Coindunction up-to

from concurrency to coalgebra and back

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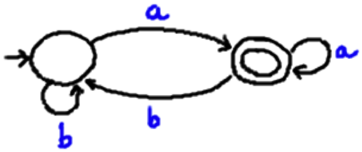
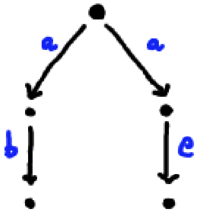
Context

- Automata are basic structures in Computer Science.
- Language equivalence: well-studied, several algorithms.
- Renewed attention (POPL'11, '13, '14).



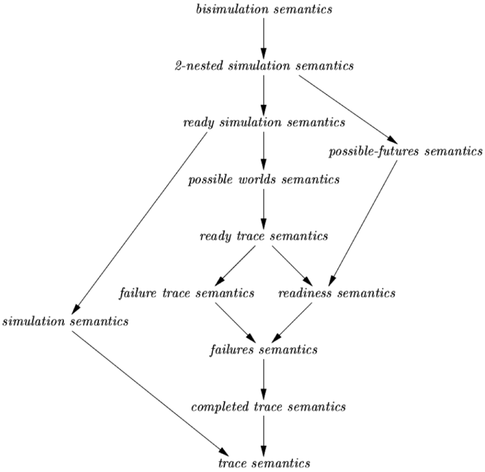
Context

- Concurrency: a spectrum of equivalences.
- Checking usually done by reducing to bisimilarity.



An alternative road

- Many efficient algorithms for equivalence of automata.
- Applications in concurrency?



From automata to concurrency

Various spectrum equivalences

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Language equivalence of a *transformed* system

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Automaton with outputs and structured state space (Moore automata).

Bonsangue, Bonchi, Caltais, Rutten, S. MFPS 12

From automata to concurrency

- Generalization of existing algorithms to Moore automata.
- Brzozowski's and Hopcroft/Karp algorithms for van Glabbeek's spectrum.
- Cleaveland and Hennessy's acceptance graphs for must/may testing = Moore automata.
- Brzozowski's and Hopcroft/Karp algorithms algorithm for must/may testing.

Bonchi, Caltais, Pous, Silva. APLAS 2013

From automata to concurrency

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Bonchi, Caltais, Pous, Silva. APLAS 2013

The approach

Roadmap

1. Automata algorithms applied to concurrency.
2. For the rest of the talk: up-to techniques applied to automata.

Compositionality

$[\![X + Y]\!] = [\![X]\!] + [\![Y]\!]$

Coinduction

Proof principle for infinite structures

Roadmap

1. Automata algorithms applied to concurrency.
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Compositionality	Coinduction
$[\![X + Y]\!] = [\![X]\!] + [\![Y]\!]$	Proof principle for infinite structures