Towards Certification of Confluence Proofs for Higher-Order Rewrite Systems

- automate higher-order confluence criteria on top of CSI (first-order confluence prover):
  - currently supported are Knuth and Bendix’ criterion, (weak) orthogonality, and development closed systems
- certify confluence proofs by formalizing confluence results in Isabelle/HOL as part of IsaFoR (Isabelle Formalization of Rewriting): focus on first-order criteria that extend to higher-order setting

Automation

Higher-Order Rewrite Systems

- variable binding
- functional variables
- quantifiers, $\lambda$-calculi, process calculi, etc.

Certification

How to Trust Output of Tools?

- formalize results and techniques in proof assistant
- implement check functions with soundness proof
- generate trusted certifier from formalization

Selected Literature

- V. van Oostrom
  Developing Developments
  *Theoretical Computer Science, 175(1):159–181, 1997*
- R. Mayr and T. Nipkow
  Higher-Order Rewrite Systems and their Confluence
- H. Zankl, B. Felgenhauer, and A. Middeldorp
  CSI – A Confluence Tool
- J. Nagele and R. Thiemann
  Certification of Confluence Proofs using CeTa

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