Chocolate Automata

first developed at the
conference dinner of AFL 2017

Input-Driven
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Input-Driven Chocolate* Automaton

consider a network of cells with a
vesicle containing as objects
pieces of chocolate of different kinds

*Replace „chocolate" by „P" if you prefer for seriosity

Input-Driven Chocolate Automaton

consider a network of cells with a
vesicle containing as objects
   pieces of chocolate of different kinds

reading input and corresponding actions:

a („push a") → insert chocolates specified by a
b („pop b") → delete chocolate(s) specified by b
c („change state") → move vesicle to the cell
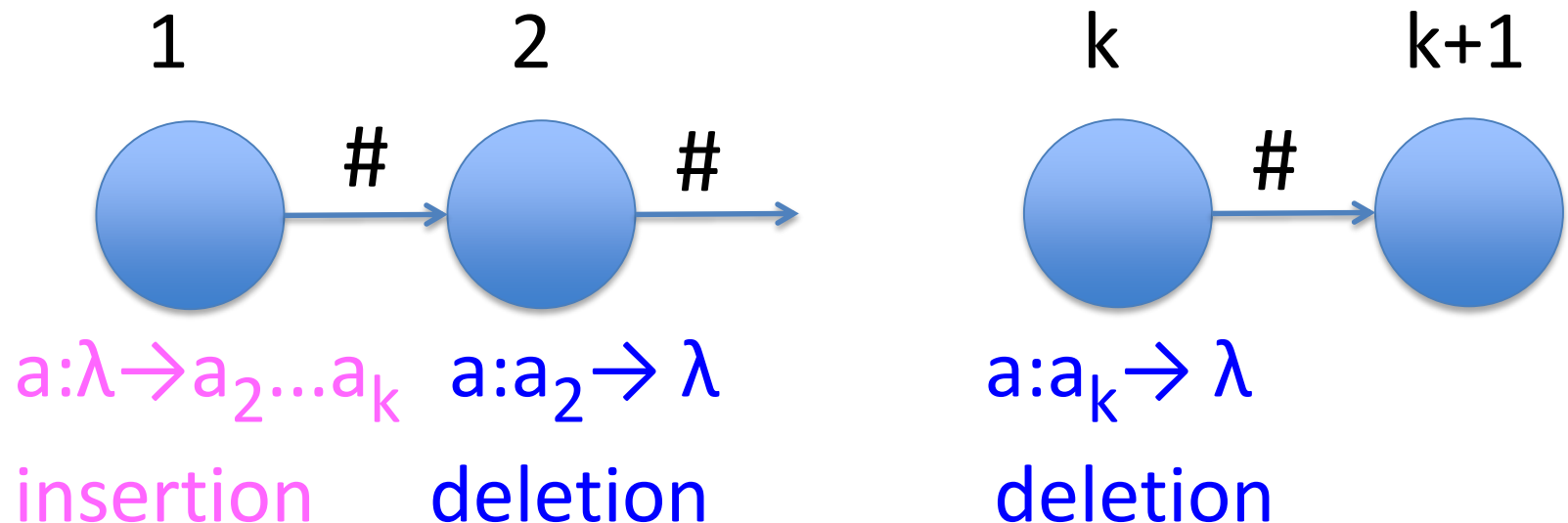   specified by c

Input-Driven Chocolate Automaton
Example (input given on input tape)

for some $k \geq 1$, consider the language

$L = \{ (a^n \#)^k : n \geq 0 \}$

network of cells with $k+1$ cells, start with empty vesicle in 1, accept with empty vesicle in $k+1$

1 2 k $k+1$

$a:\lambda \rightarrow a_2 \ldots a_k$ $a:a_2 \rightarrow \lambda$ $a:a_k \rightarrow \lambda$

insertion   deletion   deletion

Input-Driven Chocolate Automata

can be considered as
input-driven partially blind counter automata /
register machines ("all multisets")

moving to another cell corresponds to changing state

insertion/deletion correspond to
increment/decrement of registers

halting with empty vesicle in a final cell
corresponds to
checking all counters to be empty at the end
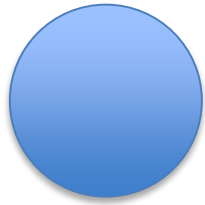having also reached a final state

Input-Driven Chocolate Automaton
Example (input given on input tape)

consider the Dyck language over { (,) }

only one 1 cells, start with empty vesicle in 1, accept with empty vesicle in 1

1

(: $\lambda \rightarrow$ c   ): c $\rightarrow \lambda$
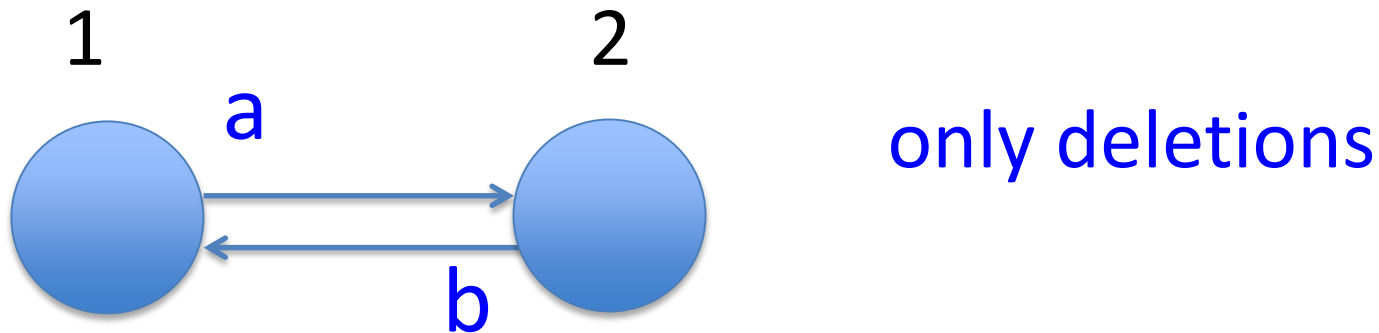insertion   deletion

Input-Driven Chocolate Automaton
Example
(input given as multiset in vesicle)

consider input as the language $L=\{(ab)^n : n \geq 0\}$

network of cells with 2 cells, start with input vesicle in 1, accept with empty vesicle in 1

1   2

a

b

only deletions

L corresponds with Parikh set $\{(n,n) : n \geq 0\}$.

Input-Driven Chocolate Automata Variants

- only move-operations

model corresponds with partially blind register machines only decrementing input registers,

„final move" has to yield an empty vesicle in the final cell

◆ with only one input symbol, we accept exactly the semilinear sets

◆ only one cell: only T^o

Input-Driven Chocolate Automata Variants

- multihead automata

- restarting automata

- ...

Chocolate Automata

say thank you and invite you
to eat some more chocolate!