

Complementing Semi-Deterministic Büchi Automata

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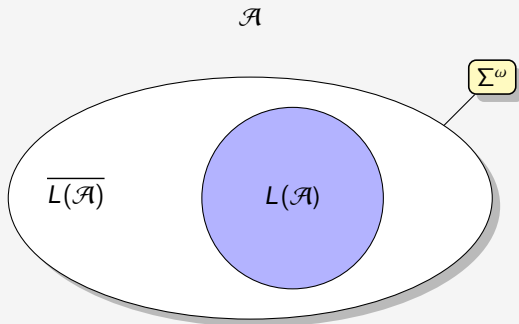
HIGHLIGHTS 2016

Motivation

- ▶ termination analysis in `ULTIMATE BÜCHI AUTOMIZER`

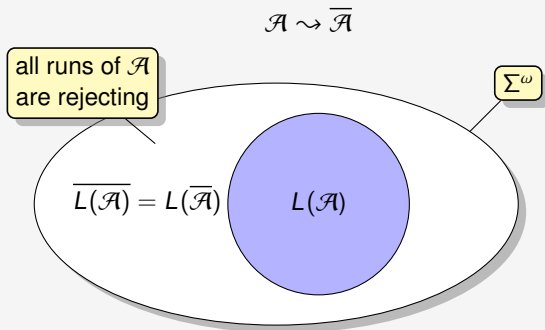
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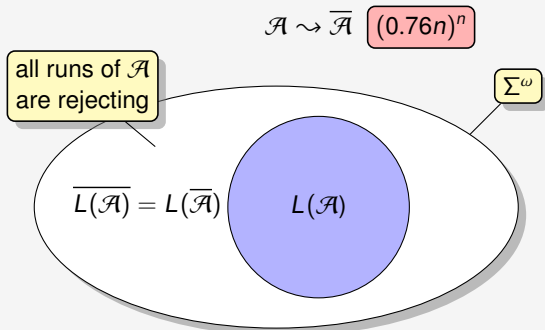
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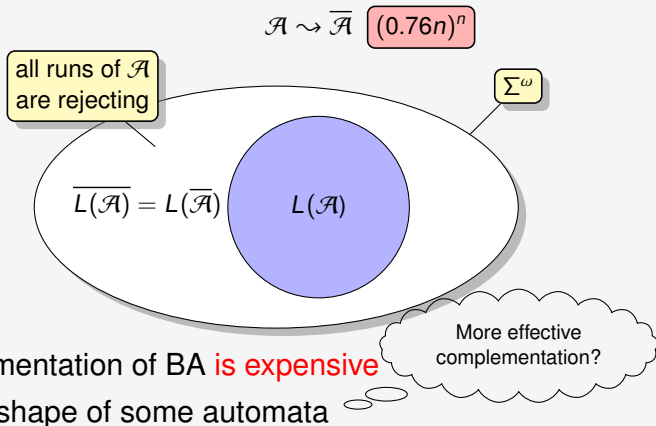
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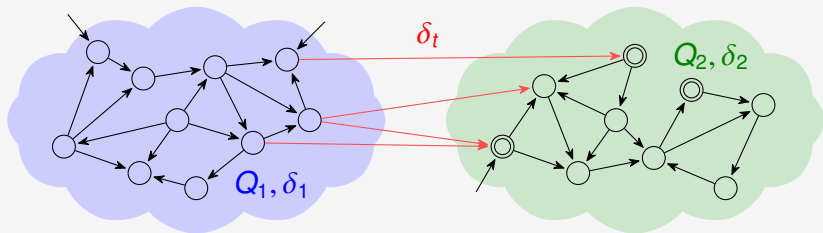
- ▶ complementation of BA **is expensive**

Motivation

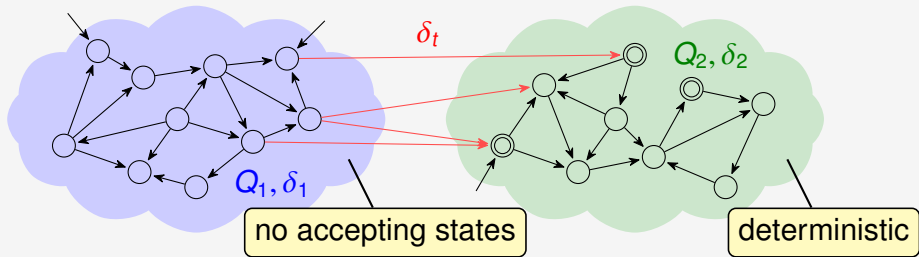
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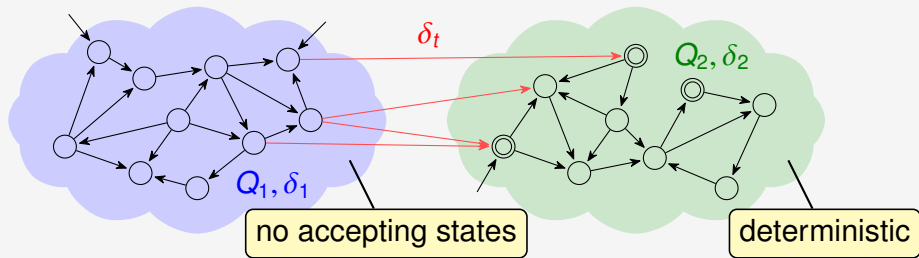
Semi-Deterministic Büchi Automata (SDBA)



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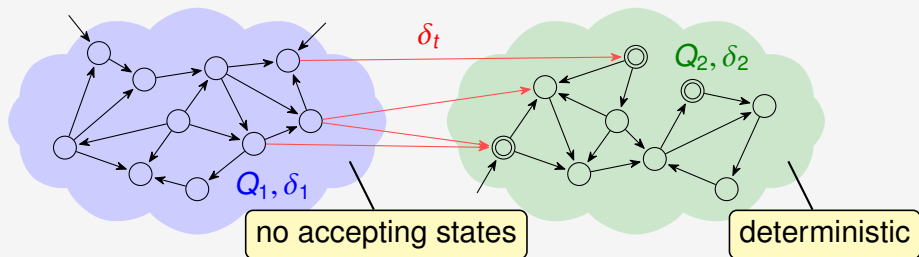
Semi-Deterministic Büchi Automata (SDBA)



A run of an SDBA

1 blocks,

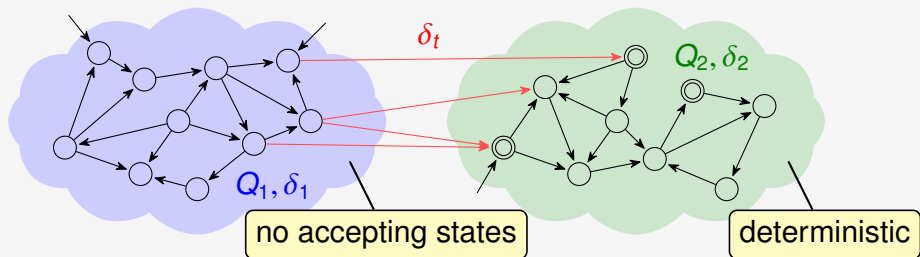
Semi-Deterministic Büchi Automata (SDBA)



A run of an SDBA

- 1 blocks,
- 2 stays in Q_1 ,

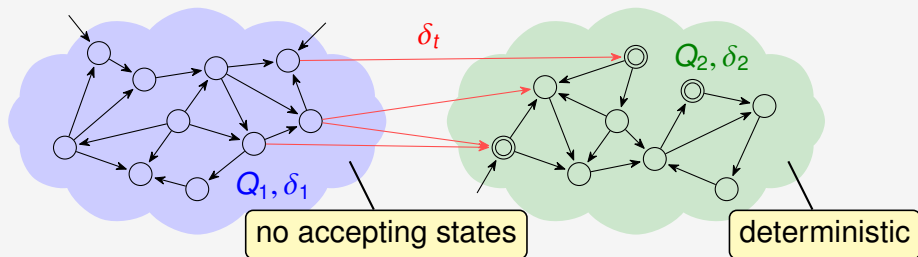
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- 1** blocks,
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- 3** is trapped in non-accepting states of Q_2 , or

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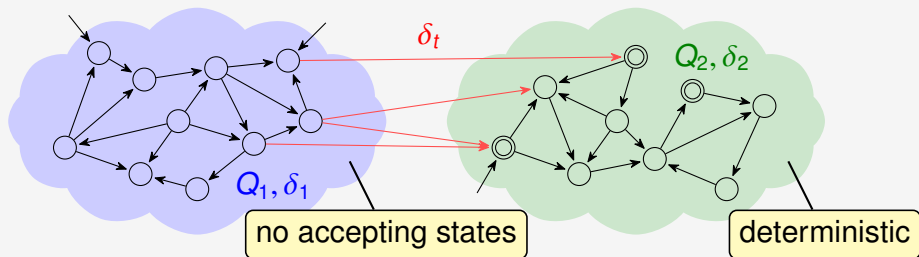


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Safe

Semi-Deterministic Büchi Automata (SDBA)



A run of an SDBA

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- 2** stays in Q_1 ,
- 3** is trapped in non-accepting states of Q_2 , or
- 4** is accepting.

Safe

NCSB complementation for SDBA

follows all possible runs of \mathcal{A}

- 1 blocks
- 2 stays in Q_1
- 3 becomes safe
- 4 accepting

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- ▶ merely extended breakpoint construction
- ▶ less than 4^n states
- ▶ low degree of non-determinism

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 - ▶ improves the performance of `ULTIMATE BÜCHI AUTOMIZER`
 - ▶ can be seen as highly optimized rank-based construction

Evaluation

- ▶ GOAL
- ▶ 91 SDBA from the Termination category of SV-COMP 2015

construction	states	transitions
Ramsey-based		
Rank-based		
Determinization-based		
Slice-based		
NCSB		

Evaluation

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construction	states	transitions
Ramsey-based	16909	848969
Rank-based	2703	21095
Determinization-based	1841	24964
Slice-based	1392	14783
NCSB	950	8003