An Isabelle Overview

Wenzel, Paulson, Nipkow, Krauss, Haftmann, Chaieb, Berghofer, Ballarin, . . .

München & Cambridge
What is Isabelle?

A logical framework based on minimal higher-order logic
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A logical framework based on minimal higher-order logic

Main instances:

- HOL
- ZF
Definitions and proofs in Isabelle/HOL — The Isar language
Topics

- Definitions and proofs in Isabelle/HOL — The Isar language
- Proof automation
Topics

- Definitions and proofs in Isabelle/HOL — The Isar language
- Proof automation
- More …
fun
datatype
inductive
Isar

fun
datatype
inductive
class Type classes
locale Named contexts
Proof Automation

FOL/HOL
Proof Automation

FOL/HOL

- simp & auto
Proof Automation

FOL/HOL

- simp & auto
- sledgehammer
Proof Automation

FOL/HOL

- simp & auto
- sledgehammer
-metis (Hurd)
Proof Automation

FOL/HOL

- simp & auto
- sledgehammer
- metis (Hurd)
- blast
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Arithmetic arith
Proof Automation

FOL/HOL

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Arithmetic arith

Algebra algebra (Harrison/Buchberger/Gröbner)
refute and quickcheck
• refute and quickcheck
• Code generation
refute and quickcheck
Code generation
Other logics:
- `refute` and `quickcheck`
- Code generation
- Other logics:
  - `Nominal` (Urban)
More

- refute and quickcheck
- Code generation
- Other logics:
  - Nominal (Urban)
  - ZF (Kolodynski)
More

- refute and quickcheck
- Code generation
- Other logics:
  - Nominal (Urban)
  - ZF (Kolodynski)
- Archive of Formal Proofs
More

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- Code generation
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- Archive of Formal Proofs
- \LaTeX
Sample Applications

Programming language definitions:
Java and JVM dialect *Jinja* (Klein)
Sample Applications

- Programming language definitions:
  Java and JVM dialect Jinja (Klein)

- Analysis and number theory:
  Prime Number Theorem (Avigad)
Sample Applications

- Programming language definitions: Java and JVM dialect Jinja (Klein)
- Analysis and number theory: Prime Number Theorem (Avigad)
- Hales’ proof of Kepler Conjecture (Bauer, Obua)
Sample Applications

- Programming language definitions: Java and JVM dialect Jinja (Klein)
- Analysis and number theory: Prime Number Theorem (Avigad)
- Hales’ proof of Kepler Conjecture (Bauer, Obua)
- System Verification: VeriSoft (Paul) and L4.verified (Klein)
Conclusion

Hope to see you all at TPHOLs 2009 in Munich!

Wenzel, Paulson, Nipkow, Krauss, Haftmann, ... (München & Cambridge)
Conclusion

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