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Volume Editors

Joan Cabestany
Universitat Politècnica de Catalunya - UPC
E.T.S.E. Telecomunicació, Barcelona, Spain
E-mail: cabestan@eel.upc.es

Francisco Sandoval
Universidad de Málaga
E.T.S.I. Telecomunicación, Málaga, Spain
E-mail: fsandoval@uma.es

Alberto Prieto
Universidad de Granada
E.T.S.I. Informática y Telecomunicación, Granada, Spain
E-mail: aprieto@ugr.es

Juan M. Corchado
Universidad de Salamanca
Departamento de Informática, Salamanca, Spain
E-mail: corchado@usal.es

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Thomas: Practical Applications of Agents and Multiagent Systems

Javier Bajo[1] and Juan M. Corchado[2]

[1] Pontifical University of Salamanca, Compañía 5, 37002 Salamanca, Spain
jbajope@upsa.es
[2] University of Salamanca, Plaza de la Merced S/N, 37008 Salamanca, Spain
corchado@usal.es

Abstract. This paper presents a brief summary of the contents of the special session on practical applications held in the framework of IWANN 2009. The special session has been supported by the THOMAS (TIN2006-14630-C03-03) project and aims at presenting the results obtained in the project, as well as at exchanging experience with other researchers in this field.

Keywords: Multiagent systems, Agents technology.

1 Introduction

Research on Agents and Multi-Agent Systems has matured during the last decade and many effective applications of this technology are now deployed. An international forum to present and discuss the latest scientific developments and their effective applications, to assess the impact of the approach, and to facilitate technology transfer, has become a necessity.

The Special Session on Practical Applications of Agents and Multiagent Systems (http://iwann.usal.es/mas), in the framework of the 10th International Work-Conference on Artificial Neural Networks (IWANN 2009) provides a unique opportunity to bring multi-disciplinary experts and practitioners together to exchange their experience in all aspects of Agents and Multi-Agent Systems, especially those concerned with applications, methods, techniques and tools for open multi-agent systems.

The session intends to bring together researchers and developers from industry and academic world to report on the latest scientific and technical advances on the application of multi-agent systems, discuss and debate the major issues, and showcase the latest systems using agent based technology. It is a multidisciplinary discipline that may attract scientist and professionals to IWANN and to provide a different field in which to apply ANN based technology. It promotes a forum for discussion on how agent-based techniques, methods, and tools help system designers to accomplish the mapping between available agent technology and application needs. Other stakeholders should be rewarded with a better understanding of the potential and challenges of the agent-oriented approach.

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This special session has been supported by the THOMAS research project (TIN2006-14630-C03-03), which aim is to advance and contribute methods, techniques and tools for open multiagent systems, principally in the aspects related to organisational structures. THOMAS is a coordinated project in which the University of Salamanca, the Technical University of Valencia and the University of Rey Juan Carlos cooperate to find new solutions in the field of the multiagent systems. This special session provides a framework to disseminate the results obtained in the project and to exchange knowledge with other researchers in the field of the agent technology.

2 Special Session on Practical Applications of Agents and Multiagent Systems Details

This volume presents the papers that have been accepted for the 2009 edition. These articles capture the most innovative results and this year's trends: Multi-Agent Systems (MAS) Applications: commerce, health care, industry, internet, etc.; Agent and MAS architectures; Agent development tools; MAS middleware; Agent languages; Engineering issues of MAS; Web services and agents; Agents and grid computing; Real-time multi-agent systems; Agent-based social simulation; Security in MAS; Trust and reputation in MAS; Improving user interfaces and usability with agents; Information recovery with MAS; Knowledge management with MAS; Software Agents in Ubiquitous Computing; Agent technologies for Ambient Intelligence; Software Agents in Industry; Planning and scheduling in MAS; Agent Technologies for Production Systems; Service-Oriented Computing and Agents; Agents for E-learning and education; Mobile computation and mobile Communications. Each paper has been reviewed by three different reviewers, from an international committee composed of 15 members from 7 different countries, and the members of the IWANN 2009 committee. From the 22 submissions received, 17 were selected for full presentation at the conference.

3 Special Session Acknowledgements

We would like to thank all the contributing authors, as well as the members of the Program Committee and the Organizing Committee for their hard and highly valuable work. Their work has helped to contribute to the success of this special session. We also would like to thank the IWANN 2009 for giving us the opportunity of organizing the special session, for their help and support. Thanks for your help, the special session on practical applications of agents and multiagent systems wouldn't exist without your contribution.

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Self Organized Dynamic Tree Neural Network

Juan F. De Paz, Sara Rodríguez, Javier Bajo, Juan M. Corchado, and Vivian López

Departamento de Informática y Automática, Universidad de Salamanca
Plaza de la Merced s/n, 37008, Salamanca, España
{fcofds,srg,jbajope,corchado,vivian}@usal.es
Department of Computer Science and Automation, University of Salamanca Plaza de la Merced s/n, 37008, Salamanca, Spain

Abstract. Cluster analysis is a technique used in a variety of fields. There are currently various algorithms used for grouping elements that are based on different methods including partitional, hierarchical, density studies, probabilistic, etc. This article will present the SODTNN, which can perform clustering by integrating hierarchical and density-based methods. The network incorporates the behavior of self-organizing maps and does not specify the number of existing clusters in order to create the various groups.

Keywords: Clustering, SOM, hierarchical clustering, PAM, Dendrogram.

1 Introduction

The assignment of a set of objects into clusters is a widely spread problem that has been the object of investigation in various scientific branches including bioinformatics [10], surveillance [15], [16], [17]. Although occasionally the number of groups is known beforehand, clustering data requires an additional step for identifying the existing groups. There are currently different methods for creating clusters, most notably those based on partitioning, such as k-means [11], and PAM [9] (Partition around medoids), which work by minimizing the error function. Other widely accepted methods are the hierarchical methods which include dendrograms [7], agnes [9], and Diana [9]. In addition to the hierarchical methods, there are others that use density-based models, or probabilistic-based models such as EM [8] (Expectation-maximization) and fanny [9].

This research presents the new Self Organized Dynamic tree neural network which allows data to be grouped automatically, without having to specify the number of existing clusters. The SODTNN uses algorithms to detect low density zones and graph theory procedures in order to establish a connection between elements. This would allow connections to be established dynamically, thus avoiding the need for the network to expand and adjust the data surface. Additionally, the connections would continue to adapt throughout the learning process, reducing the high density neuron areas and separating them from the low density areas.

The SODTNN integrates techniques from hierarchical and density-based models that allow the grouping and division of clusters according to the changes in the

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Stereo-MAS: Multi-Agent System for Image Stereo Processing

Sara Rodríguez[1], Juan F. De Paz[1], Javier Bajo[2], Dante I. Tapia[1], and Belén Pérez[1]

[1] University of Salamanca
[2] Pontifical University of Salamanca
{srg,fcofds,jbajope,dante,lancho}@usal.es

Abstract. This article presents a distributed agent-based architecture that can process the visual information obtained by stereoscopic cameras. The system is embedded within a global project whose objective is to develop an intelligent environment for location and identification within dependent environments that merge with other types of technologies. Vision algorithms are very costly and take a lot of time to respond, which is highly inconvenient if we consider that many applications can require action to be taken in real time. An agent architecture can automate the process of analyzing images obtained by cameras, and optimize the procedure.

Keywords: Stereoscopy, stereo cameras, artificial vision, MAS, agents, correspondence analysis, dependent environments.

1 Introduction

One of the greatest challenges for Europe and the scientific community is to find more effective means of providing care for the growing number of people that make up the disabled and elderly sector. The importance of developing new and more cost effective methods for administering medical care and assistance to this sector of the population is underscored when we consider the current tendencies. Multi-agent systems (MAS) and intelligent device based architectures have been examined recently as potential medical care supervisory systems [1][7][6][3] for elderly and dependent persons, given that they could provide continual support in the daily lives of these individuals.

The study of artificial vision, specifically stereoscopic vision, has been the object of considerable attention within the scientific community over the last few years. Image processing applications are varied and include aspects such as remote measurements, biomedical images analysis, character recognition, virtual reality applications, and enhanced reality in collaborative systems, among others.

The main topic of our research is part of a larger, global project whose objective is to develop a system for the care and supervision of patients in dependent environments, providing an environment capable of automatically carrying out location, identification and patient monitoring tasks. Such an environment would also allow medical personnel to supervise patients and simulate situations remotely via a virtual environment. In order to reach this objective, artificial intelligence techniques, intelligent agents and wireless technologies are used.

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CBR System with Reinforce in the Revision Phase for the Classification of CLL Leukemia

Juan F. De Paz, Sara Rodríguez, Javier Bajo, and Juan M. Corchado

Departamento de Informática y Automática, Universidad de Salamanca
Plaza de la Merced s/n, 37008, Salamanca, España
{fcofds, srg, jbajope, corchado}@usal.es

Abstract. Microarray technology allows measuring the expression levels of thousands of genes providing huge quantities of data to be analyzed. This fact makes fundamental the use of computational methods as well as new intelligent algorithms. This paper presents a Case-based reasoning (CBR) system for automatic classification of microarray data. The CBR system incorporates novel algorithms for data classification and knowledge discovery. The system has been tested in a case study and the results obtained are presented.

Keywords: Case-based Reasoning, CLL, luekemia, HG U133.

1 Introduction

The use of microarrays, and more specifically expression arrays, enables the analysis of different sequences of oligonucleotides [1], [2]. Simply put a microarray is an array of probes that contains genetic material with a predetermined sequence. These sequences are hybridized with the genetic material of patients, thus allowing the detection of genetic mutations through the analysis of the presence or absence of certain sequences of genetic material. This work focuses on the levels of expression for the different genes, as well as on the identification of the probes that characterize the genes and allow the classification into groups.

The analysis of expression arrays is called expression analysis. An expression analysis basically consists of three stages: normalization and filtering; clustering and classification; and extraction of knowledge. These stages are carried out from the luminescence values found in the probes. Presently, the number of probes containing expression arrays has increased considerably to the extent that it has become necessary to use new methods and techniques to analyze the information more efficiently. There are various artificial intelligence techniques such as artificial neural networks [4], [5], Bayesian networks [6], and fuzzy logic [7] which have been applied to microarray analysis. While these techniques can be applied at various stages of expression analysis, the knowledge obtained cannot be incorporated into successive tests and included in subsequent analyses.

This paper presents a system based on CBR which uses past experiences to solve new problems [8], [9]. As such, it is perfectly suited for solving the problem at hand. In addition, CBR makes it possible to incorporate the various stages of expression analysis into the reasoning cycle of the CBR, thus facilitating the creation of

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