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Title: Semantics and Reasoning for ε Terms

Abstract: We review the extension of first-order logic with Hilbert's ε terms and discuss their treatment in the model semantics. We show how they can be used as an alternative to Skolemization in Free Variable Semantic Tableaux (see eg [1]), extending a line of research on the liberalisation of δ rules [2]. We also show how to reason about in ε terms themselves in such a calculus. Most of this was originally presented in [3]

We continue with a short account of our attempt to use ε terms in a first order Dynamic Logic in the KeY program verification system (https://www.key-project.org/), which turned out to be a bad idea.

Finally, we report on recent work [4] that explores the addition of ε individuals to Description Logics. We obtain decidability and complexity results for a number of common logics.

References:
[1] Melvin Fitting, First-order logic and automated theorem proving, Section 7.4
[2] Beckert, Hähnle, Schmitt, The Even More Liberalized δ–Rule in Free Variable Semantic Tableaux, KGC 1993
https://formal.kastel.kit.edu/~beckert/pub/Liberalized_Free_Variable_Delta_Rule_KGC93.pdf
[3] Giese, Ahrendt, Hilbert's epsilon-Terms in Automated Theorem Proving, Tableaux 1999
https://link.springer.com/chapter/10.1007/3-540-48754-9_17
[4] Søberg, Giese, Kostylev, Description Logics with Epsilon Individuals, DL Workshop 2025
https://nva.sikt.no/registration/01990a396c5b-ad891f0a-b375-4f06-a244-1ac38f0387a1