Chapter 7
Eliciting User Preferences in Multi-Agent Meeting Scheduling Problem

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ABSTRACT
Meeting Scheduling Problem (MSP) arranges meetings between a number of participants. Reaching consensus in arranging a meeting is very difficult and time-consuming when the number of participants is large. One efficient approach for overcoming this problem is the use of multi-agent systems. In a multi-agent system, agents are deciding on behalf of their users. They must be able to elicit their users’ preferences in an effective way. This paper focuses on the elicitation of users’ preferences. Analytical hierarchy process (AHP) - which is known for its ability to determine preferences - is used in this research. Specifically, an adaptive preference modeling technique based on AHP is developed and implemented in a system and the initial validation results are encouraging.

INTRODUCTION
Meeting Scheduling Problem (MSP) is a distributed task in which there are several participants, and they are looking for times and places to hold their meetings. Each of the participants has their own preference and calendar (Al-ani, 2007). Meeting scheduling is naturally a time consuming and iterative activity. Tsuruta and Shintani (2000) have defined an MSP as “the process of determining a starting time and an ending time of an event in which several people will participate.” Solving a meeting scheduling problem involves satisfying conflicted preferences between individuals. Constraints in the context of scheduling problem are divided into two kinds, hard and soft. Hard constraints are conditions that must be satisfied (like the availability of an individual), whereas soft constraints may be violated. However, it would be better to satisfy them as much as possible.

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Figure 1. Simplified components of the preference modeling system

(Abdennadher & Schlenker, 1999). Automated meeting scheduling has two important effects; it will reduce the time that users spend on scheduling, and it will also try to find an efficient schedule. Before we introduce the preference problem, we provide a closer look at the scheduling problem.

There are two main approaches in solving a meeting scheduling problem. The first approach is the centralized approach. In a centralized system each of the participants sends their preferences to the meeting scheduling manager. It is the manager’s job to search for a good feasible answer that satisfies all the participants (Ephrati et al., 1994). In this case, a meeting scheduling problem has been seen as a Constraint Satisfaction Problems (CSP) (Chun et al., 2003; BenHassine et al., 2006). However, in recent years many researchers have used distributed and multi-agent systems in order to find good solutions (Mishra & Mishra, 2010; Mazumdar & Mishra, 2010). There have been enormous attempts for solving the CSP in a distributed way such as Distributed CSPs or DCSPs (Maheswaran et al., 2006). Even so, there is another important distributed method in MSP solving, which is the multi-agent negotiation approach. In this method MSP is a treated as a multi-agent agreement problem, and each agent represents a user (Crawford & Veloso, 2004, 2005). Increasingly, software agents perform tasks on behalf of their human counterpart in a variety of application domains (Kuppuswamy & Chithralekha, 2010; Russell & Yoon, 2009).

In this paper, we formulate the MSP as a multi-agent problem and base it on the work

Table 1. Fundamental scale for pairwise comparisons

<table>
<thead>
<tr>
<th>Intensity of importance</th>
<th>Definition</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Equal importance</td>
<td>Two elements contribute equally to the objective</td>
</tr>
<tr>
<td>3</td>
<td>Moderate Importance</td>
<td>Experience and judgment slightly favor one element over another</td>
</tr>
<tr>
<td>5</td>
<td>Strong importance</td>
<td>Experience and judgment strongly favor one element over another</td>
</tr>
<tr>
<td>7</td>
<td>Very strong importance</td>
<td>One element is favored very strongly over another</td>
</tr>
<tr>
<td>9</td>
<td>Extreme importance</td>
<td>The evidence favoring one element over another is of the highest possible order of affirmation</td>
</tr>
</tbody>
</table>

Intensities of 2, 4, 6 and 8 can be used to express intermediate values.