Preference Modeling by Rectangular Bilattices

Ofer Arieli[1], Chris Cornelis[2], and Glad Deschrijver[2]

[1] Department of Computer Science,
The Academic College of Tel-Aviv, Israel
oarieli@mta.ac.il
[2] Fuzziness and Uncertainty Modeling Research Unit,
Department of Mathematics and Computer Science,
Ghent University, Belgium
{chris.cornelis, glad.deschrijver}@UGent.be

Abstract. Many realistic decision aid problems are fraught with facets of ambiguity, uncertainty and conflict, which hamper the effectiveness of conventional and fuzzy preference modeling approaches, and command the use of more expressive representations. In the past, some authors have already identified Ginsberg's/Fitting's theory of bilattices as a naturally attractive candidate framework for representing uncertain and potentially conflicting preferences, yet none of the existing approaches addresses the real expressive power of bilattices, which lies hidden in their associated truth and knowledge orders. As a consequence, these approaches have to incorporate additional conventions and 'tricks' into their modus operandi, making the results unintuitive and/or tedious. By contrast, the aim of this paper is to demonstrate the potential of (rectangular) bilattices in encoding not just the problem statement, but also its generic solution strategy.

1 Introduction

The notion of *preference* is common in various contexts involving decision or choice. Preference *modeling* provides declarative means for choosing among alternatives, including different solutions to problems, answers to database queries, decisions of a computational agent, etc. This topic is gaining increasing attention in diverse areas of artificial intelligence such as nonmonotonic reasoning, qualitative decision theory, configuration, and AI planning. More recently, preference modeling has also been used in constraint satisfaction and constraint programming, for treating soft constraints, for describing search heuristics, and for reducing search effort (see, e.g. [9] and [13] for recent collections of papers on these topics).

Conventional preference modeling (see e.g. [25]) is centered on the notion of classical preference structures $\langle P, I, R\rangle$, consisting of three fundamental binary relations (strict preference P, indifference I, and incomparability R) that may hold among the alternatives; usually the evidence in favour of these relations is captured by a so-called *outranking* relation S that describes, for each couple (u, v) of alternatives, whether u is (known to be) at least as good as v. In

V. Torra et al. (Eds.): MDAI 2006, LNAI 3885, pp. 22–33, 2006.

Because of copyright this paper is not presented in its full version here. If you would like to obtain a copy, please e-mail to Chris.Cornelis@UGent.be