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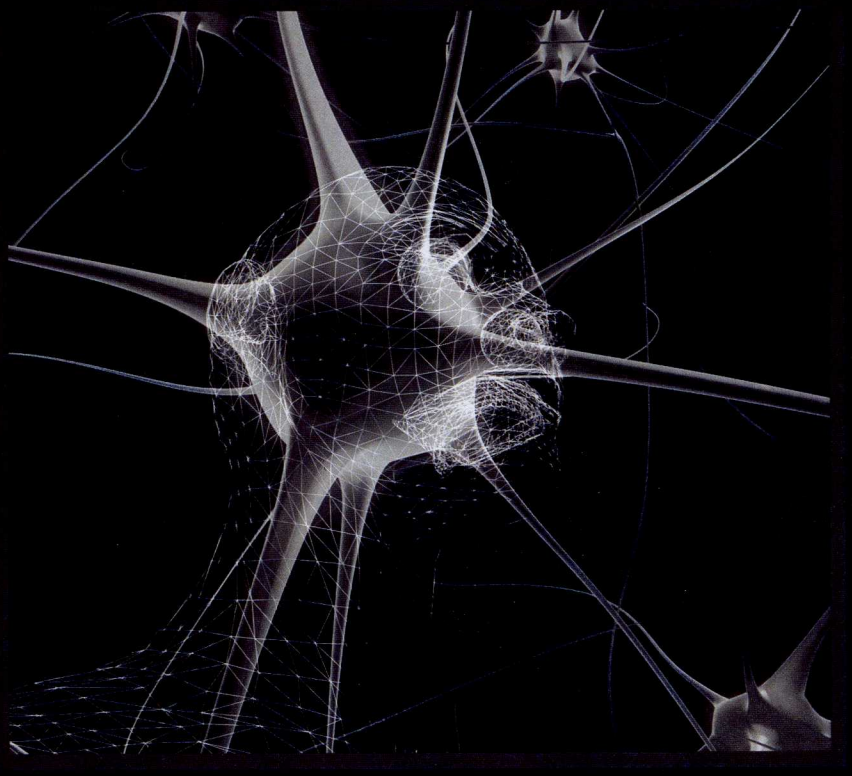

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HAIS

Hybrid Artificial Intelligence Sy
symbolic techniques to construc
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to their capabilities in handling
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HAIS provides an interesting o
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trying to collect the most innova
Systems.

Hybrid Multi-Agent System for Intelligent Health Care

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Abstract. This paper presents a dynamic multi-agent system for monitoring Alzheimer patients' health care in execution time in geriatric residences. The system architecture implements autonomous deliberative case-based agents with reasoning and planning capabilities, with the ability to operate in wireless devices and capable of obtaining information about the environment through RFID technology. ALZ-MAS description and preliminary results of the prototype in a real environment are presented.

1 Introduction

Agents and multi-agent systems (MAS) have become increasingly relevant for developing distributed and dynamic open systems. ALZ-MAS (ALZheimer Multi-Agent System) is aimed to improve the efficiency of health care in geriatric residences, increasing the patients' quality of life. This paper will describe ALZ-MAS, and explain how this distributes and dynamic multi-agent system has been designed and implemented. A case study is then presented, with the system working in a real environment, with initial results and conclusions analyzed. Is also examined the residential health care problem and the possibilities of Radio Frequency Identification (RFID) as a technology for ascertaining patients location in order to generate plans and maximize safety.

This paper focuses in the development of deliberative agents using case-based reasoning (CBR) 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. The development of a deliberative agent that incorporates a Case-Base Planning (CBP) reasoning mechanism, derivative from CBR systems [1], specially designed for planning construction is proposed. CBP-BDI facilitates learning and adaptation, and therefore a greater degree of autonomy than that found in pure BDI (Believe, Desire, Intention) architecture [2]. A

Table 2. Font sizes of headings. Table captions should always be positioned *above* the tables.

	Monitoring	Written Reports	Daily Visits	Other	TOTAL
Before Implementation	167	48	73	82	370
After Implementation	105	40	45	60	250

The system facilitates the more flexible assignation of the working shifts at the residence; since the workers have reduced the time spent on routine tasks and can assign this time to extra activities. Their work is automatically monitored, as well as the patients' activities. The stored information may be analyzed with knowledge discovery techniques and may help to improve the quality of life for the patients and the efficiency of the centre. The security of the centre has also been improved in two ways: the system monitors the patients and guarantees that each one of them is in the right place, and secondly, only authorized personnel can gain access to the residence protected areas.

In the future, health care for Alzheimer's patients, the elderly and people with other disabilities will require the use of new technologies that allow medical personnel to carry out their tasks more efficiently. Some potential of deliberative CBP-BDI agents has been shown in a distributed multi-agent system focused on health care. ALZ-MAS integrates Wi-Fi and RFID technologies, being sensitive to context and adaptable to user necessities, providing a high level of human-system interaction in a natural and simple way.

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References

1. Aamodt A., Plaza, E.: Case-Based Reasoning: foundational Issues, Methodological Variations, and System Approaches, AICOM. Vol. 7 (1994) 39-59
2. Bratman, M.E.: Intentions, Plans and Practical Reason. Harvard University Press, Cambridge, M.A. (1987)
3. Corchado, J.M., Laza, R.: Constructing Deliberative Agents with Case-based Reasoning Technology. International Journal of Intelligent Systems. Vol. 18 No.12 (2003) 1227-1241
4. Pokahr, A., Braubach L., Lamersdorf, W.: Jadex: Implementing a BDI-Infrastructure for JADE Agents, in: EXP - In Search of Innovation (Special Issue on JADE), Vol. 3, Telecom Italia Lab, Turin, Italy, September (2003) 76-85
5. Nealon, J., Moreno, A.: Applications of Software Agent Technology in the Health Care domain. Whitestein series in Software Agent Technologies. (2003)
6. Camarinha-Matos, L., Afsarmanesh, H.: Design of a virtual community infrastructure for elderly care. PRO-VE'02 – 3rd IFIP Working Conference on Infrastructures for Virtual Enterprises. Sesimbra, Portugal. (2002)
7. Sokymat. : http://www.sokymat.com/ (2005)
8. Glez-Bedia, M., Corchado, J.M.: A planning strategy based on variational calculus for deliberative agents. Computing and Information Systems Journal. Vol 10, No 1 (2002) 2-14

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