COMPUTATIONAL COMPLEXITY OF NL1 WITH ASSUMPTIONS

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ABSTRACT

We take into consideration Non-associative Lambek Calculus with identity (NL1) enriched with a finite set of arbitrary assumptions and some of extensions of this system such as NL1 with permutation and Generalized Lambek Calculus (i.e. the system with n-ary operations) with identities. De Groote and Lamarche in [2] established the polynomial time decidability for Classical Non-associative Lambek Calculus. Buszkowski in [1] showed that systems of Non-associative Lambek Calculus with assumptions are also decidable in polynomial time and generate context-free languages. The same holds for systems with unary modalities, studied in Moortgat [5], n-ary operations, and the rule of permutation, studied in Jäger [3]. In order to obtain the P-TIME decision procedure for NL1 with the finite set of nonlogical axioms we adapt the method used by Buszkowski [1]. This method does not rely on cut elimination which is not available for systems with additional assumptions. Then, using the results for NL1 we prove that considered extensions are decidable in polynomial time.

References

1. Buszkowski, W., 'Lambek Calculus with Nonlogical Axioms', in: C. Casadio, P. J. Scott and R. A. G. Seely (eds.), *Language and Grammar. Studies in Mathematical Linguistics and Natural Language*, CSLI Publications, 77:93, 2005.
2. de Groote, P. and F. Lamarche, 'Clasical Non-Associative Lambek Calculus ', *Studia Logica*, 355:388–71, 2002, (special issue: *The Lambek calculus in logic and linguistics*).
3. Jäger, G., 'Residuation, Structural Rules and Context Freeness', *Journal of Logic, Language and Information*, 2002.
4. Lambek, J., 'The mathematics of sentence structure', *The American Mathematical Monthly* , 154:170–65, 1958.
5. Moortgat, M., 'Categorial Type Logics', in: J. van Benthem and A. ter Meulen (eds.), *Handbook of Logic and Language*, Amsterdam: Elsevier, Cambrigde Mass.: The MIT Press, 93:177, 1997.

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