AGCP

System Description for CoCo 2016

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AGCP (Automated Ground Confluence Prover)

A ground confluence prover for many-sorted TRSs

- **Available from**
  http://www.nue.ie.niigata-u.ac.jp/tools/agcp/

- **SML/NJ is used for the implementation.** **Some program code are incorporated from confluence prover ACP [Aoto et al., 2009], and an inductive theorem prover [Aoto, 2008].**

- **entrant of Demo(GCR) category**

- **Criteria:**

  (1) $\mathcal{R}$ is GCR if $\mathcal{S} \subseteq \mathcal{R}$ is GCR and $\mathcal{R} \setminus \mathcal{S}$ is a set of inductive theorems of $\mathcal{S}$.

  (2) terminating $\mathcal{S}$ is GCR if all critical pairs of $\mathcal{S}$ are bounded ground convertible.

  Terms s and t are *bounded ground convertible* wrt $\succsim$ if $s\sigma_g \overset{*}{\leftrightarrow}_{\succsim \mathcal{R}} t\sigma_g$ holds for any ground substitution σ_g, where $s_g \overset{*}{\leftrightarrow}_{\succsim \mathcal{R}} t_g$ if $s_g = u_0 \leftrightarrow_{\mathcal{R}} u_1 \leftrightarrow_{\mathcal{R}} \cdots \leftrightarrow_{\mathcal{R}} u_n = t_g$ such that for any i, either $s \succsim u_i$ or $t \succsim u_i$.

- **Method:**

  an extension of rewriting induction is used for proving both (1) and (2).

Rewriting Induction for GCR

Suppose $\mathcal{R}$ is terminating and quasi-reducible. Let $\succsim$ be a reduction quasi-order with $\mathcal{R} \subseteq \succ$. Then, $\mathcal{R}$: GCR if $\langle \mathrm{CP}(\mathcal{R}), \emptyset \rangle \overset{*}{\rightsquigarrow} \langle \emptyset, H \rangle$.

$$\frac{\left\langle E \uplus \{s \doteq t\},\ H \right\rangle}{\left\langle E \cup \{s_i' \doteq t_i\}_i,\ H \cup \{s \to t\} \right\rangle} \quad \begin{array}{l} u \in \mathcal{B}(s), \\ \{s_i \to t_i\}_i = \mathrm{Expd}_u(s,t), \\ s_i \xrightarrow{*}_{H \cup \mathrm{inv}(H)^{\succsim}} s_i' \end{array}$$

$$\frac{\left\langle E \uplus \{s \doteq t\},\ H \right\rangle}{\left\langle E \cup \{s' \doteq t\},\ H \right\rangle} \, s \to_{\mathcal{R} \cup H^{\succ}} \circ \xrightarrow{*}_{H \cup \mathrm{inv}(H)^{\succsim}} s'$$

$$\frac{\left\langle E \uplus \{s \doteq t\},\ H \right\rangle}{\langle E,\ H \rangle} \, s \overset{=}{\leftrightarrow}_H t$$