

CoLL-Saigawa: A Joint Confluence Tool*

Nao Hirokawa and Kiraku Shintani

JAIST, Japan

CoLL-Saigawa is a tool for automatically proving or disproving confluence of (ordinary) term rewrite systems (TRSs). The tool, written in OCaml, is freely available from:

<http://www.jaist.ac.jp/project/saigawa/>

The typical usage is: `collsaigawa <file>`. Here the input file is written in the standard WST format. The tool outputs YES if confluence of the input TRS is proved, NO if non-confluence is shown, and MAYBE if the tool does not reach any conclusion.

CoLL-Saigawa is a joint confluence tool of CoLL v1.1 [8] and Saigawa v1.8 [4]. If an input TRS is left-linear, CoLL proves confluence. Otherwise, Saigawa analyzes confluence. CoLL is a confluence tool specialized for left-linear TRSs. It proves confluence by using Hindley's commutation theorem [3] together with the three commutation criteria: Development closeness [2, 9], rule labeling with weight function [10, 1], and Church-Rosser modulo A/C [6]. Saigawa can deal with non-left-linear TRSs. The tool employs the four confluence criteria: The criteria based on critical pair systems [5, Theorem 3] and on extended critical pairs [7, Theorem 2], rule labeling [10], and Church-Rosser modulo AC [6]. Saigawa uses T_1T_2 and MU-TERM to check (relative) termination.¹ A suitable rule labeling is searched by using MiniSmt².

This version of CoLL-Saigawa is still at the experimental stage. Full integration of the two tools is planned for the next version.

References

- [1] T. Aoto. Automated confluence proof by decreasing diagrams based on rule-labelling. In *Proc. 21st RTA*, volume 6 of *LNCS*, pages 7–16, 2010.
- [2] T. Aoto, J. Yoshida, and Y. Toyama. Proving confluence of term rewriting systems automatically. In *Proc. 21st RTA*, volume 5595 of *LNCS*, pages 93–102, 2009.
- [3] J. R. Hindley. *The Church-Rosser Property and a Result in Combinatory Logic*. PhD thesis, University of Newcastle-upon-Tyne, 1964.
- [4] N. Hirokawa. Saigawa: A confluence tool. In *3rd Confluence Competition (CoCo 2014)*, pages 1–1, 2014.
- [5] N. Hirokawa and A. Middeldorp. Commutation via relative termination. In *Proc. 2nd IWC*, pages 29–33, 2013.
- [6] J.-P. Jouannaud and H. Kirchner. Completion of a set of rules modulo a set of equations. *SIAM Journal on Computing*, 15(4):1155–1194, 1986.
- [7] D. Klein and N. Hirokawa. Confluence of non-left-linear TRSs via relative termination. In *Proc. 18th LPAR*, volume 7180 of *LNCS*, pages 258–273, 2012.
- [8] K. Shintani and N. Hirokawa. CoLL: A confluence tool for left-linear term rewrite systems. In *Proc. 25th CADE*, LNAI, 2015. To appear.
- [9] V. van Oostrom. Developing developments. *Theoretical Computer Science*, 175(1):159–181, 1997.
- [10] V. van Oostrom. Confluence by decreasing diagrams converted. In A. Voronkov, editor, *Proc. 19th RTA*, volume 5117 of *LNCS*, pages 306–320, 2008.

*This work is supported by the JSPS KAKENHI Grant Number 25730004.

¹<http://colo6-c703.uibk.ac.at/ttt2/> and <http://zenon.dsic.upv.es/muterm/>

²<http://cl-informatik.uibk.ac.at/software/minismt/>