

## Abstract

Answer Set Programming (ASP) is a declarative rule-based programming paradigm for knowledge representation and declarative problem-solving. The idea of ASP is to represent a given computational problem by using a logic program, i.e., a set of logic rule, such that its answer sets correspond to solutions, and then, use an answer set solver to find such solutions.

Logic programming paradigms have received renewed interest in recent years, as demonstrated by emerging applications in many different areas of computer science, as well as industry. Due to this renewed interest an increased level of activity in the area has been registered which involved new partitioners both from academia and industry.

The development of such applications has provided important information on the real potentials of this programming paradigm, especially concerning the capability of solving complex problems in practice; moreover, application developers highlighted some critical issues to be addressed to make ASP more effective and easy to use ASP in real-world.

This thesis offers several contributions in this context can be summarized as follows:

- (i) The development of two applications of ASP in a specific industrial field;
- (ii) The design and implementation of new development tools for ASP.

Concerning point (i), the thesis addresses two issues considered relevant in the tourism industry. The first is known in the literature as the problem of (semi-)automatic allotment of package tours; and the second is the intelligent management of personalized newsletters for customers of travel agency. The ASP-based solutions presented in the thesis confirm that ASP is an effective tool for solving complex real-world problems.

Concerning point (ii), the thesis describes two new development tools that extend ASPIDE, a well-known integrated development environment for ASP. The first tool aims at making easier the writing of logic programs for novice programmers and is particularly suitable for those who prefer visual programming tools. In particular, the user can “ draw ” an ASP program composing graphically the logic rules. The second development tool described in the thesis answers a need arising in the scientific communities that study the usage of logic programming, and its extensions, for reasoning and querying ontologies. The goal is to integrate editing tools for ontologies with tools for the development/generation of logic

programs. To this end, the thesis proposes a tool that connects two well-known development environments in the two fields, ASPIDE and *Protégé*, in an integrated environment.

The main contributions presented in this thesis have been published in the following research papers:

- Barbara Nardi, Kristian Reale, Francesco Ricca, Giorgio Terracina: *An Integrated Environment for Reasoning over Ontologies via Logic Programming*. Web Reasoning and Rule Systems - 7th International Conference, RR 2013, Mannheim, Germany, July 27-29, 2013. (LNCS – Vol. 7994 – Springer – Pg. 253-258).
- Barbara Nardi: *A Visual Syntax for Answer Set Programming*. Web Reasoning and Rule Systems - 8th International Conference, RR 2014, Athens, Greece, September 15-17, 2014. (LNCS – Vol. 8741 – Springer – Pg.249-250).
- Carmine Dodaro, Nicola Leone, Barbara Nardi, Francesco Ricca: *Allotment Problem in Travel Industry: A Solution Based on ASP*. Web Reasoning and Rule Systems - 9th International Conference, RR 2015, Berlin, Germany, August 4-5, 2015. (LNCS – Vol. 9209 – Springer – Pg. 77-92).