

New additions to Fuzzy Prolog and its semantics

Susana Muñoz¹, Claudio Vaucheret², and Sergio Guadarrama²

¹ Departamento de Lenguajes, Sistemas de la Información e Ingeniería del Software
susana@fi.upm.es

² Departamento de Inteligencia Artificial
claudio@clip.dia.fi.upm.es sgaumela@isys.fi.upm.es
Facultad de Informática - Universidad Politécnica de Madrid
Campus de Montegancedo 28660 Madrid, Spain

Abstract. We use default knowledge to combine the Closed World Assumption (CWA) and the Open World Assumption (OWA) to represent uncertainty in Logic Programming. This new framework is used to enhance Fuzzy Prolog [1] (for example by combining crisp and fuzzy logic in Prolog programs).

Fuzzy Prolog is a language that models $\mathcal{B}([0, 1])$ -valued Fuzzy Logic. It subsumes former approaches because it is more general in two aspects: it uses a truth value representation based on unions of sub-intervals on $[0,1]$ (Borel algebra) and it is defined using general operators (instead of a fixed one) that can model different logics. Declarative and procedural semantics for Fuzzy Logic programs were defined and shown equivalent in [1].

This fuzzy extension to Prolog was realized by incorporating fuzzy reasoning into a set of constraints which are propagated through the rules by means of aggregation operators. An interpreter for this language using Constraint Logic Programming over Real numbers (CLP(\mathcal{R})) has been implemented and is available in the Ciao system [2].

The incorporation of default reasoning in Fuzzy Prolog removes some deficiencies inherited from Prolog and requires a richer semantics, which we discuss.

Keywords Fuzzy Prolog, Modeling Uncertainty, Logic Programming, Constraint Programming Application, Implementation of Fuzzy Prolog, Logic Negation, Constructive Negation.

References

1. S. Guadarrama, S. Muñoz, and C. Vaucheret. Fuzzy prolog: A new approach using soft constraints propagation. *Fuzzy Sets and Systems, FSS*, 144(1):127–150, 2004. ISSN 0165-0114.
2. M. Hermenegildo, F. Bueno, D. Cabeza, M. Carro, M. García de la Banda, P. López-García, and G. Puebla. The CIAO Multi-Dialect Compiler and System: An Experimentation Workbench for Future (C)LP Systems. In *Parallelism and Implementation of Logic and Constraint Logic Programming*, pages 65–85. Nova Science, Commack, NY, USA, April 1999.