

Automated Synthesis of a Tableaux Theorem Prover for Classical Propositional Logic using Coq

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Abstract. Proving or disproving that a formula is a theorem in a logical system is an essential process in many areas of applied logic. Theorem provers utilising the tableau method is one common way that this is done for a variety of logical systems. We describe a framework in Coq which can be used to synthesise tableau-based theorem provers for various logical systems. The main novelty of using this framework to implement a theorem prover is the following. Firstly, to synthesise an interactive theorem prover using the framework, only the grammar of the formula and rule set of the logical system is needed. Secondly, that the underlying implementation of the rule set used to define the logical system of the theorem prover is in Coq. Subsequently, this allows the framework and the user to prove various properties about the synthesised theorem prover in Coq, such as the correct correspondence between the rule set and the synthesis theorem prover and the completeness and soundness of the rule set with respect to the logical system being defined. We demonstrate this framework in Coq by implementing the standard tableau calculus for classical propositional logic.

1 Introduction

2 Preliminaries