# Nrbox: System Description for CoCo 2016

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*Nominal rewriting* [4, 5] is a framework that extends first-order term rewriting by a binding mechanism. A distinctive feature of the nominal approach is that $\alpha$-conversion and capture-avoiding substitution are not relegated to meta-level—they are explicitly dealt with at object-level. This makes nominal rewriting significantly different from classical frameworks of higher-order rewriting systems based on 'higher-order syntax'.

Nrbox (Nominal rewriting toolbox) is an automated confluence prover for *nominal rewrite systems (NRSs)*. Nrbox is written in Standard ML of New Jersey (SML/NJ). The tool registered to the category of confluence of nominal rewrite systems that has been adopted as one of the demonstration categories in CoCo 2016. Nrbox proves whether input NRSs are Church-Rosser modulo the $\alpha$-equivalence (CR$\approx_\alpha$) based on the following results (we refer to [1] for the notions and notations):

**Proposition 1** ([7])**.** *Orthogonal and abstract skeleton preserving NRSs are CR$\approx_\alpha$.*

**Proposition 2** ([8])**.** *Linear uniform NRSs are CR$\approx_\alpha$ if $\Gamma \vdash u \to^= \circ \approx_\alpha \circ \leftarrow^* v$ and $\Gamma \vdash u \to^* \circ \approx_\alpha \circ \leftarrow^= v$ for any basic critical pair $\Gamma \vdash \langle u, v\rangle$.*

**Proposition 3** ([8])**.** *Terminating uniform NRS are CR$\approx_\alpha$ iff all basic critial pairs are joinable.*

**Proposition 4** ([6])**.** *Left-linear uniform NRSs are CR$\approx_\alpha$ if $\Gamma \vdash u \mathrel{+\!\!\!\!\!\twoheadrightarrow} \circ \approx_\alpha v$ ($u \mathrel{+\!\!\!\!\!\twoheadrightarrow} \circ \approx_\alpha \circ \leftarrow^* v$) for any inner (resp. outer) basic critical pair $\Gamma \vdash \langle u, v\rangle$.*

Termination of NRSs is proved by encoding the problem into the termination problem of first-order term rewriting, which is explained in [1]. For the comptation of BCPs (basic critical pairs), the equivariant unification algorithm [3] is required; our equivariant unification procedure is based on the algorithm explained in [2].

## References

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