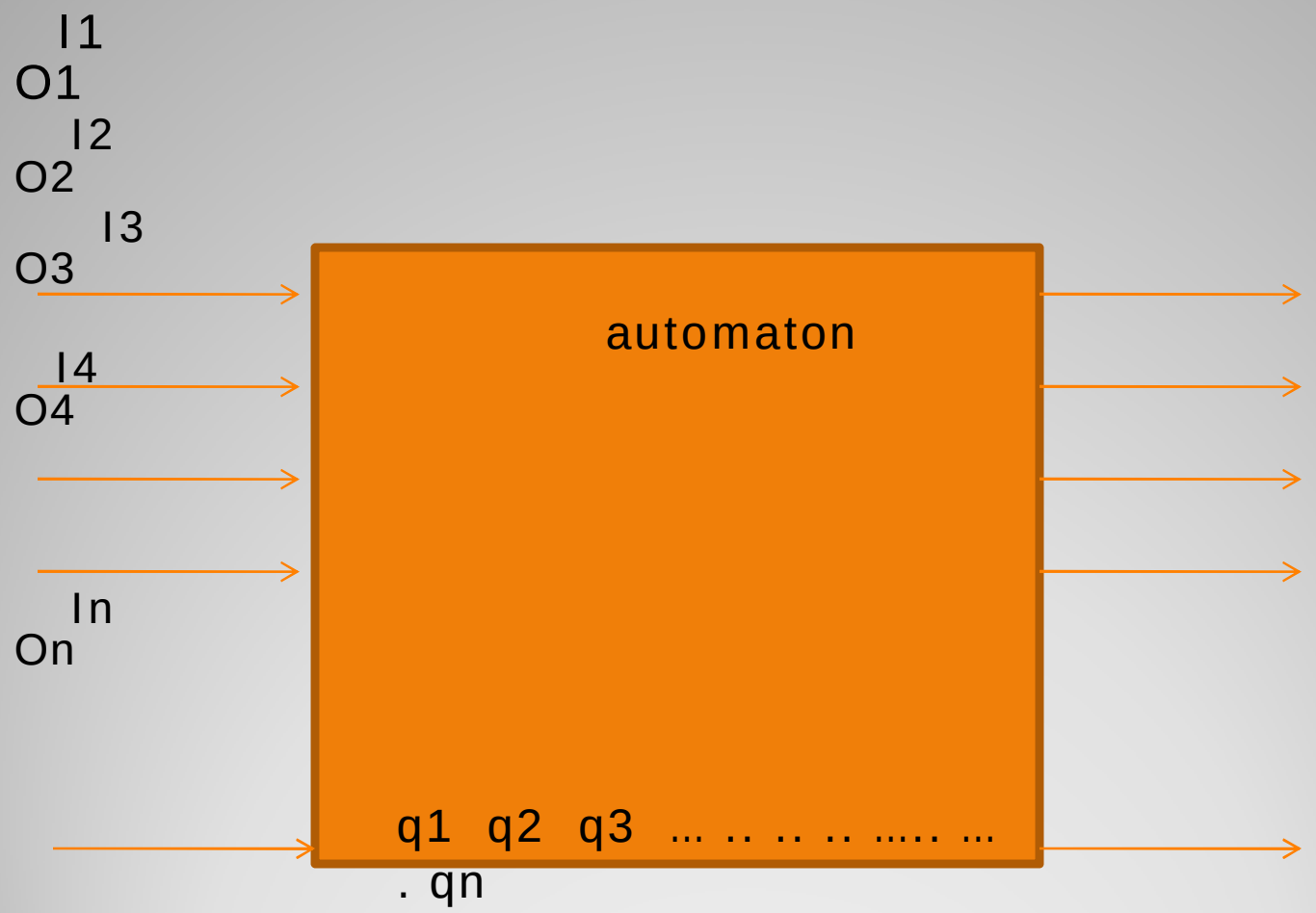
THE THEORY OF AUTOMATA

Introduction

- Definition Of an automata
- Finite Automaton
- State(transition) Diagram

Definition of an automaton

- An automaton is a system where energy, material and information are transformed, transmitted and used for performing some function without direct participation of man.


I1
O1
I2
O2
I3
O3
I4
O4
In
On
automaton
q1 q2 q3 ... .
. qn

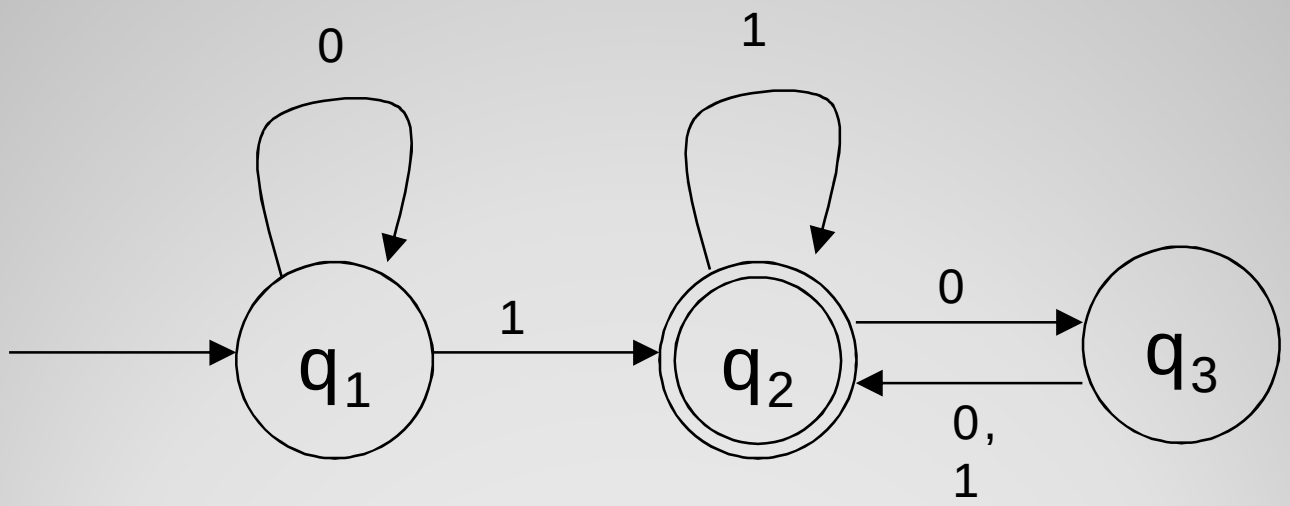
- Input
- Output
- State
- State Relation
- Output Relation

Finite Automaton

A ***finite automaton*** is a 5-tupple $(Q, \Sigma, \delta, q_0, F)$, wh

1. Q is a finite set called the ***states***,
2. Σ is a finite set called the ***alphabet***,
3. $\delta : Q \times \Sigma \to Q$ is the ***transition function***,
4. $q_0 \in Q$ is the ***start state***, and
5. $F \subseteq Q$ is the ***set of accept states***.

State(transition) Diagram



Data Representation

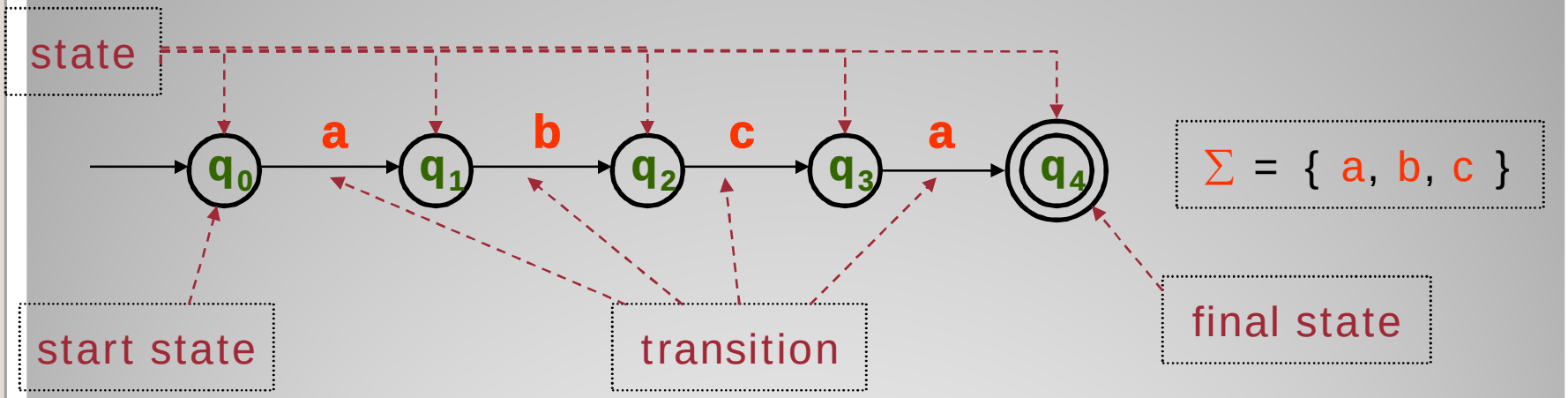
1. $Q = \{q_1, q_2, q_3\}$
2. $\Sigma = \{0,1\}$
3. δ is described as

	0	1
q_1	q_1	q_2
q_2	q_3	q_2
q_3	q_2	q_2

,

4. q_1 is the start state, and
5. $F = \{q_2\}$.

Finite-state Automata

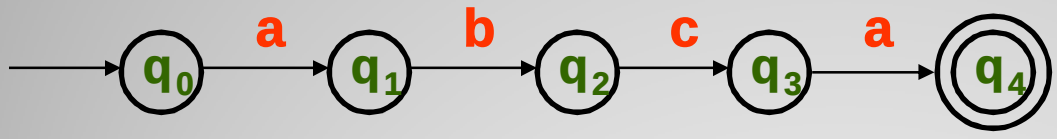


- Representation
  (continued)
  - An FSA may also be represented with a state-transition table. The table for the above FSA:

State	Input a	b	c
0	1	∅	∅
1	∅	2	∅
2	∅	∅	3
3	4	∅	∅
4	∅	∅	∅

Finite-state Automata

Σ = { a, b, c }



State	Input a	b	c
0	1	∅	∅
1	∅	2	∅
2	∅	∅	3
3	4	∅	∅
4	∅	∅	∅

IS_1:

a	b	c	a

IS_2:

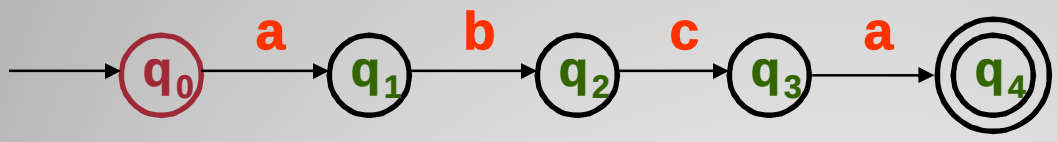
c	c	b	a

IS_3:

a	b	c	a	c

Finite-state Automata

Σ = { a, b, c }



State	Input a	b	c
0	1	∅	∅
1	∅	2	∅
2	∅	∅	3
3	4	∅	∅
4	∅	∅	∅

IS_1:

a	b	c	a

IS_2:

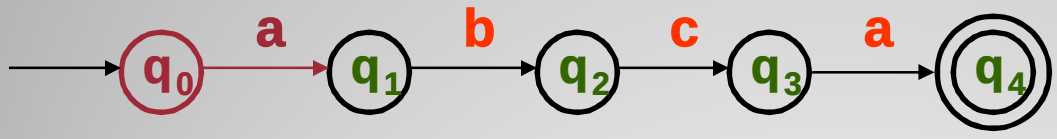
c	c	b	a

IS_3:

a	b	c	a	c

Finite-state Automata

$\Sigma = \{ a, b, c \}$



State	Input a	b	c
0	1	∅	∅
1	∅	2	∅
2	∅	∅	3
3	4	∅	∅
4	∅	∅	∅

IS_1:

a	b	c	a

IS_2:

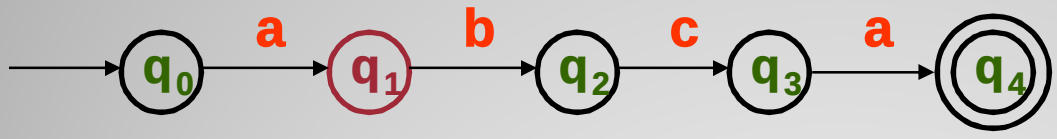
c	c	b	a

IS_3:

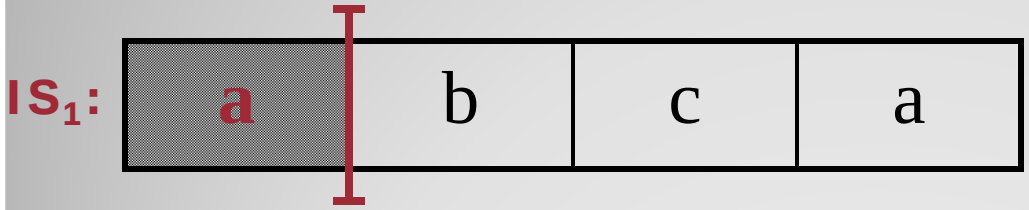
a	b	c	a	c

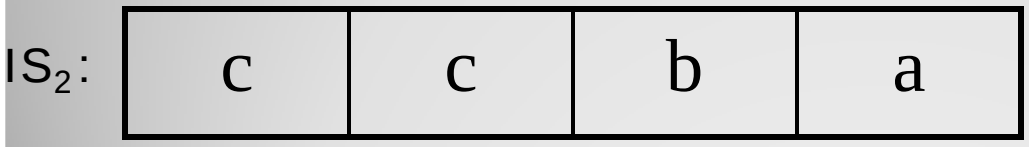
Finite-state Automata

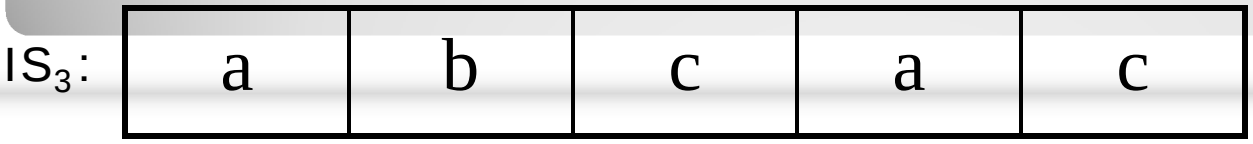
$\Sigma = \{ a, b, c \}$



State	Input a	b	c
0	1	∅	∅
1	∅	2	∅
2	∅	∅	3
3	4	∅	∅
4	∅	∅	∅

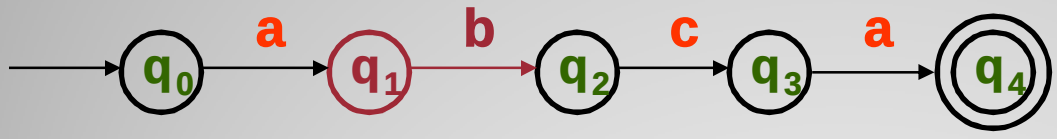






Finite-state Automata

Σ = { a, b, c }



State	Input a	b	c
0	1	∅	∅
1	∅	2	∅
2	∅	∅	3
3	4	∅	∅
4	∅	∅	∅

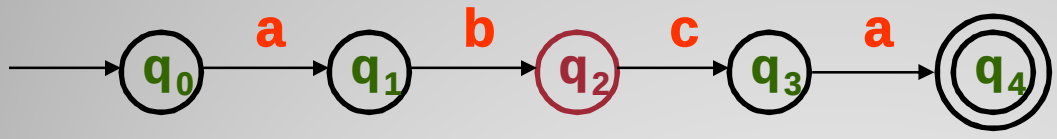
IS_1: a | b | c | a

IS_2: c | c | b | a

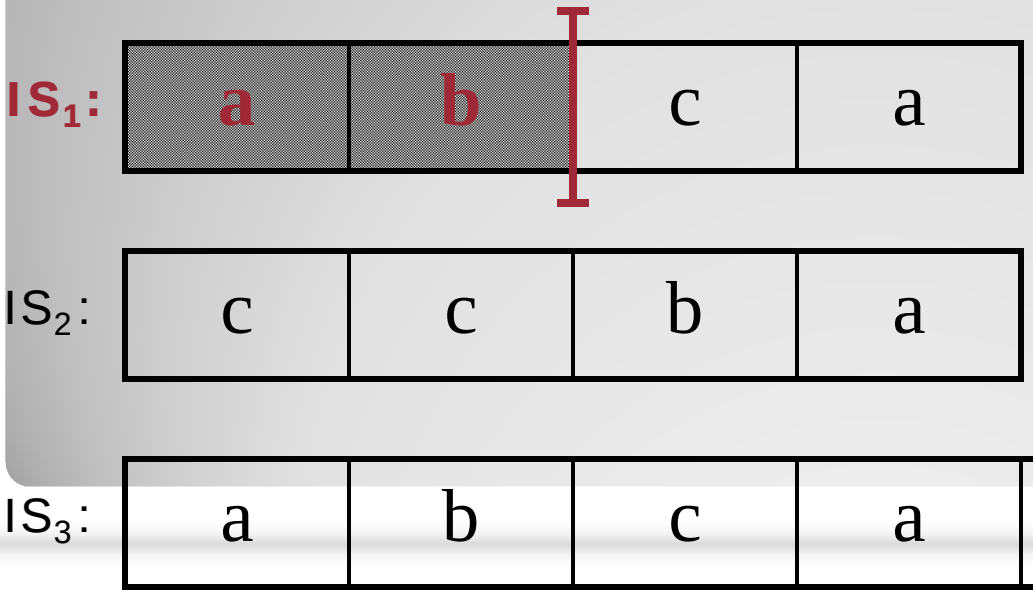
IS_3: a | b | c | a | c

Finite-state Automata

Σ = { a, b, c }

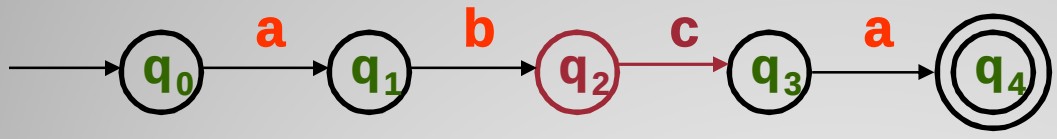


State	Input a	b	c
0	1	∅	∅
1	∅	2	∅
2	∅	∅	3
3	4	∅	∅
4	∅	∅	∅



Finite-state Automata

$\Sigma = \{ a, b, c \}$



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0	1	∅	∅
1	∅	2	∅
2	∅	∅	3
3	4	∅	∅
4	∅	∅	∅

IS_1:

a	b	c	a

IS_2:

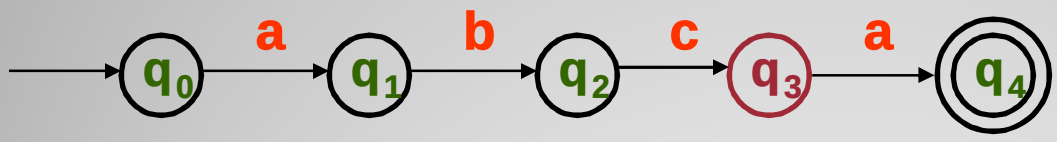
c	c	b	a

IS_3:

a	b	c	a	c

Finite-state Automata

Σ = { a, b, c }



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2	∅	∅	3
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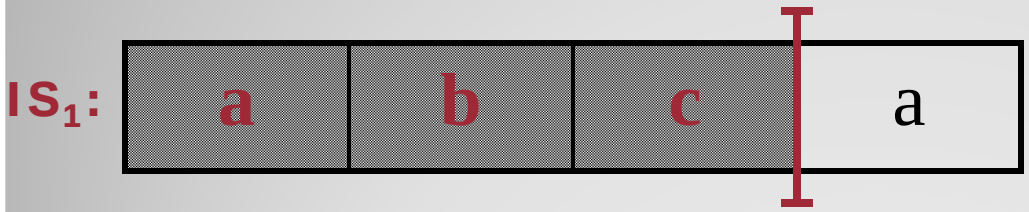

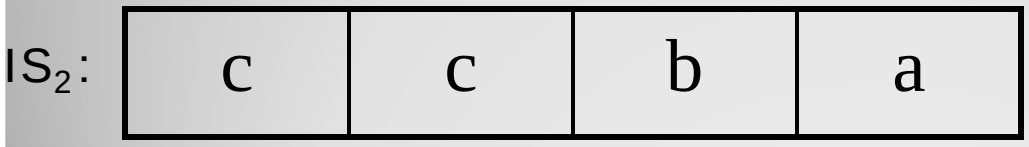

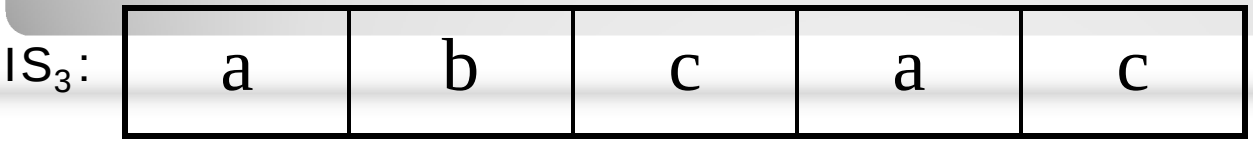

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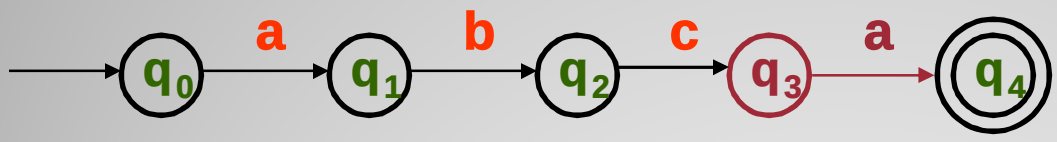

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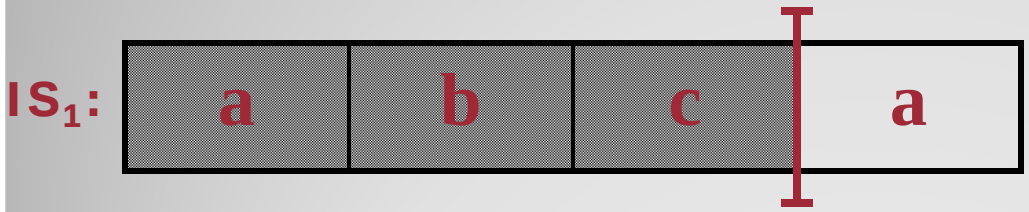

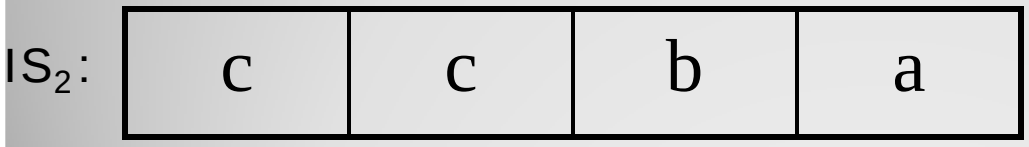

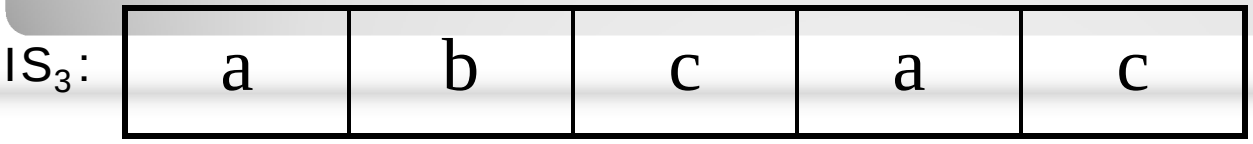

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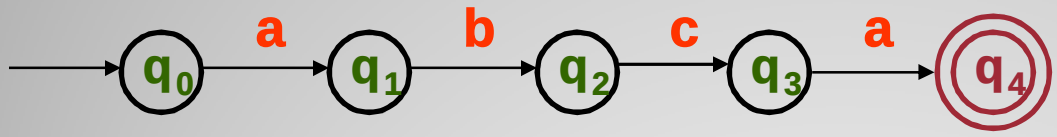

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2	∅	∅	3
3	4	∅	∅
4	∅	∅	∅

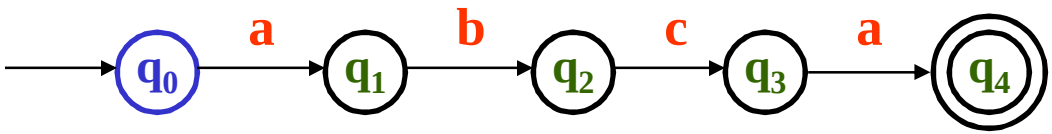
IS_1: a b c a

IS_2: c c b a

IS_3: a b c a c

Finite-state Automata

Σ = { a, b, c }



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1	∅	2	∅
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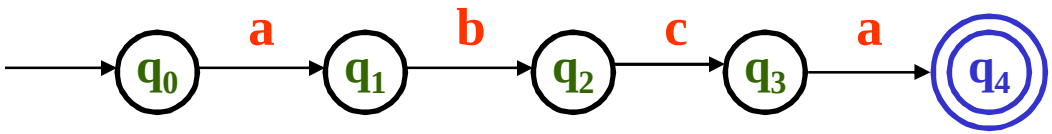
4	∅	∅	∅

IS_1:	a	b	c	a	
IS_2:	c	c	b	a	
IS_3:	a	b	c	a	c

Finite-state Automata

Σ = { a, b, c }



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2	∅	∅	3
3	4	∅	∅
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