Knowledge Mediation: A Procedure for the Cooperative Construction of Domain Ontologies

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1 Introduction

Up to now, there are few detailed proposals for the cooperative (and distributed) construction of ontologies (cf. [2]). The problem of how to establish a consensus and a shared conceptualization, especially when dealing with contradictory knowledge and conflicting interests has hardly been dealt with. We propose and evaluate a three-phased knowledge mediation procedure which is especially conceived to integrate different perspectives and information needs into one consensual ontology.

2 The Knowledge Mediation Procedure

1) *Generation Phase:* Participants generate terms in a brainstorming session, using a middle-out approach as well as automatic thesaurus generation tools.
2) *Explication Phase:* Each participant *independently* explicates a taxonomy based on the collected terms and indicates the relevance of different parts of this proposal. Ontology mining techniques from texts (e.g. [4]) complement this phase.
3) *Integration Phase:* We adapted techniques from conflict mediation [3] to the requirements of ontology construction. While the knowledge mediator considers principles of ontology design, she usually does not interfere with the content of the ontology. She acts as a neutral person who can balance between the different perspectives and interests of ontology users. The mediator can use the following techniques:

Perspective Taking (Participants present the proposal of another participant to the group). *Balancing* (Everybody gets an equal chance to express ideas). *Summarizing* (Summarize reached agreements to structure the communication process). *Useful Questions* (Urge participants to explicate their viewpoints and the advantages or disadvantages of their proposals).

Neutral Knowledge Sources: Refer to the results from the ontology from text mining techniques and existing ontologies to settle disagreements.

Analysis of Disagreement: Table 1 may help to understand reasons for disagreements.

Table 1. Possible disagreements during an ontology construction session (adapted from [5])

		term	
		same	different
refers to concept	same	**consensus** participants use terms and concepts in the same way	**correspondence** participants use different terms for the same concepts
	diff.	**conflict** participants use same terms for different concepts	**contrast** participants differ in terms and concepts

Participants agree on the resulting structure or conclude that no agreement is possible. A comprehensive documentation should be drawn up.

3 Experimental Evaluation

Method. 28 Cognitive Science students (University of Osnabrueck) who were matched into pairs were requested to agree about a common study programme after they had received contradictory programmes. In one condition students conducted the knowledge mediation procedure with a mediator, whereas in the other condition the pairs had an unassisted discussion. Recorded measures: speaking times, a qualitative category system, an analysis of resulting programmes, a questionnaire, a sorting task.

Results. The knowledge mediation procedure resulted in a more balanced negotiation (speaking times) and a more elaborated level of communication (qualitative categories). Stronger differences could presumably be found in real conflict situations, like company fusions. The evaluation showed the feasibility of the approach for distributed construction groups communicating via videoconference.

4 Conclusion

We proposed an ontology construction procedure for the integration of different *user* perspectives and contradictory information needs and showed benefits in an experimental evaluation. For more details see [1]. We conclude that an ontology construction process is not only an engineering task but more importantly also a social process where the relevant parties need to be involved before successful and durable solutions can be found.

References

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