

# CoCo 2023 Participant: CeTA 2.45

René Thiemann, Christina Kohl, and Dohan Kim

Department of Computer Science, University of Innsbruck, Austria

The tool CeTA [4] is a certifier for, among other properties, (non-)confluence of term rewrite systems with and without conditions. Its soundness is proven as part of the formal proof library IsaFoR, the Isabelle Formalization of Rewriting. Below, we present the relevant changes from last year's version (2.42) to this year's version (2.45). For a complete reference of supported techniques we refer to the certification problem format (CPF) and the IsaFoR/CeTA website:

<http://cl-informatik.uibk.ac.at/isafor/>

The development closedness criterion for confluence of left-linear TRSs has now been extended to *almost* development closed critical pairs, allowing a weaker joining condition for overlays [5, Corollary 28]. This result has also been extended for showing commutation of left-linear TRSs. Hence, CeTA now fully supports the results described in [5] for the first-order case. The Isabelle formalization for these extensions is described in [2].

Confluence criteria along with commutation criteria using *parallel critical pairs* [1] have been fully formalized and added to CeTA. In addition to the parallel critical pair condition, CeTA also supports rule labeling with parallel critical pairs for confluence and commutation [6]. Furthermore, compositional confluence criteria as discussed in [3] have been fully formalized and added to CeTA. Note that these confluence criteria subsume many well-known existing confluence criteria as corollaries.

Finally, the following changes have also been added to the current version of CeTA: (i) infeasibility proofs are supported as top-level proof obligations, (ii) decision procedure for (innermost-)right ground termination, (iii) improved bound for solving linear integer arithmetic constraints, (iv) improved efficiency of RPO implementation from cubic to quadratic (for fixed signature), and (v) improved efficiency of WPO implementation from exponential to polynomial.

## References

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