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A Scheme for Integrating Datatype Groups into Description Logics

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Existing ontology-related formalisms focus on either datatypes (such as the OWL datatype formalism) or datatype predicates (such as the concrete domain approach). Furthermore, they don't provide a general framework for representing customised datatypes and predicates, which is identified as a key requirement of ontology languages.

In this paper we shall propose a scheme for integrating concept languages with customised datatypes and datatype predicates, based on a formalism called datatype group. The main difference between our approach and the concrete domain approach is that the latter one does not support customised datatypes and datatype predicates. According to Baader and Hanschke [2], the concrete domain approach assumes that datatype constraints are sufficiently structured by datatype predicates; therefore, they do not want to define new classes of elements of a concrete domain (customised datatypes) or new relations between elements of a concrete domain (customised datatype predicates). Specifically, the concrete domain approach does not support the `oneOf` constructor that OWL DL requires, which can be used to define *simple* customised datatypes (called enumerated datatypes) using typed literals.

Intuitively speaking, a datatype group a set of datatype predicates defined over a set of primitive datatypes. Based on datatype groups, we provide a set of datatype constructors to build datatype expressions to represent customised datatypes and datatype predicates. We show the conditions that computable datatype groups require. Furthermore, we provide a scheme for integrating an arbitrary conforming datatype group into decidable Description Logics. We have proved that the family of combined DLs, including the datatype group extension of OWL DL, are all decidable. Our result generalises existing results on decidable DLs with feature chain-free concrete domains[1].

References

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- [2] Franz Baader and Philipp Hanschke. A Schema for Integrating Concrete Domains into Concept Languages. In *Proc. of the 12th Int. Joint Conf. on Artificial Intelligence (IJCAI'91)*, pages 452–457, 1991.