Comparison of two theorem provers: Isabelle & Coq

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Foundations of Formal Approach

The Formal System
Properties of a Formal
System

Classical and Intuitionistic

wo Theorem

Isabelle

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Comparison of the Theorem Provers

Common Features

Major Difference

Outline

Foundations of Formal Approach

The Formal System
Properties of a Formal System
Classical and Intuitionistic Logics

Two Theorem Provers

Isabelle

Coq

Comparison of the Theorem Provers

Common Features Major Differences Comparison of two theorem provers: Isabelle & Coq

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Major Differences

Summarv

Definition of the Formal System

- ► // TODO
- My second point.

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Foundations of Formal Approach

The Formal System
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Common Feature

Major Difference

Properties of a Formal System

A formal system $\Gamma = \langle A, V, \Omega, R \rangle$ is called:

- if $\exists \phi \in \Gamma : \Gamma \vdash \phi \land \Gamma \vdash \neg \phi \Leftrightarrow \Gamma \nvdash \bot :$ consistent.
- complete, if $\forall \phi \in U : A \vdash \phi \lor A \vdash \neg \phi$;
- ▶ independent. if $\exists a \in A : A \vdash a$.

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Properties of a Formal System

Classical and Intuitionistic Logics

```
// Classical: set of axioms
// Intuitionistic: same, but without EM
```

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Common Feature Major Differences

Isabelle: First Acquaintance

- a generic proof assistant
- ▶ a successor of HOL theorem prover //TODO: cite
- created in 1986 by
 - Larry Paulson @ University of Cambridge, and
 - ► Tobias Nipkow @ Technische Universität München
- based on classical higher-order logic
- ▶ uses powerful functional language HOL
- ▶ has large collection of formalised theories //TODO: HOL, ZF, CCL, ...

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Comparison of the Theorem Provers

Major Differences

Major Differences

Coq: First Acquaintance

- a formal proof management system
- created at INRIA (Paris, France) in 1984
- based on Calculus of Inductive Constructions theory (an implementation of intuitionistic logic)
- uses powerful functional language Gallina
- has large collection of formalised theories //TODO
- widely used in software verification (proof code extraction)

```
Example 3: Definition of basic datatypes
Inductive False : Prop := . ???
Inductive True : Prop := I : True.

Inductive nat : Type := | 0 : nat | S : nat -> nat.
```

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Theorem Provei Common Features

Major Differences

Summarv

Blocks

Block Title

You can also highlight sections of your presentation in a block, with it's own title

Theorem

There are separate environments for theorems, examples, definitions and proofs.

Example

Here is an example of an example block.

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Major Differences

Summary

- ▶ The first main message of your talk in one or two lines.
- ► The second main message of your talk in one or two lines.
- ▶ Perhaps a third message, but not more than that.
- Outlook
 - Something you haven't solved.
 - Something else vou haven't solved.

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For Further Reading I

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Appendix

For Further Reading

A. Author.

Handbook of Everything.

Some Press, 1990.

S. Someone.

On this and that.

Journal of This and That, 2(1):50-100, 2000.