A Demonstration of the MARKOS License Analyser

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Abstract. The MARKOS license analyser is an innovative application of the latest version of the Carneades argumentation system, for helping software developers to analyse open source license compatibility issues.

Keywords. legal applications; argument generation from knowledge bases; evaluation, visualization and collaborative editing of argument graphs

The European MARKOS project[1] is developing a prototype application for browsing and analysing functional, structural and licensing properties of open source software at the semantic level [1]. Here we focus on the license analyser component of the MARKOS system, a legal application of the Carneades argumentation system[2] for helping software developers to understand license compatibility issues. Figure 1 shows an overview of the MARKOS system architecture.

The license analyser applies a copyright knowledge base to facts in the repository, and interactively entered in dialogues with users, to automatically build an argument graph. The knowledge base is represented as a Carneades "theory" defining a language of predicate and function symbols, some imported from an OWL ontology, along with strict and defeasible argumentation schemes (inference rules). Carneades includes an extensible, hybrid inference engine for constructing arguments from various data sources, including OWL ontologies, Semantic Web triple stores, and Carneades rules. The inference engine is extensible via "plug-in" modules implementing an argument generation protocol (interface). Arguments are generated from argumentation schemes in Carneades theories using a backwards chaining rule engine, with a depth-limited, depth-first search strategy, to assure termination, and memoization (tabling) of intermediate inferences, to reuse arguments constructed for previous subgoals.

The argument graph constructed from the knowledge base and facts is mapped to a Dung abstract argumentation framework, in a manner similar to ASPIC+, and evaluated using grounded semantics. This applies a new formal model of argument graphs (to be published) which generalizes the original Carneades model [3] to handle cycles, while retaining the support of the original model for proof burdens and standards. The labeled argument graph is visualized using an interactive web application. The application provides multiple linked views onto the argument graph, including hypertext, outlines and argument maps. A collaborative argument graph editor is provided, with forms to help users to apply argumentation schemes to enter further arguments which were
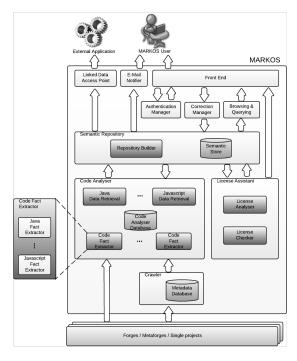

Figure 1. MARKOS System Architecture

not constructed automatically from the knowledge base, or to modify arguments if they disagree with the interpretation of copyright law modeled in the knowledge base. Argument graphs are persistently stored in relational databases and can be shared, to support collaboration by allowing others to access, view and edit the argument graphs.

In an earlier project, we developed a single-user, desktop prototype of a license analyser [2]. The MARKOS license analyser improves upon this prior work with a multi-user web application based on a more advanced computational model of argument and a more complete copyright knowledge base. We hope the application will prove to be a useful tool for open source software developers and serve as a good demonstration of the practical utility of argumentation technology.

References

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