The Incredible ELK

From Polynomial Procedures to Efficient Reasoning with $\mathcal{EL}$ Ontologies

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Abstract $\mathcal{EL}$ is a simple tractable Description Logic that features conjunctions and existential restrictions. Due to its favorable computational properties and relevance to existing ontologies, $\mathcal{EL}$ has become the language of choice for terminological reasoning in biomedical applications, and has formed the basis of the OWL EL profile of the Web ontology language OWL. This paper describes ELK—a high performance reasoner for OWL EL ontologies—and details various aspects from theory to implementation that make ELK one of the most competitive reasoning systems for $\mathcal{EL}$ ontologies available today.

Keywords Description logics · Implementation and optimization techniques · Saturation procedures · Concurrency

1 Introduction

One of the central research goals in Description Logics (DLs) [10] is finding knowledge representation languages with the right balance between expressivity—what can be said using the language—and complexity—how difficult it is to check if something specific holds. For the lack of a better formal criterion, 'complexity' of DLs was commonly measured in terms of the worst case algorithmic behavior. This research area has resulted in discovery and classification of a broad spectrum of DLs, from simple tractable languages, such as $\mathcal{EL}$ [8]

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