

## **Making sense of Description Logics**

This talk will describe a programme of research to improve how people understand and reason with Description Logics (DLs). The work employs insights from cognitive psychology to understand the difficulties people experience with DLs and to propose ways of mitigating those difficulties. In particular, the work draws on the two competing theories of reasoning, mental models and mental rules, plus a complementary theory based on relational complexity.

An initial study (Warren et al, 2014), with 12 participants, looked at commonly-used DL constructs, expressed in Manchester OWL syntax. In particular, the study identified problems in reasoning with negated conjunction and with functional object properties. For the former, mental model theory has been used to explain behaviour; for the latter, relational complexity theory has provided insight.

More recent work (Warren et al., 2015), with 28 participants, has examined these issues in more detail and has also examined the effect of the interaction of negation with existential and universal quantification, and of the interaction of multiple quantifiers. This has identified difficulties people have in interpreting the quantifiers and in handling the interaction with negation.

These studies have led to some proposed additions to the Manchester OWL syntax. For example, proposals have been made to assist in interpreting negated conjunction; understanding the directionality of uniqueness in a functional property, and in fully expanding the quantifiers into their mental models. These proposals have recently been evaluated in a study with 30 participants.

## **Reference**

- Warren, P., Mulholland, P, Collins, T, & Motta, E. (2014). The usability of Description Logics: understanding the cognitive difficulties presented by Description Logics. In *The Proceedings of ESWC 2014*, pp. 550-564. Crete: Springer.
- Warren, P., Mulholland, P, Collins, T, & Motta, E. (2015). Making sense of Description Logics. In *SEMANTICS '15 Proceedings of the 11<sup>th</sup> International Conference on Semantic Systems*, pp. 49-56. Vienna: ACM.