

NETDEMO: INCA Intelligent Community Alarm

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Abstract

The Intelligent Community Alarm (INCA) demonstrator is an example of how the multi-agent system (MAS) paradigm can be utilised to develop a complex healthcare information system. We illustrate how Transaction Agent Models (TrAM) permit the rapid conversion of initial requirements into MAS program code, such that high level, qualitative concepts can be captured and verified during the agent realisation process.

1. INTRODUCTION

Home-based community care requires a variety of healthcare services to be delivered within the recipient's own home, allowing them to continue to live independently, and maintaining the best possible quality of life. Whilst the aims of community care address humanitarian issues, it is a challenging and expensive task to manage the organisation, logistics, quality assurance and efficiency of these services. The INCA demonstrator, together with the Transaction Agent Model (TrAM) approach, illustrates how Agent Oriented Software Engineering (AOSE) can assist the development of community healthcare information system.

2. BUILDING THE DEMONSTRATOR

Throughout the process of developing a MAS for complex healthcare systems, we have encountered an increasing number of qualitative issues that support the need for a framework that considers the wider issues of community healthcare provision [2].

Figure 1 illustrates the three abstract, conceptual stages of the TrAM framework:

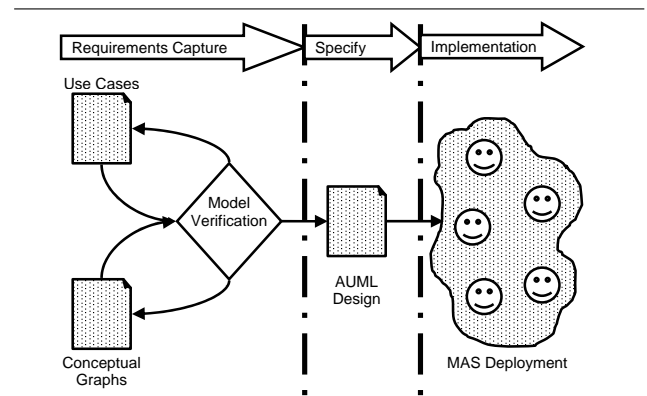


Figure 1. TrAM framework.

1. *Gathering Requirements* - The domain is modelled with UML use cases and Conceptual Graphs and projected through the transaction model [3]. The transaction model enforces a discipline upon the process, such that further specification cannot take place until all aspects of the model are complete and a 'balance' is achieved.
2. *Creating a Design Specification* - After the model has been verified at the previous stage, the model is translated into AUML activity diagrams.
3. *Implementation* - The AUML design specification is then translated into program code.

The INCA system consists of individual 'home unit' agents that reside within the elderly persons' home environment. Local Authority (UK) agents broker requests from each of the home units against an Individual Care Plan (ICP), and pro-actively manage the 'care provider' agents. Figures 2,3 and 4 illustrate sample interfaces to allow interaction and observation of the message passing.

Each agent was derived using the TrAM framework, ensuring representations could be assembled that adhered to

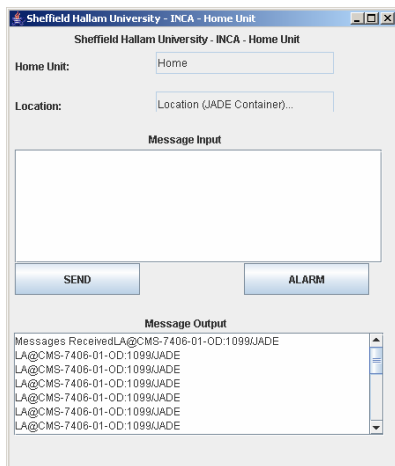


Figure 2. INCA Home unit interface.

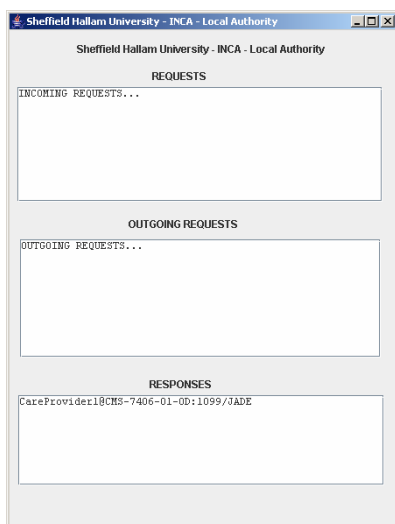


Figure 3. INCA Local Authority interface.

the robust notion of a balanced transaction. Once the models had been verified, mappings to AUML enabled the relevant agent and conversation classes to be specified. Finally, specific behaviours were added to augment the particular business protocols required.

3. EXTENDING THE DEMONSTRATOR

Currently the INCA demonstrator has been used to explore how complex contractual agreements can be managed by multiple parties, and now serves to support the further development of the TrAM MAS development framework. It is now feasible to extend the deployment beyond planned care provision in order that emerging technologies such as context awareness and ambient intelligence can be fully em-

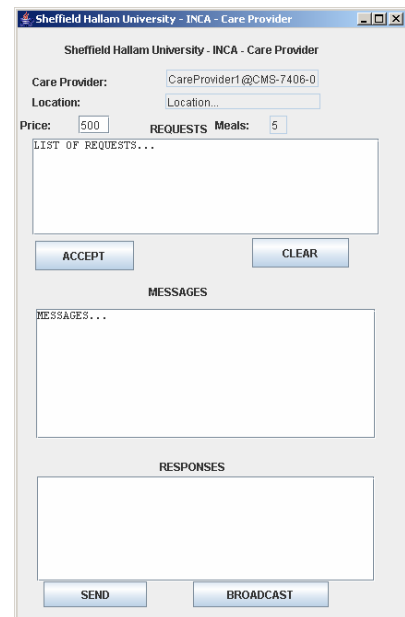


Figure 4. INCA Care provider interface.

braced, exploited and integrated within the management of community care.

4. ACKNOWLEDGEMENTS

This project is in receipt of an AgentCities Deployment Grant from the European Union AgentCities.rtd Project (IST-2000-28385).

References

- [1] Bauer, B., Muller, J. P., and Odell, J., 'Agent UML: A Formalism for Specifying Multi-agent Software Systems', in Agent-Oriented Software Engineering, vol. 1957, Ciancarini, P. and Wooldridge, M. J., Eds. Springer-Verlag, 2000, pp. 91-104.
- [2] Hill, R., Polovina, S., Beer, M. D., (2004) 'Towards a Deployment Framework for Agent-Managed Community Healthcare Transactions', The Second Workshop on Agents Applied in Health Care, 23-24 Aug 2004, Proceedings of the 16th European Conference on Artificial Intelligence (ECAI 2004), Valencia, Spain, IOS Press, 13-21.
- [3] Polovina, S., Hill, R., Crowther, P., Beer, M. D., (2004) 'Multi-Agent Community Design in the Real, Transactional World: A Community Care Exemplar', Conceptual Structures at Work: Contributions to ICCS 2004 (12th International Conference on Conceptual Structures), Pfeiffer, H., Wolff, K. E., Delugach, H. S., (Eds.), Shaker Verlag (ISBN 3-8322-2950-7, ISSN 0945-0807), 69-82.