The great table of Description Logics and formal ontology notations

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Description Logics (DL) are the logics used to formalize ontology [1]. Many notations are used to express DL, e.g. in equations in scientific papers, in editor software like Protégé, or in programming languages. Moreover, the semantics of DL is usually expressed in first-order logics or as set formula. These notations are difficult to understand and to translate from one to another.

This is why I propose here a big table (next page) that compares 5 notations related to DL and formal ontologies:

1. DL syntax (as commonly used in equations and scientific papers)
2. Protégé editor (expression editor syntax)
3. Owlready2 (a package for ontology-oriented programming in Python [2,3])
4. Semantics in first-order logic
5. Semantics in set formula

This table is an augmented and improved version of the one I presented in [2] and in my habilitation thesis [4].

Background on DL semantics

DL have a model-theoretic semantics, which is defined in terms of interpretations. For a given ontology \( \mathcal{O} \), an interpretation \( \mathcal{I} = (\Delta, f) \) is a tuple where the domain \( \Delta = \{\ldots\} \) is a non-empty set of objects and the interpretation function \( f \) is a function that associates each individual \( i \), class \( A \), role \( R \), composed expression (defined with semantic connectors) and axiom with its interpretation over \( \Delta \), as follows:

\[
\begin{align*}
  f(i \in I) &\in \Delta \\
  f(A \in C) &\subseteq \Delta \\
  f(R \in R) &\subseteq (\Delta \times \Delta)
\end{align*}
\]

Note: \( f \) and \( \Delta \) are sometimes written \( \cdot^I \) and \( \Delta^I \); in this case \( x^I = f(x) \).

References


Available at:

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