In this paper, a new propositional proof system **H** is introduced, that allows quantification over permutations of the variables. In **H** the syntax of propositional logic is enriched by quantifiers $(\exists ab)\alpha$ and $(\forall ab)\alpha$ for variables a and b, which are intended to be semantically equivalent to $\alpha \vee \alpha[b/a, a/b]$ and $\alpha \wedge \alpha[b/a, a/b]$, respectively.

The paper studies the fragment of **H** with cuts restricted to Σ_1-formulas, denoted $\mathbf{H}_1$. It is shown that $\mathbf{H}_1$ simulates efficiently the Hajós calculus (**HC**) for constructing graphs which are non-3-colorable. This shows that short proofs using formulas asserting the existence of permutations of the variables can capture polynomial time reasoning, as it is known [1] that **HC** is equivalent to Extended Frege systems (**EF**), which capture polynomial time reasoning.

The converse direction is left open, but it is shown that at least **EF** efficiently simulates tree-like proofs in $\mathbf{H}_1$.

References

[1] T. Pitassi and A. Urquhart, The complexity of the Hajós calculus, SIAM J. Discrete Math. **8** (1995), no. 3, 464–483. MR1341550 (96h:68151)