

University of East London Institutional Repository: <http://roar.uel.ac.uk>

This is an unpublished conference paper. Please scroll down to view the document itself. Please refer to the repository record for this item and our policy information available from the repository home page for further information.

Author(s): Mouratidis, Haralambos.

Article title: An Agent-Oriented Methodology for the Development of Secure Agent-Based Systems

Year of publication: 2003

Citation: Mouratidis, H. (2003) 'An Agent-Oriented Methodology for the Development of Secure Agent-Based Systems', Proceedings PREP 2003, 14-16 April, Exeter, England.

AGENT-BASED ASSISTANTS FOR HEALTH AND SOCIAL CARE PROFESSIONALS

H. Mouratidis, N. Abouzakhar, A. Gani,
Department of Computer Science, University of Sheffield, Sheffield

Key words to describe the work: Agent Technology, Software Agents, Agent-Based Distributed Systems, Health Care Information Systems

Key Results: An agent –based distributed system that assists health and social care professional to provide health and social care in a more efficient way than current systems.

How does the work advance the state-of-the-art?: Applying agent technology, in the development of health and social care information systems, allows to provide functionalities such as reduction of professionals' workload and efficiency of care procedures, that current web-based and database systems fail to provide.

Motivation (problems addressed): Although current health and social care information systems provide advantages over paper-based approaches, they fail to adequately provide the main reason of using computer systems in the health and social care setting, which is to reduce the workload and make procedures easier and quicker for health and social care professionals and thus improve the quality of care for the patients.

Introduction

In a human society many activities involve the cooperation of more than one person, in order to accomplish a difficult and demanding task. In a distributed health care setting different health and social care professionals, such as general practitioners, nurses and social workers must cooperate together to provide the patient with appropriate care.

Due to the huge amount of information that needs to be stored and shared, health care information systems are becoming more and more computerised, and many web-based and database systems are widely used. However, storing and distributing information is not the only functionality that information systems must provide in the health care sector. One of the main reasons of using computer systems in this sector is to reduce the workload and automate some of the administration tasks of the health and social care professionals. This will allow professionals more time for the actual care of patients, and thus will improve the quality of care for the patients.

Although, current information systems for the health sector provide advantages such as fast storing and distribution of data, they fail to adequately reduce the workload and make procedures easier and quicker for health and social care professionals.

Employing Agent Technology

An alternative technology that has grasped the attention of the researchers the last few years is agent technology [1]. The agent paradigm is based around the concept of an agent¹. A software agent is a computer program that demonstrates some special (human-like) characteristics such as autonomy, mobility and the ability to learn [2]. Because of those characteristics, it has been argued [3] that agents are well suited in the development of health and social care information systems.

Each health care professional has their own data and expertise and they need to cooperate to provide the best care for the patients. An agent could be allocated to each professional, and it would be given enough intelligence (capable of analysing information and take decisions on behalf of the professionals) so that it can negotiate with agents of other professionals to minimise the workload of the professionals and maximise the cooperation required for the efficient care of the patients.

The Agent Architecture

An important feature of the system is the architecture that agents should have in order to be able to act on behalf of the professionals. In our system, each agent consists of internal modules²,

¹ In this paper when we refer to an agent we always refer to a software agent.

² In this paper, due to lack of space, the modules are briefly described.

which play an important role in the functionality of the agents. There are five basic modules inside the agents used in this project (Figure 1):

Agent Memory Module: The Agent Memory module is where the agent’s beliefs and goals are stored. Thus two sub-modules (Goals and Beliefs) are used inside the Agent memory module. Beliefs in the agent terminology represent the knowledge of the agent about its environment (the system the agent is situated in). For example, some of the beliefs of an agent could be: what kind of other agents exists in the system, what are their functionalities, and also what kind of other (non-agent) components exists in the system. The goals of the agent represent its aims and the objectives it has to achieve either as individual or as a member of a team of agents (system).

Communication Module: The Communication Module is responsible for the communication of the agent with other components (agents and non-agents) of the system. Agents in order to communicate they are using message passing communication protocols which are divided into a transport protocol and a communication language such as KQML [4].

Control Module: The Control Module is responsible for organizing the different tasks that come out from the other modules. This is the most important module of the agent architecture since its main function is to coordinate the different modules that exist inside the agent. It reads, for example, the Goals of the agent from the Goals sub-module and by considering the actions of the Action module specifies what the next “move” of the agent will be.

Actions Module: The Action Module is responsible for managing the actions that the agent will perform. Thus, by taking into consideration other factors, such as for example the Goals and the beliefs of the agent, it decides what kind of actions the agent must take in order to complete its goals according to its beliefs.

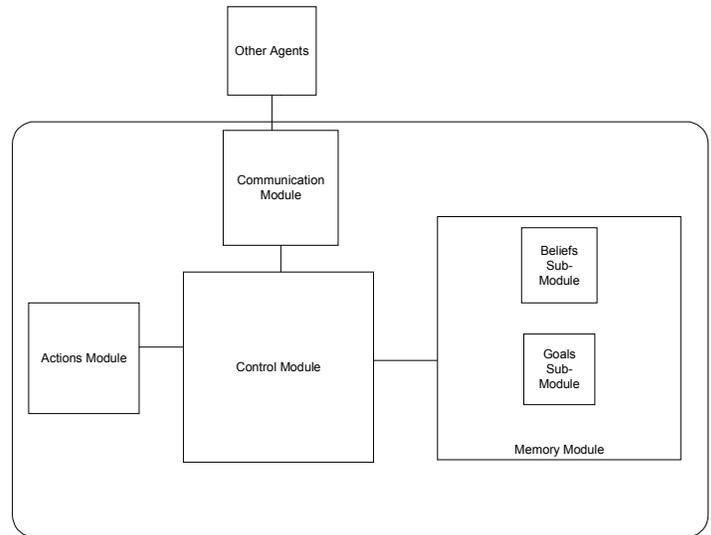


Figure 1: Agent Architecture

Conclusion

Agent Technology provides an effective solution in the development of health and social care information systems [3]. In this paper we introduce how an agent system can be used to help professionals provide better and more efficient health and social care to patients, and we briefly describe the internal architecture of an agent of such a system. The main advantage of such a system over other traditional (web and database) approaches is that less human (professional) intervention is required for procedures not directly associated with patients’ care, such as workload management and administration tasks, and thus it allows professionals more time for the actual care of the patients, leading to a better and more efficient care.

References

- [1] N. R. Jennings, “An agent-based approach for building complex software systems”, *Communications of the ACM*, Vol. 44, No 4, April 2001
- [2] S. Franklin, A. Graesser. *Is it an Agent, or just a Program? A Taxonomy for Autonomous Agents*. Proceedings of the Third International Workshop on Agent Theories, Architectures, and Languages, Springer-Verlag 1996.
- [3] H. Mouratidis, G. Manson, I. Philp, “ Testing the suitability and limitations of agent technology to support integrated assessment of health and social care needs of older people”, (to appear) in *Informatica Medica Slovenica*.
- [4] J. Mayfield, Y. Labrou, T. Finin, “Evaluating KQML as an agent communication language”, In Wooldridge and J.P. Muller and M. Tambe, editors, *Intelligent Agents II (LNAI 1037)*, pages 347-360, Springer, 1996.