

Description Logics of Context

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Abstract

We introduce Description Logics of Context (DLCs) - an extension of Description Logics (DLs) for context-based reasoning. Our approach descends from J. McCarthy's tradition of treating contexts as formal objects over which one can quantify and express first-order properties. DLCs are founded in two-dimensional possible world semantics, where one dimension represents a usual object domain and the other a domain of contexts, and accommodate two interacting DL languages - the object and the context language - interpreted over their respective domains. Effectively, DLCs comprise a family of two-sorted, two-dimensional combinations of pairs of DLs. We argue that this setup ensures a well-grounded, generic framework for capturing and studying mechanisms of contextualization in the DL paradigm. As the main technical contribution, we prove 2ExpTime -completeness of the satisfiability problem in the maximally expressive DLC, based on the DL SHIO. As an interesting corollary, we show that under certain conditions this result holds also for a range of two-dimensional DLs, including the prominent (Kn)ALC.