KR-driven Development Process Integration

Karl-Heinz Krempels and Andriy Panchenko*

RWTH Aachen University, Computer Science Department - Informatik IV, Ahornstr. 55, D-52074 Aachen, Germany {krempels,panchenko}@cs.rwth-aachen.de

1 Objective

Medical operation planning is a substantial element of hospital management. It is characterized by high complexity, which is caused by the uncertainty between the offered capacity and the true demand. As emergency cases occur the planning requirements will change. Therefore, the use of a dialog-based system is preferred against fully manual or fully automated systems, because of the inability of the latter to recognize the changes in a high dynamic environment. In order for an automatic created schedule to be accepted by involved personnel, it should include the interests and preferences of all the human actors. The objective is to build a suitable knowledge-based scheduler for the described problem, that considers a ward personnel's preferences in the scheduling process. Furthermore, the target system should provide FIPA (Foundation of Intelligent and Physical Agents) compliant interaction capabilities for the integration in the Agent.Hospital Framework [2].

2 Framework Description

The developed framework supports a four stage development process for agentbased applications. In this process, Protégé's main role is the knowledge representation integration among the different tools used in each stage, but also ontology modeling, knowledge acquisition, problem solving method development, and code generation and export to the target technology (agent technology, Web services, etc.). The first stage covers domain analysis and requirements specification with the help of well-established tools in the domain of discourse. The second stage addresses knowledge engineering: ontology modeling and knowledge acquisition with the help of core Protégé functionality. The problem solving method (PSM) is developed/implemented with the help of the JessTab in stage three. The last stage covers code generation and export of the ontology (TBox, ABox) and PSM into a JessAgent. The JessAgent is a generic rule-based agent with interaction capabilities and an embedded JESS (Java Expert System Shell) rule engine for reasoning.

^{*} This work was supported by the German Research Foundation in the research priority programme SPP 1083 – Intelligent Agents in Real-World Business Applications.

3 Prototype Description

The application scenario was analyzed and modeled in Protégé with the help of the domain ontology OntHoS [1] (Fig. 1, step 1). The ontology (TBox) together with its instances (ABox) were exported into the expert system JESS as facts and rules (step 2). Further the A-Box, T-Box and all the PSM [3] (scheduling heuristics, conflict solving, and preference consideration) are implemented in JESS (step 3) and exported into the JessAgent (step 4). The agents are started and the scheduling process is initiated by the SchedulerAgent. The user interface for the planner as well as the subplans generated based on ontological constraints are provided by this agent. New scheduling tasks are added to the system by a wards representatives with the help of WardAgents (step 5).



Fig. 1. System Overview

References

- M. Becker, C. Heine, R. Herrler, and K.-H. Krempels. OntHoS an Ontology for Hospital Scenarios. In Antonio Moreno and John Nealon, editors, *Applications of* Software Agent Technology in the Health Care Domain, Whitestein Series in Software Agent Technologies (WSSAT), pages 87–103. Birkhäuser Verlag Basel, February 2003.
- Stefan Kirn, Christian Heine, Rainer Herrler, and Karl-Heinz Krempels. Agent.hospital - agent-based open framework for clinical applications. In WETICE '03: Proceedings of the Twelfth International Workshop on Enabling Technologies, page 36, Washington, DC, USA, 2003. IEEE Computer Society.
- Karl-Heinz Krempels and Andriy Panchenko. An Approach for Automated Surgery Scheduling. In Edmund Burke and Hana Rudova, editors, *Practice and Theory* of Automated Timetabling VI: Sixth International Conference, PATAT 2006 Brno, Czech Republic, August 30 - September 1, 2006.