

ACP

System Description for CoCo 2014

Takahito Aoto and Yoshihito Toyama
(Tohoku University)

ACP (Automated Confluence Prover)

- A confluence tool for first-order TRSs developed in Toyama-Aoto group in Tohoku University
- Written in Standard ML of New Jersey (SML/NJ)
- Implementing multiple direct methods and divide-and-conquer methods
- Source code and SML/NJ heap images available at <http://www.nue.riec.tohoku.ac.jp/tools/acp/>

Development of ACP

0.10(2009)–0.20(2010)–0.30(2012)–0.40(2013)–0.50(2014)

Divide-and-conquer criteria:

- commutative decomposition (Toyama,1988)
- layer-preserving decomposition (Ohlebusch,1994)
- persistent decomposition (Toyama,1987)-(Aoto&Toyama,1997)

Direct confluence criteria:

- Knuth-Bendix criterion (Knuth&Bendix,1970)
- Gramlich-Ohlebusch criterion (Gramlich,1995)
- Linear strongly closed TRSs (Huet,1980)
- Criterion based on parallel critical pairs (Toyama,1981)
- Simple-right-linear non-E-overlapping TRSs (Ohta&Oyamaguchi&Toyama,1995)
- Left-linear development closed TRSs (Huet,1980)-(Toyama,1988)-(van Oostrom,1997)
- Criterion based on simultaneous critical pairs (Okui,1998)
- Strongly depth-preserving non-E-overlapping TRSs (Gomi&Oyamaguchi&Ohta,1996)
- Strongly weight-preserving/depth-preserving root-E-closed TRSs

(Gomi&Oyamaguchi&Ohta,1998)

- **Left-linear upside-parallel-closed or outside-closed TRSs** (Oyamaguchi&Ohta,2004)
- **Decreasing diagrams based on rule-labelling** (van Oostrom,2008)-(Aoto,2010)
- **Weakly-non-overlapping non-collapsing shallow TRSs** (Sakai&Ogawa,2010)
- **Reduction-preserving completion** (Aoto&Toyama,2012)
- **Quasi-left-linear and parallel-closed TRSs** (Suzuki&Aoto&Toyama,2013)
- **Strongly-quasi-linear and hierarchically decreasing TRSs**
(Aoto&Toyama&Uchida,to appear in 2014)
- **Quasi-linear and linearized-decreasing TRSs** (Aoto&Toyama&Uchida,to appear in 2014)

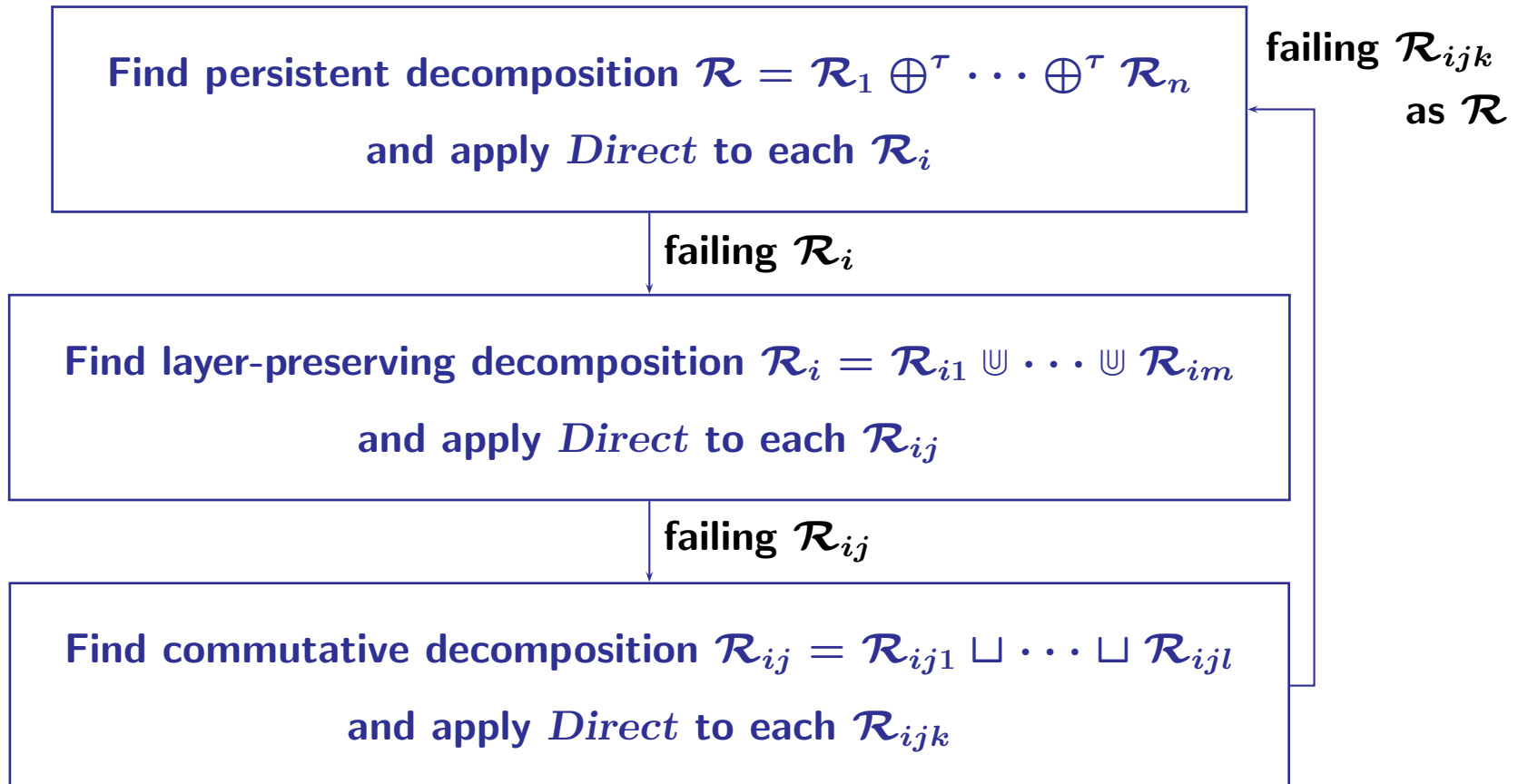
Direct non-confluence criteria:

- **A simple non-confluence criterion** (absolute)
- **Disproving by direct approximations using tcap/root**
- **Disproving by tree-automata (growing) approximation**
(Jacquemard,1996)-(Durand&Middeldorp,1997)
- **Disproving by interpretation and ordering** (Aoto,2013)

Certifier output:

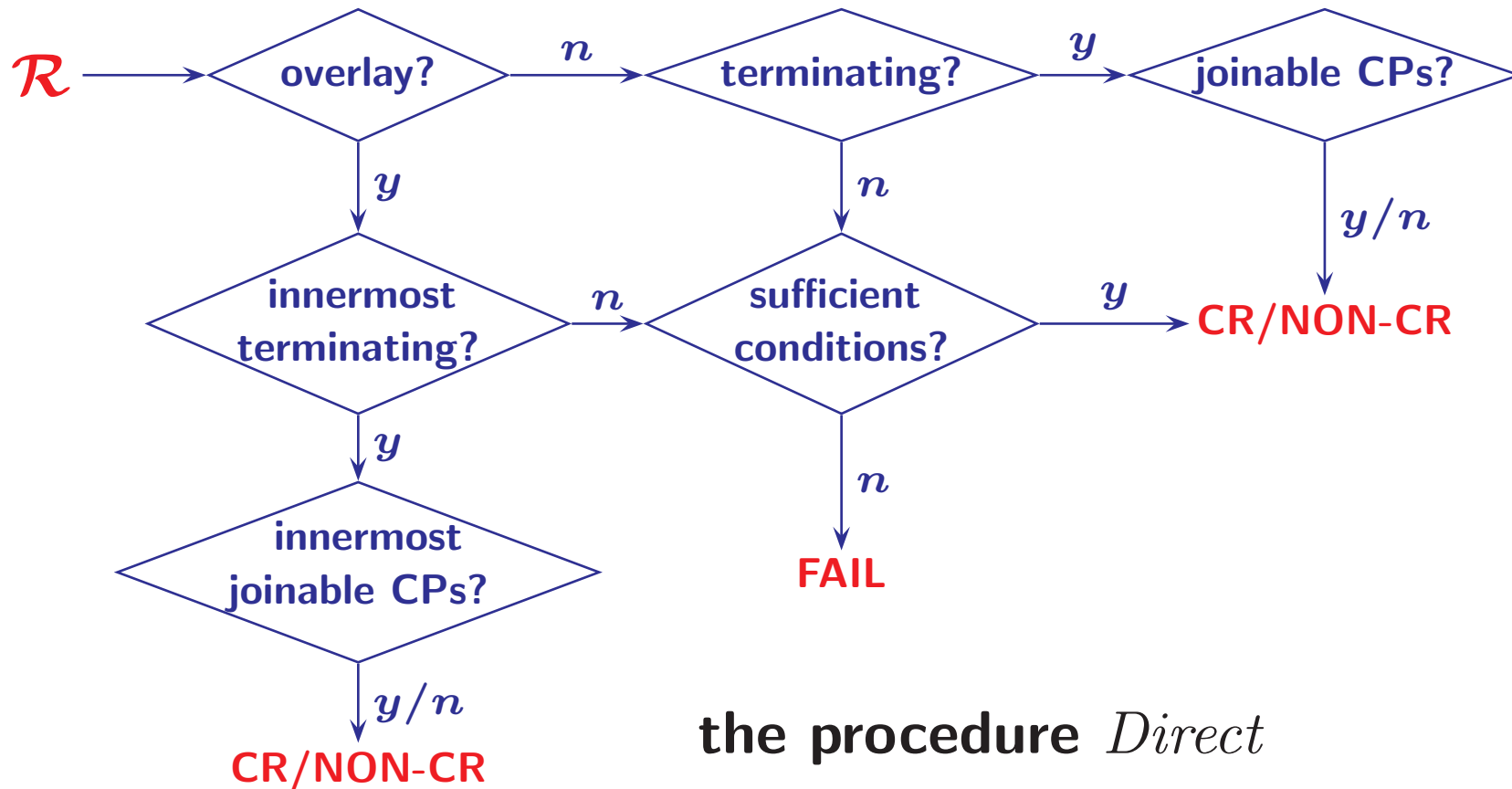
- **(under development, but some contributions to certification problems of CoCo 2014)**

Organizing Divide-and-Conquer Methods



(Three successive failures of decomposition \Rightarrow FAIL)

Organizing Direct Methods



```
$ sml @SMLload=acp.x86-linux --help
```

```
acp v0.50
```

```
-h          --help          print this message
-v 0|1|2|3  --verbose=0|1|2|3    verbosity level [0:YES/NO/MAYBE,1(default):YES/NO/MAYBE+explanation,2
                --ps=0|1|no|yes    use persistent decomposition [default:yes]
                --lp=0|1|no|yes    use layer-preserving decomposition [default:yes]
                --cm=0|1|no|yes    use commutative decomposition [default:yes]
                --nm=0|1|no|yes    with non-minimal commutative decomposition [default:no]
-d          --direct          equivalent to --ps=0 --lp=0 --cm=0
-t int      --timer=int       specify the time limit in seconds [default:0 (no-limit)]
                --minisat-path=path  specify an executable minisat [default:./minisat]
                --yices-path=path    specify an executable yices [default:./yices]
                --tmp-dir=path       specify a directory for putting temporal files [default:.]
                --termination-prover=path  specify an external termination prover [default:(internal)]
                --relative-termination-prover=path  specify an external relative termination prover [default:(internal)]
-r          --reset          turn off all criteria by default (use before enable options)
                --enable-KB          (Knuth&Bendix,1970)
                --enable-strong      (Huet,1980) strongly closed
                --enable-modulo      (Huet,1980) Church-Rosser modulo
                --enable-parallel    (Toyama,1981) parallel critical pairs
                --enable-simple      (Ohta&Oyamaguchi&Toyama,1995) simple-right-linear
                --enable-development (Huet,1980)-(Toyama,1988)-(van Oostrom,1997) development closed
                --enable-simultaneous (Okui,1998) simultaneous critical pairs
                --enable-depth       (Gomi&Oyamaguchi&Ohta,1996/1998) strongly depth-preserving
                --enable-weight      (Gomi&Oyamaguchi&Ohta,1998) strongly weight-preserving
                .....

```

Thank you!