

Huge Propositional Proofs are Redundant: Towards a proof that $NP=PSPACE$

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We discuss an argument in favour of $NP=PSPACE$. Any exponentially sized linearly bounded height proof Π of a formula A in implicational minimal logic is highly redundant. This is expressed by the fact that there is at least one derivation Π^* that occurs exponentially many times as sub derivation of Π . This is a consequence that any tree-like proof is labeled with linearly many formulas (subformulas from A) and the proof is linearly height-bounded. May exists more than one (different) derivation that occur exponentially many times as sub-derivations of Π . They and the way that they glue in each other to form the proof itself raises a kind of spectral analysis of proofs, components are the occurring derivations and the analysis is the way they combine, by means of repetitions to the whole proof. We decompose exponentially linearly height-bounded proof into, somehow, combinations of polynomially sized derivations. This combination resembles the horizontal compression method we presented previously in [1]. We show a new horizontal compression, based on rewriting rules, that obtains a polynomially sized dag-like (compressed) proof of A . We provide polynomial algorithm for the verification of the validity of dag-like proofs.

References

- [1] GORDEEV, L. AND HAEUSLER, E.H., *Proof Compression and NP vs PSPACE*, Studia Logica, vol. 107 issue 1, pp53–83, 2019