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Editors

Innovations in Hybrid Intelligent Systems

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Preface

The 2nd International Workshop on Hybrid Artificial Intelligent Systems (HAIS 2007) combines symbolic and sub-symbolic reliable problem solving models. Hybrid Artificial Intelligent Systems (HAIS) combines the strengths of their capabilities in handling many complex problems with their precision, uncertainty and vagueness, providing an opportunity to use both, our knowledge and experience in an interesting and promising way. This workshop provides an expansion in the artificial intelligence research. CAEPIA 2007 is an excellent forum for researchers to present and discuss their work and applications in this multidisciplinary area.

This volume of Advances in Soft Computing (Advances in Soft Computing) HAIS 2007 held in University of Salamanca, Spain.

The global purpose of HAIS conference is to provide a multidisciplinary forum for Hybrid Artificial Intelligent Systems Paradigms, which are playing increasingly important roles in applications fields.

Since its first edition in Brazil in 2005, HAIS has been a forum for researchers on fundamental and theoretical issues in Hybrid Artificial Intelligent Systems based on the hybrid use of Symbolic and Bio-inspired Models, Fuzzy Systems, Evolutionary Algorithms, Optimization Models and so on.

HAIS 2007 received 112 technical papers. The Program Committee selected -after a rigorous selection process- a volume in the Advances in Soft Computing series.

The large number of submitted papers and the high quality and attractiveness of the fields related to HAIS 2007 conferences.

HAIS 07 has also teamed up with the 10th International Conference on Hybrid Artificial Intelligent Systems (HAIS 2007). The extended papers, to be published in the Advances in Soft Computing series, will be the result of the response to subsequent open calls, will be published in the next issue of the journal.

We would like to thank the work of the Organizing Committee, formed admirably under tight deadlines, and the Keynote Speakers: Prof. Ajith Abraham, Norwegian University of Science and Technology, Norway, and Prof. José María Corchado, Universidad de Salamanca, Madrid, Spain.

Particular thanks go to the Organization and promotion of HAIS 2007.

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Combining Improved FYDPS Neural Networks and Case-Based Planning – A Case Study

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Abstract. This paper presents a hybrid deliberative architecture based on the concept of CBP-BDI agent. A CBP-BDI agent is a BDI agent that incorporates a CBP reasoning engine. The work here presented focuses in the development of the CBP internal structure. The planning mechanism has been implemented by means of a novel FYDPS neural network. The system has been tested and this paper presents the results obtained.

1 Introduction

In this article we present a novel hybrid planning system based on the combination of neuronal networks with CBP (Case-based planning) systems [8]. CBP allows us to retrieve past experiences when a new plan is created which lends the system a large capacity for learning and adaptation [8]. The neuronal networks proposed within this research framework are self-organised, based on Kohonen [11] networks, but which present certain improvements (FYDPS neural Neural Network) [13]. These improvements allow the network to reach a solution much more rapidly. Furthermore, once a solution has been reached, it makes it possible to make new modifications taking restrictions into account (specifically time restrictions).

Case-based planning is based on the way through which a new plan is generated through experiences acquired in the past (after the creation and execution of plans to resolve similar problems to the current one). Case-based planning is carried out through a CBP cycle [2], [3], [8]. The CBP cycle is formed by four sequential stages: retrieve, reuse, revise and retain. In the retrieve stage past experiences are recuperated with a description of the problem similar to that of the current problem. In the revise stage the results attained after executing a new plan are evaluated. Lastly, in the retain stage, lessons are learnt from the new experience. Each one of the stages of the CBP cycle may be implemented in various ways, using different algorithms. In this article we present a novel model that allows the integration of the planning based on cases from FYDPS networks. This model offers greater speed for obtaining the solutions that Kohonen networks, and incorporated restrictions in the network.

The hybrid planning system developed has been applied to an existent Multiagent System, developed for guiding and advising users in Shopping Centres (also known as shopping malls) [2], [3]. A shopping centre is a dynamic environment, in which shops change, promotions appear and disappear continuously, etc. The proposed system

helps users to identify a shopping or leisure activity within a given shopping mall. Multiagent systems are recommended for solving dynamic distributed problems. A deliberative agent that works at a high level of reasoning (Intention (BDI) [2], [9]). A CBP-BDI agent is a BDI agent mechanism, which allows it to learn from past experiences with the environment as well as with users. The system has a large capacity for adaptation to the environment. The system used a system of planning based on cases. The system obtained with the planning system proposed in this paper is obtained with the previous planning system.

Section two presents the shopping mall multiagent system. Section three introduces the planning strategy. Section four presents the neural network model finally, the system

2 Shopping Mall Multiagent System

This paper presents a distributed architecture for a shopping mall. A CBP-BDI guiding agent, wireless agent. A BDI agent incorporates a reasoning engine. The agent learns from the environment and users, and allows it to discover knowledge “know how”. The system recommends plans in dynamic environments. The system developed a guiding system for the user. The system identifies bargains, offers, leisure activities, etc. The system developed, which is capable of incorporating user preferences and advice services to the users not only in the current environment such as the labour market, but also in similar environments. Users (clients in the mall) are able to get information and on leisure time activities (entertainment, etc.) through a mobile phone or PDA. Mechanisms for providing personalized offers (a shop owner will be able to provide personalized offers)

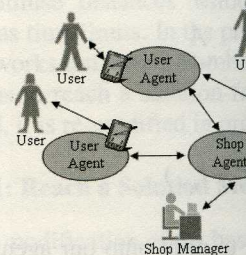


Fig. 1. Shopping Mall multiagent system

In terms of the efficacy obtained with the new planning model, the results of the new model have been compared with those of a classic planner and with the prior system. A set of synthetic tests has been developed, proposing 50 cases for generating a plan in each planner. The average times taken by each planner to generate a plan is illustrated in Table 2. Table 2 shows how the planner proposed in this study significantly improves the time taken over classical planner, and also slightly improves on the time taken by a geodesic based planner.

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Autonomous FYDPS Neural Network-Based Planner Agent for Health Care in Geriatric Residences

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Abstract. This paper presents an autonomous intelligent agent developed for health care in geriatric residences. The paper focuses on the construction of an autonomous agent which incorporates a model of human thinking, such as reasoning based on past experiences. The work here presented focuses in the development of the CBP internal structure. The planning mechanism has been implemented by means of a novel FYDPS neural network. The system has been tested and this paper presents the results obtained.

Keywords: Multi-agent System, CBR, FYDPS neural network.

1 Introduction

In this article we present a novel planning system based on the combination of neuronal networks with CBP (Case-based planning) systems [7]. Case-based planning allows us to retrieve past experiences to create a new plan which lends the system a large capacity for learning and adaptation [7]. The neuronal networks proposed within this research framework are self-organised, based on Kohonen networks [10], but present certain improvements (FYDPS Neural Network) [11]. These improvements allow the network to reach a solution much more rapidly. Besides, once a solution has been reached, it is possible to make modifications taking restrictions into account (in this study time restrictions). The new planning mechanism is integrated within AGALZ (Autonomous aGent for monitoring ALZheimer patients) [5], [6], a planning agent that works in conjunction with complementary agents into a prototype multi-agent system (ALZ-MAS: ALZheimer Multi-Agent System). The results obtained are compared to those obtained with the previous geodesic planner used by AGALZ.

This work focuses in the development of deliberative agents using a case-based planning [1] architecture, as a way to implement adaptive systems to improve assistance and health care support for elderly and people with disabilities, in particular with Alzheimer's. Agents in this context must be able to respond to events, take the initiative according to their goals, communicate with other agents, interact with users, and make use of past experiences to find the best plans to achieve goals, so we propose the development of a deliberative agent that incorporates a CBP mechanism, specially designed for planning construction. CBP-BDI facilitates learning and

In the future, health care will require the use of new technologies that allow medical personnel to carry out their tasks more efficiently [3]. We have shown some potential of deliberative CBP-BDI agents in a distributed multi-agent system focused on health care. In addition, the use of RFID technology [15] on people provided a high level of interaction among users and patients through the system.

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Structure-Preserving Noise Reduction in Biological Imaging

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Abstract. An approach for noise filtering based on edge-preserving structures and a mechanism to further smooth the molecular architecture of complex biological structures to increase the extremely low signal-to-noise ratio of the three-dimensional structures. The filtering reduces the noise with excellent preservation of the

1 Introduction

The advent of biological imaging technologies, either directly or indirectly, the molecular and cellular structures and their essential functions within cells and tissues. Various techniques (optical microscopy, confocal microscopy, tomography, just to name a few) in biology have emerged, the need for sophisticated image processing and interpretation at different scales of resolution. This is even needed for analysis of other biological structures.

Noise reduction is paramount for processing biological images. Standard linear filtering techniques using Gaussian kernels succeed in reducing the noise, but they also blur the structures. Anisotropic nonlinear diffusion (AND) is a more powerful noise reduction technique [3]. AND achieves noise reduction by tuning the strength and direction of the smoothing kernel. It preserves edges and enhances the signal-to-noise ratio (SNR) with no side effects. It was first introduced in 1990 by Perona and Malik [4], in the context of image denoising. It is now a well-established tool for denoising multidimensional structures.

Electron cryotomography (cryoET) is a powerful technique for the molecular architecture of biological structures. However, it produces extremely low contrast three-

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