

Accepted Manuscript

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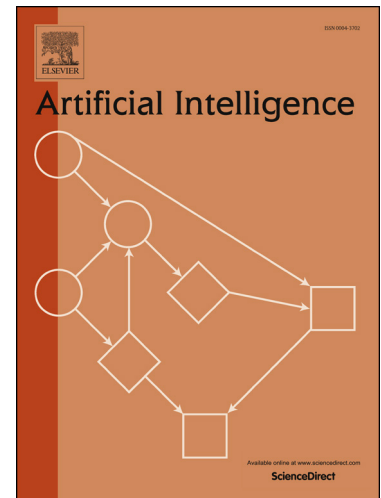
PII: S0004-3702(17)30168-6
DOI: <https://doi.org/10.1016/j.artint.2017.12.002>
Reference: ARTINT 3047

To appear in: *Artificial Intelligence*

Received date: 13 November 2015
Revised date: 7 July 2017
Accepted date: 11 December 2017

Please cite this article in press as: M. Aiguier et al., Belief Revision, Minimal Change and Relaxation: A General Framework based on Satisfaction Systems, and Applications to Description Logics, *Artif. Intell.* (2018), <https://doi.org/10.1016/j.artint.2017.12.002>

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Belief Revision, Minimal Change and Relaxation: A General Framework based on Satisfaction Systems, and Applications to Description Logics

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Abstract

Belief revision of knowledge bases represented by a set of sentences in a given logic has been extensively studied but for specific logics, mainly propositional, and also recently Horn and description logics. Here, we propose to generalize this operation from a model-theoretic point of view, by defining revision in the abstract model theory of satisfaction systems. In this framework, we generalize to any satisfaction system the characterization of the AGM postulates given by Katsuno and Mendelzon for propositional logic in terms of minimal change among interpretations. In this generalization, the constraint on syntax independence is partially relaxed. Moreover, we study how to define revision, satisfying these weakened AGM postulates, from relaxation notions that have been first introduced in description logics to define dissimilarity measures between concepts, and the consequence of which is to relax the set of models of the old belief until it becomes consistent with the new pieces of knowledge. We show how the proposed general framework can be instantiated in different logics such as propositional, first-order, description and Horn logics. In particular for description logics, we introduce several concrete relaxation operators tailored for the description logic \mathcal{ALC} and its fragments \mathcal{EL} and \mathcal{ELU} , discuss their properties and provide some illustrative examples.

Key words: Abstract belief revision, Relaxation, AGM theory, satisfaction systems, description logics

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