GUEST EDITOR'S INTRODUCTION

Special Issue: Computational Linguistics and Logic Programming

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Computational linguistics investigates the application of computational paradigms to the scientific study of human language, as well as the development of concrete language processing systems. Its theoretical aspects include the study of syntax (what constructions are acceptable), semantics (how to describe meaning), pragmatics (what world knowledge is needed for understanding or producing language), discourse (how a sentence relates to its surrounding sentences), language acquisition (how does the capability of decoding an infinite number of sentences develop from a finite learning sample), and other areas. Its numerous applications include machine translation, database front ends, speech understanding, automatic programming, computer-aided instruction, office automation, text analysis, etc.

The connections of computational linguistics (CL) to other areas of science are multiple: besides its obvious links to linguistics, CL has strong interactions with cognitive science, psychology, philosophy, engineering, information science, etc. It typically both contributes to as well as takes inspiration from these areas.

Logic programming (LP) is one of the areas with which CL has strong links. The first Prolog version was developed in order to solve the deductive problems of a “system of man-machine communication in French” written by Alain Colmerauer, Henri Kanoui, Robert Pasero, and Philippe Roussel. Shortly afterwards, Colmerauer introduced the concept of logic grammars. Several logic programmed systems for translating language into logic or other forms soon followed. The “parsing as deduction” paradigm—an expression coined by Fernando Pereira—had been born. In this paradigm, which generalizes in practice into “language processing as deduction,” useful information about utterances in a language and their representations can be deduced by a specialized theorem prover, from a set of axioms expressing knowledge about that language. While the first exponents of this notion used...
relatively ad hoc methods, linguistic models soon started to inspire more evolved systems. In addition to language being a common interest to LP systems for processing language and to computational linguistics, there is a commonality of aims between CL and LP. Both pursue such objectives as principledness, succinctness, and high-level description, and this often yields overlapping or related results which are arrived at independently (e.g., the use of unification and constraints), as well as cross-disciplinary feedback, most dramatically exemplified by the interactions between parsing, logic programming, and deductive databases (e.g., chart parsing, memoization).

This special issue presents some recent developments in the exciting intersection of the two fields. The issue starts with a paper by Stuart Shieber, Yves Schabes, and Fernando Pereira, which brings fresh and generalized perspective to the “parsing as deduction” paradigm, by exploiting it for synthesizing a variety of parsing algorithms for different grammatical formalisms, through a uniform deduction engine parameterized by inference rules in specialized logics.

Next, Rolf Backofen describes Gert Smolka and Ralf Treinen’s CFT constraint system for LP and natural language processing in terms of axiom schemes, and shows its completeness. This paper has implications for that part of contemporary CL based on feature structures, of which several LP incarnations are in existence.

In the third paper, David Searles gives us an interesting study on how to extend logic grammars for dealing with a language that it is not orthodox to count among the “natural” or human languages, but which is undeniably an important language, and which can certainly, as the author shows, be usefully formalized in terms of logic grammars.

The fourth paper, written by Paulo Quaresma and Jose Gabriel Lopes, exemplifies how recent advances in LP can be usefully transferred to CL applications. It exploits recent abductive inference techniques for the purpose of recognizing plans and intentions in natural language dialogues.

Closing the issue, Solange Coupet-Grimal and Olivier Ridoux advocate the desirability of higher-order terms and logical context-handling for CL. They illustrate their arguments within Prolog II and Lambda-Prolog, and exemplify them with a concrete natural language application.

It has been a pleasure to be Guest Editor for this special issue. I am indebted to the Editor-in-Chief, Maurice Bruynooghe, for his immediate attention to and help in all matters needing advice; to the many authors who responded to the call for papers and submitted high-quality contributions, only a few of which could be accommodated; to the authors of this issue, for their diligence in perfecting their papers; and to the 46 conscientious referees, who supported this special issue with timely criticism, suggestions, and advice. Special thanks to Rob Turner, for his patience and support during this very long process.