201920 New Modular Reasoning Capabilities for SNOMED CT Classification Beyond the EL profile

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Summary

The MORe reasoner uses modular combinations of OWL reasoners to improve classification performance of SNOMED CT enhanced beyond the EL description logic profile. MORe 2.0 includes the fast Datalog reasoner RDFox and is now available as a Protégé plugin for use in evaluating these new capabilities.

Audience

Technical , Research/academic

Learning Objectives

1. Learn about the SNOMED description logic and potential enhanced capabilities beyond the EL profile
2. Learn about modular reasoning for OWL ontologies
3. Learn about new modular reasoning capabilities with the new MORe 2.0 Protege plugin

Abstract

The underlying description logic of SNOMED CT, even after the recent enhancements of the new OWL refset and added logic features, remains based on a subset of the OWL 2 EL profile (EL++). Available reasoners for EL++ such as ELK and Snorocket provide efficient and tractable reasoning, but do not support more advanced description logic features including universal restriction, disjunction and negation. Available more expressive OWL reasoners such as FaCT++ and HermiT do support universal restriction, disjunction, negation and further advanced logic capabilities, but with a significant performance cost which makes them generally impractical for classifying the entire SNOMED CT ontology. Previous work utilizing a modular reasoning technique with the available version of the MORe reasoner from the University of Oxford has shown some promise in improving classification performance of SNOMED CT enhanced with logical negation and universal restrictions, but the results to date with the previously available version of MORe (adapted from MORe 1.6) have been inconsistent in showing a sufficient performance improvement that would warrant consideration for adoption.

The MORe reason uses an ontology module extraction technique to divide the reasoning workload between a more expressive reasoner (e.g., HermiT or FaCT++) and an efficient reasoner (e.g., ELK) and assigns the bulk of the reasoning workload to the latter. The original version of the MORe reasoner was updated to work as a plugin with recent versions of the Protégé OWL ontology editor tool. A new version of MORe (2.0) with improved module extraction algorithms and further reasoning capabilities with additional combinations of reasoners including the fast Datalog reasoner RDFox has been developed, but it previously was not available as a plugin for use with Protégé and Snow Owl and other ontology editing tools. Now further development work has been done that makes the MORe 2.0 reasoner available as a Protégé plugin (compatible with Protégé 5.5.0). With this enhancement it is now possible to further explore and evaluate the capabilities of various reasoner configurations utilizing the modular OWL reasoning techniques.

Tests to evaluate the performance of these new reasoning capabilities are planned with the previously studied enhanced versions of SNOMED CT with added negation axioms and also with the Singapore Drug Dictionary which incorporates a large number of universal restriction axioms. Additional ontology tests including the use of

disjunction and further OWL 2 DL features which are beyond the expressiveness of the OWL 2 EL profile will also be performed. If the results of this further testing are promising, then this may support consideration of further enhancements to the SNOMED CT description logic profile and modeling capabilities.