Chapter 5

Policy-Agents to Support CSCW in the Case of Hospital-Scheduling

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Computer Supported Co-operative Work encircles collaboration of different parties in order to achieve a common goal. Human beings or organizations made up of human beings are conducted by preferences, goals, aims, intentions, etc., which in general are not consistent, i.e., they cannot be summed up to a common goal without conflicting individual preferences. For the case of hospital scheduling, we show the concept of a policy-agent that is able to represent individual preferences and goals, and thus, may act as a personal assistant to support solution of standard problems like scheduling of operating room activities. The main focus of the chapter lies in the representation of preferences and goals, such that adaptations to changed environments may be done easily. In addition, we show how interaction will work. Not within the scope of the chapter are questions of optimality of any scheduling algorithm. Rather, we focus on negotiation processes and acceptable negotiation results. The implementation of the concepts shown takes place at time. My thanks go to the German Research Foundation (Deutsche Forschungsgemeinschaft) for its support.

INTRODUCTION

In CSCW, different parties are engaged in order to fulfil a common goal. In the context of hospital scheduling, especially scheduling of the operating room, we show the basic concept of an agent-based solution. The idea, at first hand, is very simple: every person or resource involved or needed in fixing a time slice for
treatment of the patient will be represented by an intelligent agent. Thus, not only every patient, surgeon, nurse, and anaesthetist, but also every operating room, every separately scheduled equipment, the whole hospital organization, the department in question, etc., is individually mapped to an intelligent agent, which represents like the “Use Case”-approach of UML the specific constraints and policies. This kind of agents are called policy-agents. These policy agents have to interact in order to achieve a common goal, here considered as a common time-slice for an operating room treatment.

In general, the different perspectives and the resulting goals will not be compatible with a common goal. Thus, we need a negotiation process that reveals the weights of the different goals and aims of the policy-agents involved to arrive at a compromise solution.

In this chapter, we describe the basic concepts relevant for the hospital scheduling problem and offer a deep understanding of coordination and cooperation by agents designed as personal assistants of natural persons obeying management policies of surrounding organizations. Deeply, we are convinced that any planning software that is not able to consider the preferences and goals of persons and organizations involved will encounter acceptance difficulties in the near future.

So far, the problem considered may be found in many organizations, and may be easily generalized to other environments (Czap and Haas, 1995; Czap and Reiter, 1997).

The specific hospital scheduling problem shows severe planning deficiencies. It’s not possible to plan in the long run since any activity is subject to a high degree of indeterminacy regarding the kind of needed activity, intensity and amount of services. This simply results from the fact that after the start of a surgery-treatment, the diagnosis might be changed or by encountering multi-morbidity result in increased intensity of care.

To keep up with the indeterminacy of planning process, a suited software must support a high degree of planning flexibility (Fitzpatrick, Baker and Dave, 1993). In addition to that, the actually used “manual” methods must be able to integrate local goals and interests of the involved parties into the global planning process. In order to ensure acceptance, this aspect is considered to be indispensable in the development of automated methods.

As a result, we focus on multi-agent systems (Czap and Reiter, 2000; Durfee, Lesser and Corkill, 1992) representing a dialogue-oriented approach that seems to be suited to grasping the distribution and instability of the problem domain. Concerning this, existing agent technology is extended and further developed to the concept of a policy agent. State of the art in agent technology shows the central deficit—that only simple and static goal representations (Mattern and Sturm, 1989; Rao and Georgeff, 1995) are possible.
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