► HAKOB TAMAZYAN, *Comparison of proof complexities for linear proofs in quantified sequent calculus and substitution sequent calculus.*
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A. Carbone proved in [1] that there is an exponential speed-up in the number of lines of the quantified propositional sequent calculus (QPK) [2] over substitution sequent calculus (SPK) [2] for tree-like proofs. This paper investigates the transformation of linear QPK-proof of any quantifier-free tautology into a linear SPK-proof of the same tautology. An algorithm is proposed for such transformation, which is then used to prove the following two statements.

Theorem 1. For a given linear proof of some quantifier-free tautology in QPK with t number of lines, exists some linear proof of the same tautology in SPK, having $O(t^2)$ number of lines.

Theorem 2. For a given linear proof of some quantifier-free tautology in QPK with proof size s, exists some linear proof of the same tautology in SPK, having $O(s^5)$ proof size.

Since SPK is polynomially equivalent to the substitution Frege systems (SF) [2], there is a transformation of a linear proof of any quantifier-free tautology in QPK into a linear proof of the same tautology in SF with no more than polynomially increases of the proof lines and size. The obtained results show that the QPK system doesn't have a substantial advantage over the systems SPK and SF in the terms of linear proofs.

[1] A. Carbone, *Quantified propositional logic and the number of lines of tree-like proofs*, ***Studia Logica***, vol. 64 (2000), pp. 315–321.

[2] P. Pudlák, *The Lengths of Proofs*, ***Handbook of Proof Theory*** (Samuel Buss editor), Elsevier, Amsterdam, 1998, pp. 547–637.