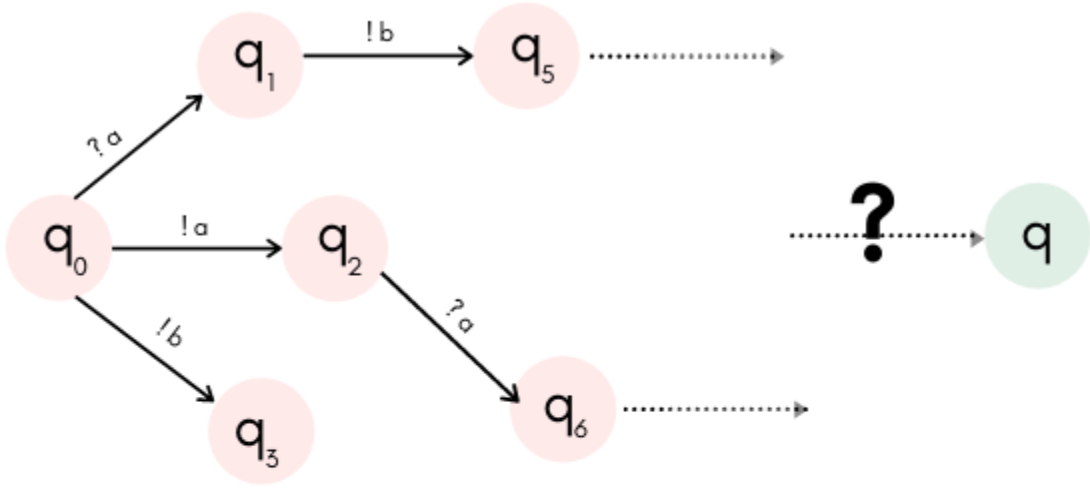
BOUNDED REACHABILITY PROBLEMS ARE DECIDABLE IN FIFO MACHINES

Benedikt Bollig, Alain Finkel, Amrita Suresh
LSV-CNRS and ENS Paris Saclay, Université Paris Saclay

CONCUR 2020 TEASER



Testing the reachability of a configuration in a general FIFO system is undecidable.

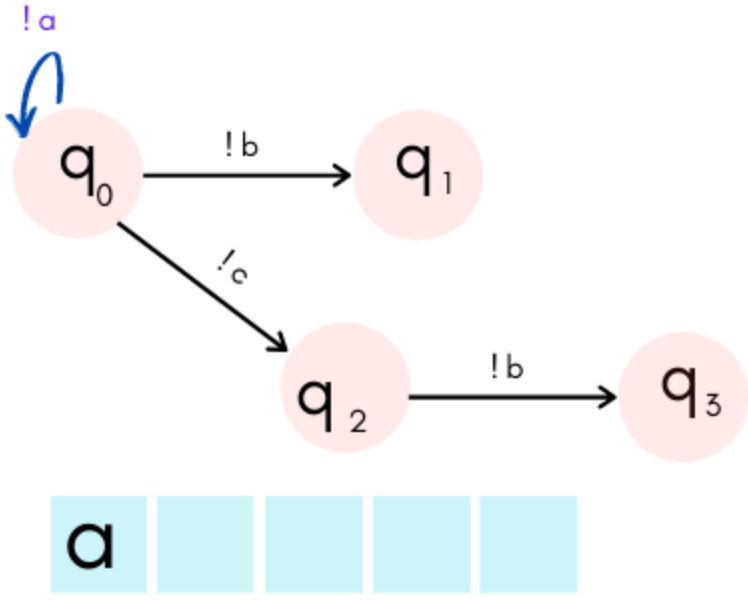
Brand, Zafiropulo 1983

INPUT-BOUNDED RUNS

Input language $\subseteq$ $u^*v^*\ldots w^*$
for u,v, … ,w words in $\sum^*$

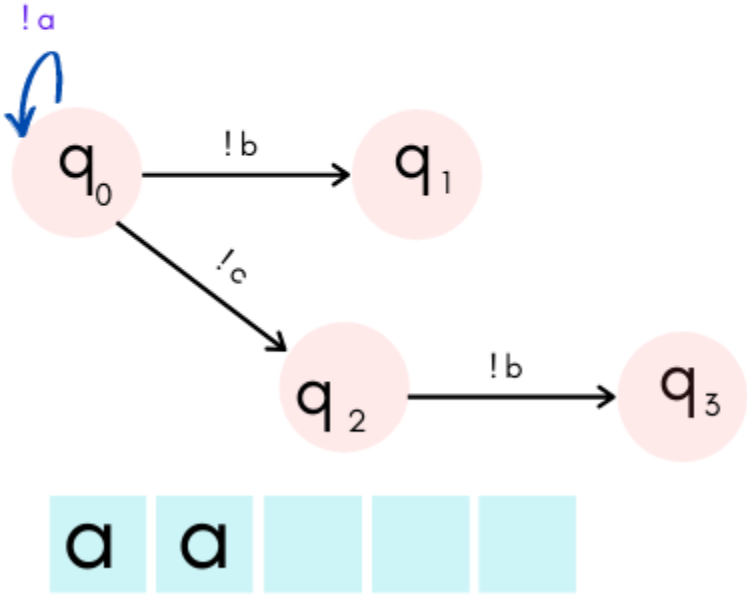
INPUT-BOUNDED RUNS

Example: L = a*(cb)*



INPUT-BOUNDED RUNS

Example: L = a*(cb)*



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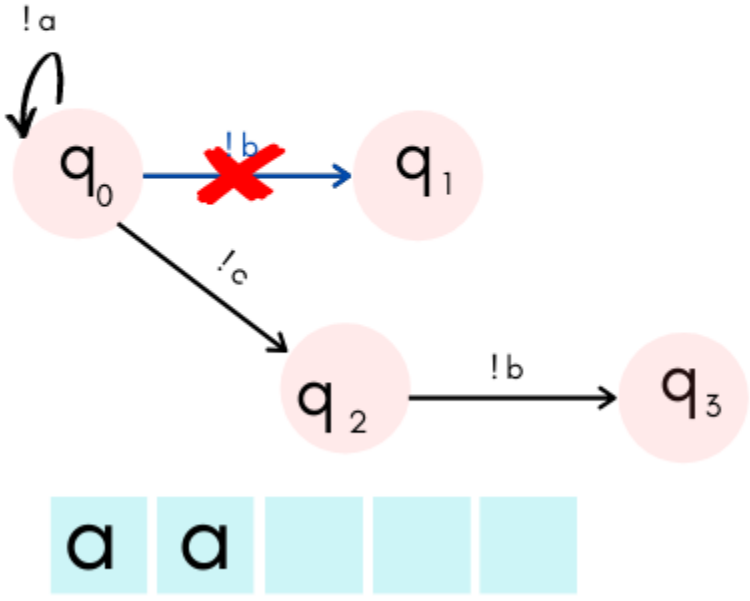

INPUT-BOUNDED RUNS

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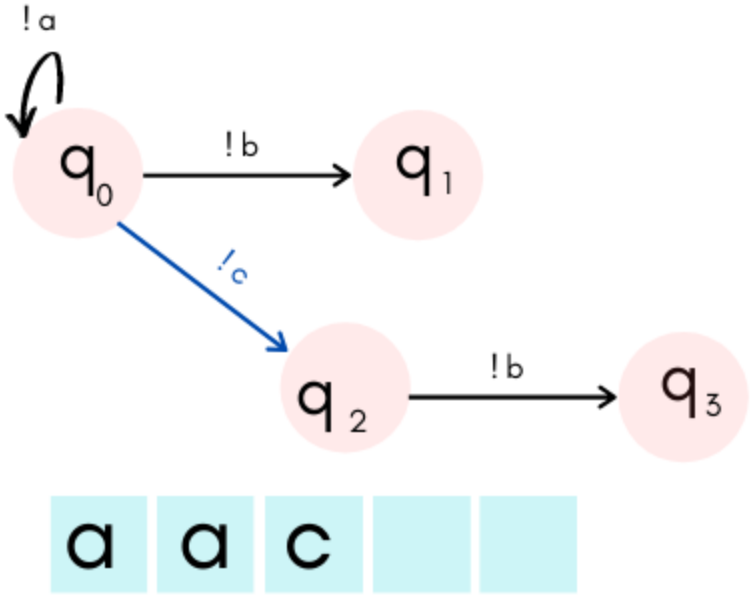
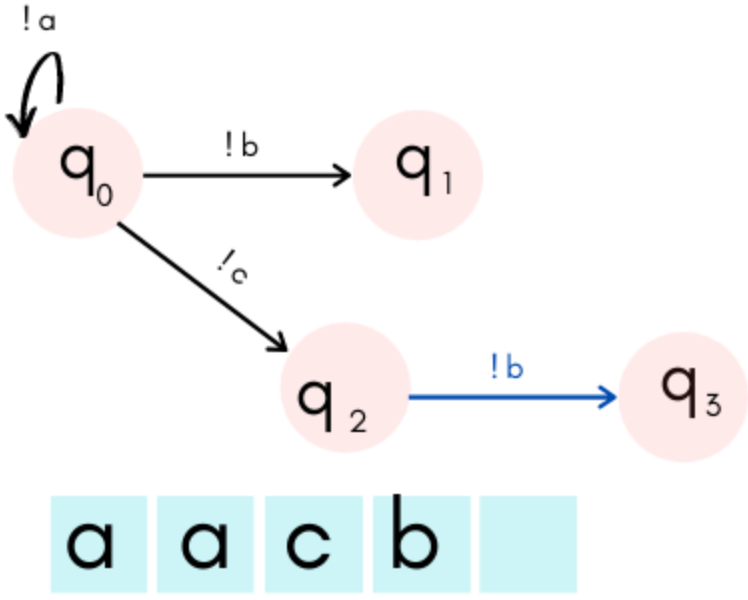


INPUT-BOUNDED RUNS

Example: L = a*(cb)*



Theorem: The Input-Bounded Reachability Problem is decidable.

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Proof by reduction to counter machines with restricted zero tests.

Summary of key results

	Letter-bounded	Bounded $\lvert Ch\rvert = 1$	Bounded $\lvert Ch\rvert > 1$
UNBOUND	D	D	D
TERM	D	**EXPTIME**	**D**
REACH	D	**EXPTIME**	**D, not ELEM**
CS-REACH	D	**EXPTIME**	D

(D stands for Decidable, $\lvert Ch\rvert$ denotes number of channels)


THANK
YOU