Analytic Tableaux for Higher-Order Logic with Choice

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Abstract While many higher-order interactive theorem provers include a choice operator, higher-order automated theorem provers so far have not. In order to support automated reasoning in the presence of a choice operator, we present a cut-free ground tableau calculus for Church's simple type theory with choice. The tableau calculus is designed with automated search in mind. In particular, the rules only operate on the top level structure of formulas. Additionally, we restrict the instantiation terms for quantifiers to a universe that depends on the current branch. At base types the universe of instantiations is finite. Both of these restrictions are intended to minimize the number of rules a corresponding search procedure is obligated to consider. We prove completeness of the tableau calculus relative to Henkin models.

1 Introduction

Interactive theorem provers based on classical higher-order logic (e.g., Isabelle-HOL [26], HOL88 [17], HOL-light [18], ProofPower [22] and HOL4 [28]) build in the axiom of choice by including a form of Hilbert's ε binder and appropriate

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