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### **Referee Report on Stefano Cavagnetto's Thesis**

Propositional Proof Complexity and Rewriting  
Thesis submitted by Stefano Cavagnetto  
Supervisor Prof. RNDr Jan Krajicek, Dr.Sc

Referee report by Prof. Matthias Baaz

The main achievement of this thesis is the systematic use of rewriting techniques for propositional proof systems. (For example, resolution is interpreted as a Semi Thue system.) Furthermore, the approach leads to elegant geometric representations where surprisingly in Euclidian space the idea of giving a proof corresponds to that of reducing the volume of a given cylinder.

A potential application is to establish heuristics for proof search in stronger proof systems. (Heuristics appear often in practical applications by the help of analogies). This could connect logical proof search to models of parallel computation in a mathematically sound way.

In addition to the valuable methodological progress, the thesis solved concrete problems. Especially interesting is the following problem of Durand: "The injectivity problem of cellular automata on bounded size is coNP complete. Does the result hold if we consider instead the size of the transition table, the smallest program which computes its transition table?" This problem has surprisingly a positive answer.

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Personally, the elegant geometric representations are most impressive for the referee, who hopes that Stefano Cavagnetto develops these ideas further and makes them available in adequate publications.

The referee suggests without any restraint to accept this thesis for awarding the doctoral degree.

Sincerely yours



Matthias Baaz