Report on Jančar's "CAK-group" at ES-meeting in 10/2005

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Results in 2005

A journal article:

- Sawa Z., Jančar P.: PTIME-hardness of behavioural equivalences on finite state systems; to appear in the journal 'Computing and Informatics', 5/2005, (Bratislava, SK), ISSN 1335-9150
  (final version sent in March 2005)

An article at a solid conference:

- Schäfer M., Vogler W., Jančar P.: Determinate STG Decomposition of Marked Graphs; in Proceedings 26th Int. Conf. on Application and Theory of Petri Nets and Other Models of Concurrency (ICATPN 2005), Miami, FL, June 20-25, 2005, Lecture Notes in Computer Science, Vol. 3536, Springer Verlag 2005, p. 365 - 384
  ISBN: 3-540-26301-2
  acceptance rate 23/71 (32%)

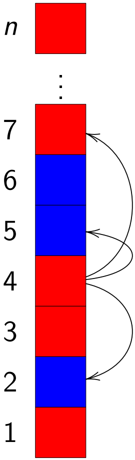
Results in 2005 - cont.

Two papers at international workshops

- Jančar P., Sawa Z.: Distributed bisimilarity on Basic Parallel Processes; presented at AVIS'05 (Automated Verification of Infinite state Systems), April 2005, Edinburgh, GB;
  (Revised version submitted in August 2005 to the special ENTCS-volume.)
- Jančar P., Kot M., Sawa Z.: Notes on complexity of bisimilarity between BPA and BPP; accepted talk at EXPRESS'05 (12th International Workshop on Expressiveness in Concurrency),
  27 August, 2005 San Francisco, USA
  acceptance rate 9/15

Non-success :-(

Parity games (in NP and co-NP)



"A lift game for 2 players"
(a directed graph with ordered nodes;
the nodes are partitioned into red and blue;
each node has out-degree ≥ 1)

in red nodes (floors), player RED chooses the next node (floor)

in blue nodes (floors), player BLUE chooses the next node (floor)

The player winning an infinite play is determined by the colour of the lowest node (floor) visited infinitely often

Who has a winning strategy where ?

The most recent result on parity games (by others)

Marcin Jurdziński, Mike Paterson, and Uri Zwick
"A Deterministic Subexponential Algorithm for Solving Parity Games"
To appear in Proceedings of ACM-SIAM Symposium on Discrete Algorithms, SODA 2006, January 2006

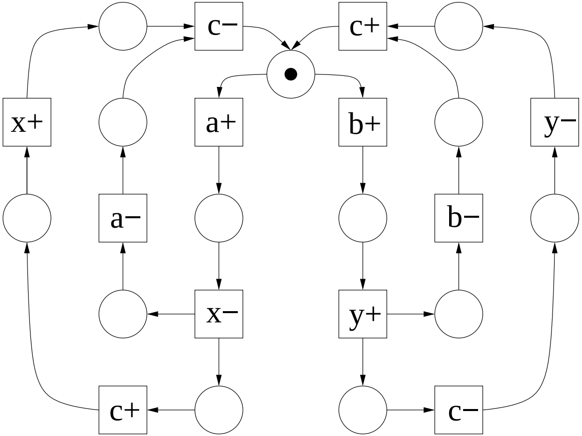
Current work

- Jančar P., Srba J.: Undecidability Results for Bisimilarity on Prefix Rewrite Systems; submitted
- Fröschle S., Jančar P., Lasota S., Sawa Z.: Non-interleaving semantics on Basic Parallel Processes; in preparation
- Jančar P., Kot M., Sawa Z.: Complexity of deciding bisimilarity between BPA and BPP; in preparation
- Esparza J., Jančar P., Miller A.: Complexity of complete state coding problem for signal transition graphs; in preparation

Asynchronous circuits

- For implementation of state dependent circuits
- No clock signal
- Communication with **signal edges** (a^+ raising, a^- falling)
- Distinction between
  - input signals (controlled by the environment)
  - output signals (controlled by the circuit)
- Advantages
  - Average case efficiency instead of worst case efficiency
  - Reduced power consumption
  - Very low electromagnetic emission
- Disadvantage
  - Complex synthesis

Signal transition graphs



Signal Transition Graphs - Definition

- STG $N = (P, T, W, M_N, In, Out, \ell)$
- (P, T, W, M_N) – a Petri net
- In – Input signals
- Out – Output signals
- $\ell : T \to (In \cup Out) \times \{+, -\} \cup \{\lambda\}$ – Labelling

Synthesis by decomposition

Usual synthesis method:

- Design of an STG
- Build the reachability graph RG (often exponential complexity or worse)
- Calculation of next-step equations from the RG

Decomposition approach (to which [SVJ-05] has contributed)

- Splitting of an STG into smaller components by structural modifications
- Each component produces a subset of signals
- All components together behave as the original STG
- Calculation of next-step equations separately for each component (thus avoiding the large reachability graph)
- Decomposition and synthesis of the components is much faster