

Report on the 2007 Workshop on Modeling and Reasoning in Context

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■ *The fourth Modeling and Reasoning in Context (MRC) workshop was held on August 20–21, 2007, in conjunction with the Sixth International and Interdisciplinary Conference on Modeling and Using Context, at Roskilde University, Denmark. This year's workshop included a special track on the role of contextualization in human tasks (CHUT). The overall goal of the workshop was to further the understanding, development, and application of AI methods for context-sensitive information technology.*

Context-sensitive processing is crucial in many application domains, not only for mobile and ubiquitous computing, but also for tasks such as collaboration support, intelligent information retrieval, adaptive games, and e-learning. The Modeling and Reasoning in Context (MRC) workshop series, begun in 2004, brings together researchers and practitioners to exchange ideas and results on modeling and reasoning issues for context-sensitive systems. MRC 2007 broadened the focus to also highlight studies of contextualization in human tasks (CHUT), to explore the practical relationships between tasks, actors, and workplace context that may shape system design.

The workshop was split into formal paper presentations and discussion sessions. The first two discussions combined themed panels with audience participation, while the closing free-form discussion offered the opportunity for participants to examine issues of their choice and provide closing perspective on the workshop as a whole. Following an MRC tradition, the workshop also included an informal dinner, enabling participants to continue their discussions in a traditional Copenhagen restaurant.

Presentations

The MRC paper presentations covered topics such as ontology-based context

models, the benefits of multilayered models (combining general metalevel and domain models with application-specific instances), the use of situation lattices to achieve situation awareness, user modeling in mobile ambient intelligent systems, and middleware for managing context. These were illustrated for a range of tasks, such as contextualized software reuse and an e-mail filtering approach using multiple heterogeneous sources of contextual data to infer when and where to deliver messages. The contextualization of human tasks was demonstrated from multiple perspectives as well, ranging from analysis of interpersonal work practices, to discover contextual parameters, to an application to improve drivers' situation awareness. These diverse presentations gave a good overview of the various uses of context, their benefits, and their challenges for modeling and reasoning, providing a starting point for the discussions.

Discussions

There was enthusiastic participation in the workshop's discussions, and many participants considered the exchanges there to be the most rewarding part of the workshop. The panel discussion sessions began with the panelists each giving a five-minute summary of their views on the panel topic, after which discus-



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sion was opened up to the floor.

The charge of the first panel was to identify key open problems for modeling context. Many issues were proposed and hotly debated, with consensus emerging on some key issues across different disciplines and domains. One of these challenges was elicitation and modeling of social aspects of context, both as they relate to human-human interactions and to human-computer interactions. Another was how to deal with the dynamic nature of context, which may require addressing issues of ambiguity, uncertainty, and vagueness, as well as building systems that can adapt to novel situations and new contextual factors. Participants believed that incremental knowledge acquisition and learning are likely to be requirements for successfully addressing these problems. Another challenge involved bringing together interdisciplinary lessons. Understanding context in itself, as well as its role in sociotechnical systems, requires drawing on perspectives from disciplines such as computer science, sociology, philosophy, and linguistics and, more importantly, on bringing their lessons together to form a cohesive vision.

The charge of the second panel was to identify key issues for reasoning in context. Although it became obvious that a clear separation between discussion of modeling and reasoning issues was impossible, this discussion suggested three additional points. First, it highlighted that contextual reasoning may be as vital for initial situation assessment as for performing the domain task. Second, participants

stressed that in sociotechnical systems, the reasoning mechanism must reflect human reasoning and perhaps must even be modeled on human reasoning. Third, because some context-sensitive systems (such as those for ambient intelligence) now communicate through behavioral interfaces rather than traditional ones, new methods are needed to enable such systems to explain their behavior to keep the human informed and provide the human with situation awareness.

The final open discussion continued to explore these themes and to seek a shared functional view of context-based processing. This discussion suggested that many adaptive context-based systems follow a three-stage process. Even though different communities may name the steps differently—for example, in terms of perceptions, awareness, and sensitivity, or as specification, management, and adaptation—the functions are comparable, enabling comparison despite domain- and application-specific differences.

Final Remarks

Building on the conclusions of the MRC discussions, work is now under way on a context manifesto, exploring shared functional similarities between approaches and making explicit their differences. In addition, planning has begun to continue the dialog with the fifth MRC workshop, in 2008. The authors thank all the participants for their significant contributions to the workshop's success, and thank the organizers of the CONTEXT'07 conference for hosting MRC 2007. The MRC proceedings are available electronically,¹ and additional information is available from the workshop web pages.² A selection of extended MRC papers will be published in a special issue of *Revue d'Intelligence Artificielle* in spring 2008.

Notes

1. www.ruc.dk/dat_en/research/reports/112.
2. mrc2007.workshop.hm.



Anders Kofod-Petersen holds a Dr. Sc. in computer science from the Norwegian University of Science and Technology, where he is also currently doing postdoctoral work. He focuses on the use of case-based reasoning

as the means of achieving situation awareness in ambient intelligent systems. His interests are on knowledge-intensive case-based reasoning, cognitive science, and multiagent systems. His recent research has been focused on using sociotechnical theories in modeling and representation of knowledge in ambient intelligent systems.



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