

Working Principles of Proof Assistants and Formalization of some proofs in Agda

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July 3, 2025

Abstract

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1 Introduction

2 Foundations

2.1 Logic Foundations

This work assumes prior knowledge of Propositional and Predicate Logic.

2.1.1 Natural Deduction

The propositions or formulas in Propositional Logic can be verified or proved simply by constructing their truth tables. But for logically complex propositions or propositions with many atomic statements, it becomes difficult to construct a truth table. With predicates, this becomes impossible. Therefore, to mitigate this we adhere to a basic set of inference rules with which we derive conclusions from assumptions in step by step, structured manner. The rule based system which allows us to reason about logical structure of propositions is known as **Natural Deduction**.

With the rules in (refer sth, either appendix or a book) we now present an example on how a proof is carried out, (write a proof here).(also use law of excluded middle here)

The above works for propositional case, now adding these Introduction and Elimination rules for quantifiers, we get a set of rules enough for predicate logic. (write extra rules) as in (refer)

and a proof as (proof with quantifiers)

The **soundness** and **completeness** of this system are discussed here (refer).

2.1.2 Intuitionistic Logic

3 General Architecture of Proof Assistants

4 Upon Some Proof Assistants and Comparative Study

4.1 Coq

4.2 Lean

4.3 Isabelle

4.4 Agda

5 Agda

6 Formalization of Some Proofs

References