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NEWS FOR PUBLICATIONS

We invite all members of the chapter to send us their contributions for publication in the next edition of the newsletter, which will be the May 2006 issue.

The information that you can send are: Articles, Conference Report, Call for Papers, Conference Calendar, and all other news that you consider can be of interest for chapter members.

For your contribution send an e-mail to pmelin@tectijuana.mx , before April 25, 2006.