Description Logic and Order-sorted Logic

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I have been studying the following work on description logic, which is closely related to my main work on extensions of order-sorted logic and logic programming [4, 3, 2].

Title: Negation in Description Logics: Contraries, Contradictories and Subcontraries (under submission)

Abstract: We propose an alternative description logic $\mathcal{ALC}_\sim$ with classical negation and strong negation. In particular, we adhere to the notions of contraries, contradictories and subcontraries [1], generated from possible statement types using predicate denial and predicate term negation. To capture these notions, our formalization provides an improved semantics that suitably interprets various combinations of classical negation and strong negation (but not Heyting negation and strong negation). We develop a tableau-based satisfiability algorithm for $\mathcal{ALC}_\sim$, and show the correctness: soundness, completeness and termination and the complexity.

References

[1] L. R. Horn. *A Natural History of Negation.* University of Chicago Press, 1989.

[2] K. Kaneiwa. Order-sorted logic programming with predicate hierarchy. *Artificial Intelligence*, 2004 (accepted).

[3] K. Kaneiwa and R. Mizoguchi. Ontological knowledge base reasoning with sort-hierarchy and rigidity. In *Proceedings of the Ninth International Conference on the Principles of Knowledge Representation and Reasoning (KR2004)*, 2004.

[4] K. Kaneiwa and S. Tojo. An order-sorted resolution with implicitly negative sorts. In *Proceedings of the 2001 Int. Conf. on Logic Programming*, pages 300–314. Springer-Verlag, 2001. LNCS 2237.