CoCo 2023 Participant: ConfCSR

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ConfCSR is a tool for automatically (dis)proving confluence of context-sensitive rewrite systems (CSTRSs). It was developed as part of a bachelor project at the University of Innsbruck. ConfCSR implements techniques described in [1], namely orthogonality and (non-)joinability of extended μ-critical pairs. The latter also requires proving termination of the CSTRS, for which an external termination tool such as AProVE2 [2] is used.

The procedure for determining joinability of μ-critical pairs searches for common reducts. However, the extended μ-critical pairs also contain so called LH_μ-critical pairs, which are obtained from rules where some variables appear in both active and frozen positions. They take the shape $\ell[x']_p \approx r \Leftarrow x \to x'$, where $\ell \to r$ is a rule of the CSTRS R and x is a variable at an active position p in ℓ which also appears in a frozen position. Such a critical pair is called joinable if $\ell[x']_p\sigma \to \cdot \leftarrow r\sigma$ for all substitutions where $x\sigma \to x'\sigma$. Therefore checking joinability cannot be done via a straight forward search. Instead ConfCSR replaces occurrences of x' and x by fresh constants d and c respectively, and checks if $\ell[x']_p\{x' \mapsto d, x \mapsto c\}$ and $r\{x \mapsto c\}$ are joinable with respect to the CSTRS $R \cup \{c \to d\}$. This criterion is sufficient to check joinability but is not complete.

The source code is freely available at

https://github.com/F200907/ConfCSR

ConfCSR participates in the CSR category of CoCo 2023.

References

[1] Salvador Lucas, Miguel Vítores, and Raúl Gutiérrez. Proving and disproving confluence of context-sensitive rewriting. *Journal of Logical and Algebraic Methods in Programming*, 126:100749, 2022. doi: 10.1016/j.jlamp.2022.100749.

[2] Jürgen Giesl, Cornelius Aschermann, Marc Brockschmidt, Fabian Emmes, Florian Frohn, Carsten Fuhs, Jera Hensel, Carsten Otto, Martin Plücker, Peter Schneider-Kamp, Thomas Ströder, Stephanie Swiderski, and René Thiemann. Analyzing Program Termination and Complexity Automatically with AProVE. *Journal of Automated Reasoning*, 58(1):3–31, 2017. doi: 10.1007/s10817-016-9388-y.