

Knowledge-intensive Stream Reasoning

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Abstract. Nonmonotonic reasoning is context-dependent [1]. For instance, Reiter-style defaults capture patterns of inference of the form “*in the absence of information to the contrary conclude*” [2]. Thus, conclusions are tentative, and they may become retracted in view of further information (or changing contexts). In other words, conclusions are context-dependent and contexts change over time. Unlike this, today’s ASP systems focus on problem solving and thus disregard changing contexts.

On the other hand, there is a the practically highly significant area of stream processing (or stream reasoning) that lacks complex reasoning tasks [3]. Given that a *Data Stream* may be regarded as a *Changing Context*, stream reasoning constitutes a highly promising application area of Nonmonotonic Reasoning and in particular it’s computational embodiment, viz. Answer Set Programming.

To underpin this claim, we report upon an extensive work on indoor position estimation [4]. Although there are well established quantitative methods in robotics and neighboring fields for addressing this problems, they lack knowledge representation and reasoning capacities. Such capabilities are not only useful in dealing with heterogeneous and incomplete information but moreover they allow for a better inclusion of semantic information and more general homecare and patient-related knowledge. We address this problem and investigate how state-of-the-art localization and tracking methods can be combined with Answer Set Programming. We report upon a case-study and provide a first experimental evaluation of knowledge-based position estimation both in a simulated as well as in a real setting.

Moreover, we illustrate by means of the problem of Online Job Scheduling a new reactive approach to Answer Set Programming, introduced in [5]. This approach aims at reasoning about real-time dynamic systems running online in changing environments. Moreover, we describe the first genuine implementation of a reactive ASP solver, *oclingo*, freely available at <http://potassco.sourceforge.net/labs.html>.

This is joint work with Roberto Bisiani, Martin Gebser, Holger Jost, Davide Merico, Alessandra Mileo, Philippe Obermeier, and Orkunt Sabuncu.

Speaker’s Short Biography. Torsten Schaub received his diploma and dissertation in informatics in 1990 and 1992, respectively, from the Technical University of Darmstadt, Germany. He received his habilitation in informatics in 1995 from the University of Rennes I, France. From 1990 to 1993 he was a Researcher at the

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Technical University at Darmstadt. From 1993 to 1995, he was a Research Associate at IRISA/INRIA at Rennes. From 1995 to 1997, he was University Professor at the University of Angers. At Angers he founded the research group FLUX dealing with the automatization of reasoning from incomplete, contradictory, and evolutive information. Since 1997, he is University Professor for knowledge processing and information systems at the University of Potsdam. In 1999, he became Adjunct Professor at the School of Computing Science at Simon Fraser University, Canada; and since 2006 he is also an Adjunct Professor in the Institute for Integrated and Intelligent Systems at Griffiths University, Australia. His research interests range from the theoretic foundations to the practical implementation of methods for reasoning from incomplete and/or inconsistent information, in particular Answer set programming.

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