Peirce Algebras and Their Applications in Artificial Intelligence and Computational Linguistics

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Abstract. In [1] we present a two-sorted algebra, called a *Peirce algebra*, of relations and sets interacting with each other. In a Peirce algebra, sets can combine with each other as in a Boolean algebra, relations can combine with each other as in a relation algebra, and in addition we have both a set-forming operator on relations (the Peirce product of Boolean modules) and a relation-forming operator on sets (a cylindrification operation). Peirce algebras provide useful formalisations for various fields in Computer Science. In this talk I focus on the application of Peirce algebras in artificial intelligence and computational intelligence. In particular, I show that the so-called *terminological logics* arising in knowledge representation (originating with a system called KL-ONE) have evolved a semantics best described as a calculus of relations interacting with sets [1,2,3]. In computational linguistics P. Suppes (1976,1979,1981) and M. Böttner (1992) use concrete Peirce algebras as a relational formalisation of the semantics of the English language. In [4] I link both these applications and show that Peirce algebra provides a useful bridge for utilising the linguistic investigations for the problem of finding adequate terminological representations for given information formulated in ordinary English.

References

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