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DOOD'95 Post-Conference Workshop on Temporal Reasoning in Deductive and Object-Oriented Databases

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For the first time, post-conference workshops were organised for the International Conference on Deductive and Object-Oriented Databases (DOOD). There were two workshops focusing on knowledge discovery and temporal reasoning. This report is dedicated to one dealing with temporal reasoning.

Although temporal databases are a quite lively research area for which several international workshops take place each year, the special connection of temporal reasoning and deductive and/or object-oriented databases is often overlooked. Most approaches discussed so far are based on traditional relational databases. Therefore, an own workshop dedicated to that area seemed to be necessary. In consequence, the main intention of our workshop was

- to clarify the importance of temporal reasoning in deductive and/or object-oriented databases, and
- to identify research issues for the near future.

The presentations (selected by an international programme committee co-chaired by J. Fiadeiro, Portugal, and G. Saake, Germany) mainly deal with temporal query languages for deductive databases. Five presentations with extensive time for discussion and a final panel discussion made up the programme of this small workshop. Especially, the following topics were to the fore of the presentations given at the workshop:

- a combination of temporal, probabilistic, deductive, and object-oriented concepts within one query language,
- describing and reasoning about schema evolution in a deductive language,
- using temporal operators (from temporal logic, but slightly modified) for adding a temporal dimension to a deductive database, and
- special visualisation techniques for results of temporal queries.

The talks provided a nice overview of current work in this area. Of course, it should be clear that not all the work within the spectrum of the workshop could be respected. For instance, the main focus of the workshop presentations was on querying temporal (deductive) databases. The use of temporal concepts in the design of databases is another very interesting application which was not covered by the talks.

In the final discussion the panelists (selected from the authors as well from the programme committee members) tried to clarify the significance of temporal reasoning for deductive and object-oriented databases. Especially, the question arose whether temporal reasoning is only one application for deductive and/or object-oriented databases. For instance, evaluating temporal queries could be implemented as a special application on top of a given database system. However, it was the conviction of the panelists that temporal reasoning techniques should be integrated into database systems. Especially, deductive database systems are priority candidates for such an integration. This is due to the fact that they already provide built-in mechanisms for general reasoning which can easily be used for realising temporal reasoning. Main advantages of an

integration are better efficiency and the possibility that the temporal reasoning techniques can be shared by several applications.

In the discussion, the following topics could be identified as special "applications" for which the panelists are sure that temporal reasoning is needed:

- active databases when composite and/or temporal events are used,
- temporal query languages (and their implementation),
- describing and reasoning about schema evolution which is, of course, a highly temporal matter,
- specifying and reasoning about long-term behaviour of database objects (here, temporal and dynamic logics are already extensively studied and used)
- describing and reasoning about transactions, and
- knowledge discovery (at least to a certain degree).

Of course, this list is not complete, and it is not only restricted to deductive and object-oriented databases. But it shows the wide spectrum in which temporal reasoning can be added to current database technology. The combination of temporal reasoning techniques with deductive database technology seems to be especially powerful and tempting. This is due to the fact already mentioned that deductive database systems already provide basic reasoning mechanisms such that the realisation of temporal reasoning mechanisms on top of deductive database systems (or, even better, as an integrated part of deductive database systems) appears to be only a little step.

Although this workshop was just a small one and there were several problems in setting it up, we think that altogether the workshop was successful because it brought together different aspects of a promising research area and because it gave motivating perspectives for ongoing as well as novel work.

The proceedings of this workshop and of the other DOOD'95 post-conference workshop have been published as *Knowledge Discovery and Temporal Reasoning in Deductive and Object-Oriented Databases*, KayLiang Ong, Stefan Conrad and Tok Wang Ling (eds), National University of Singapore, 1995 (ISBN 9971-62-418-4).