

CSEN 1002

Task 3: Fallback Deterministic Finite Automata

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Operation

1 Operation

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Operation

- A fallback DFA with actions operates like the standard DFA, moving only L, and pushing every state it enters onto the stack with every transition.
- This continues until the DFA runs out of input.
- If it runs out of input in state $q_a \in F$, it executes $A(q_a)$ and halts.
- If it runs out of input in $q_r \notin F$, it
 1. continues to simultaneously pop the stack and move L one step to the left until the stack gets empty or some $q_a \in F$ is popped.
 2. In the first case, the DFA executes $A(q_r)$ and halts.
 3. In the second case it does the following.
 1. Executes $A(q_a)$ (with lex being the string extending from R to L).
 2. Moves L one step to the right.
 3. Moves R to where L is.
 4. Empties the stack.
 5. Enters q_0 .

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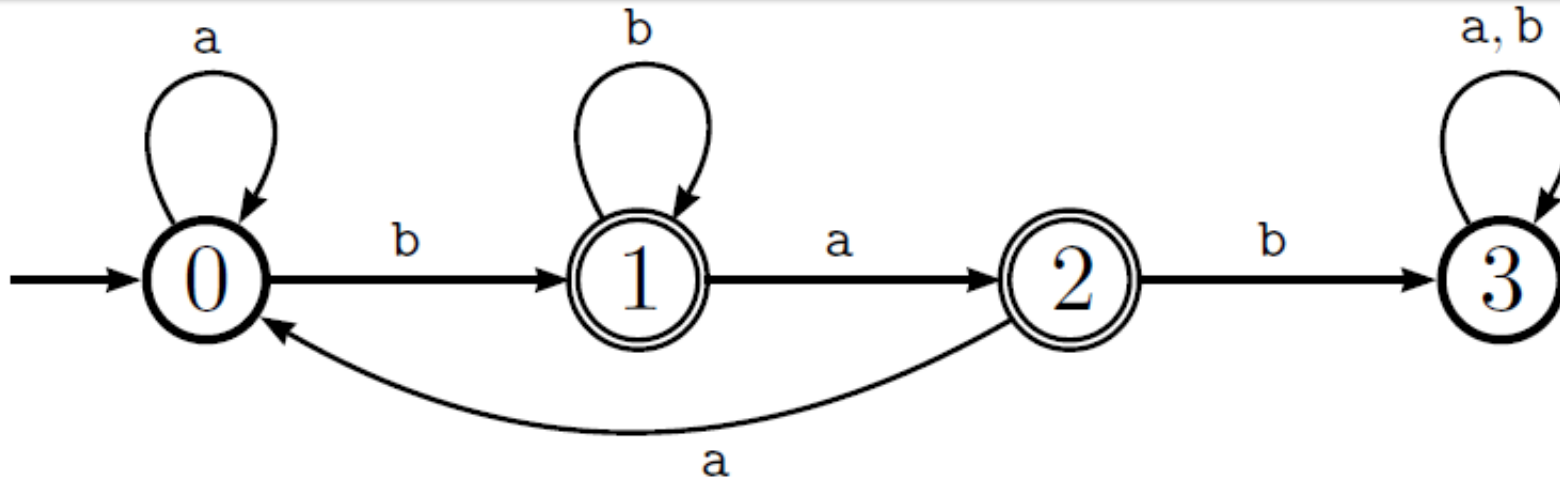
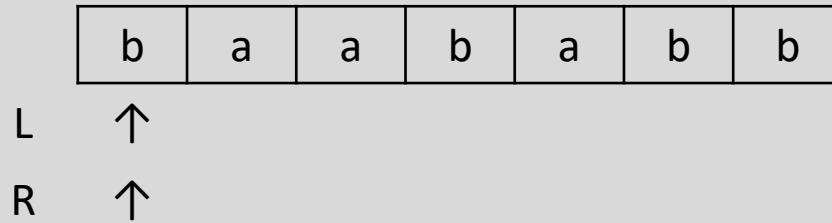
Examples

1 Operation

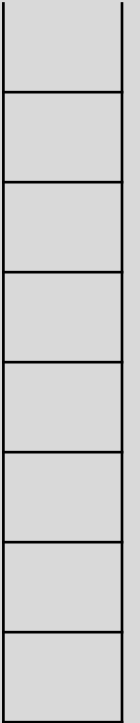
2 Examples

Examples

Example I: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

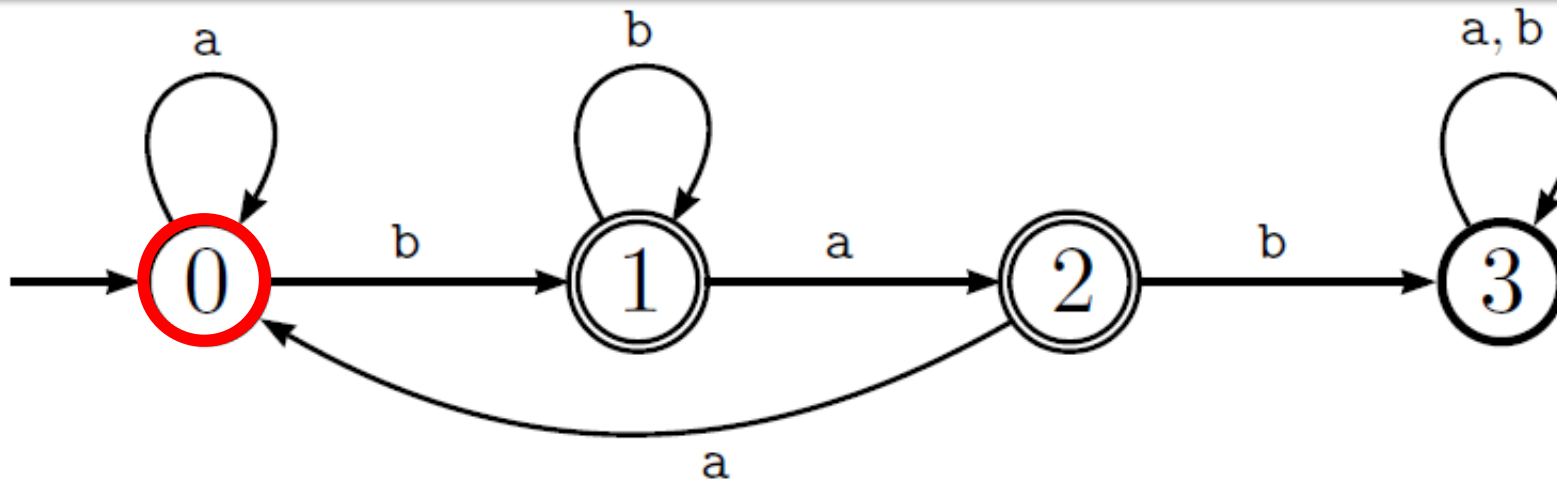
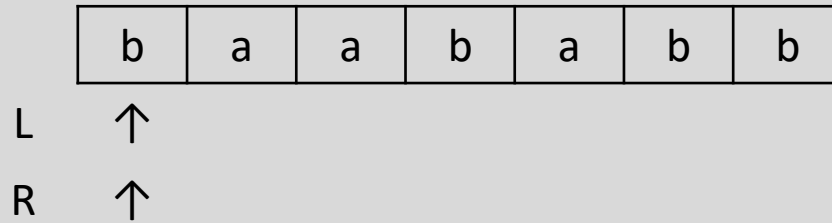


Stack

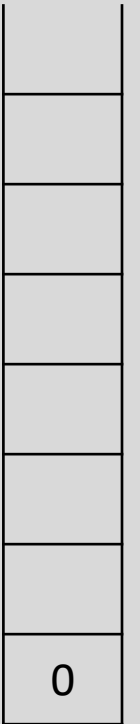


Examples

Example I: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

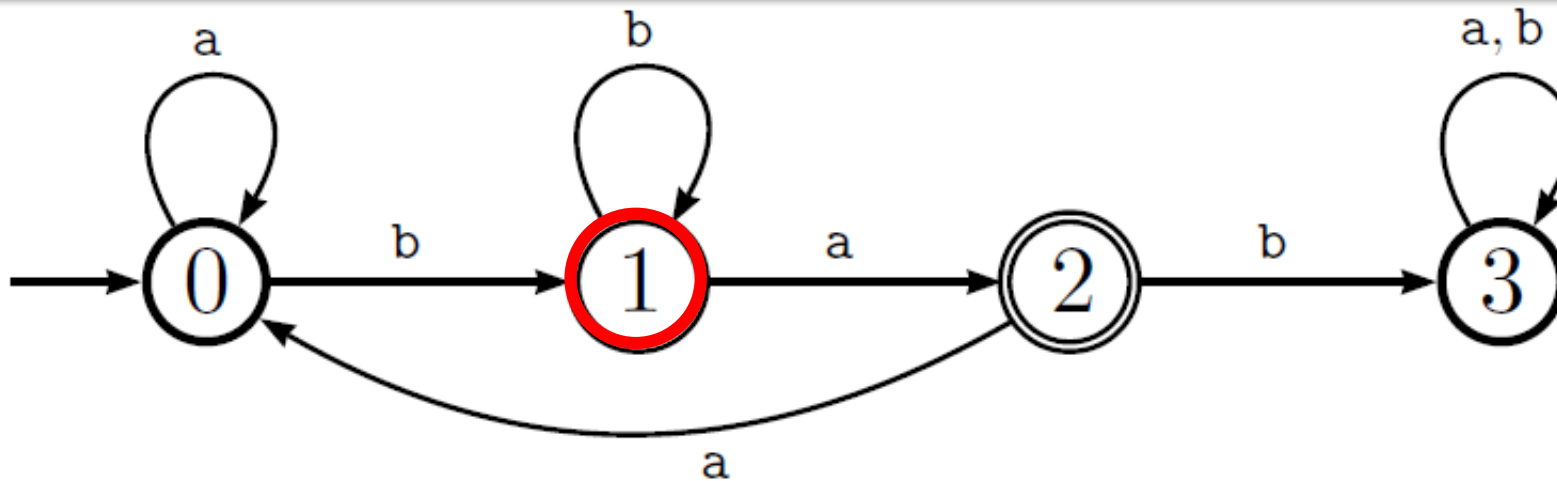
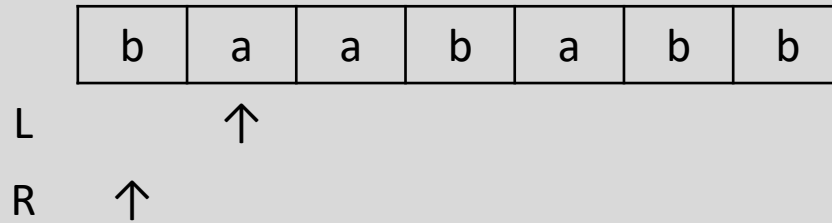


Stack

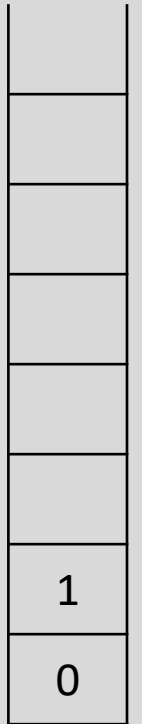


Examples

Example I: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

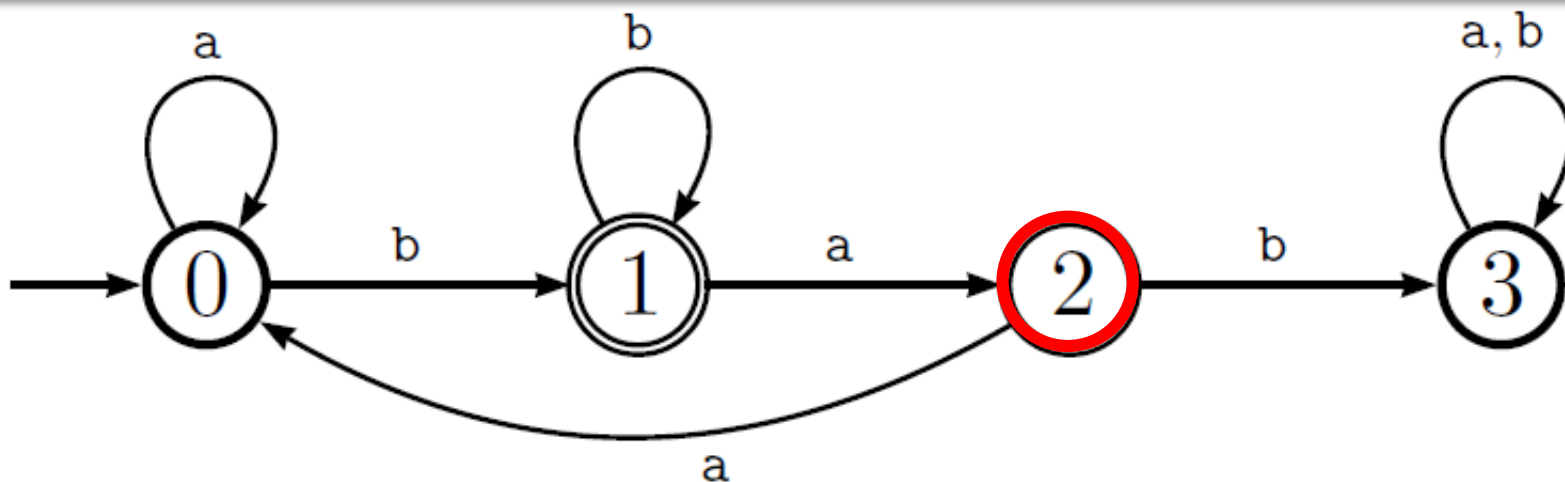
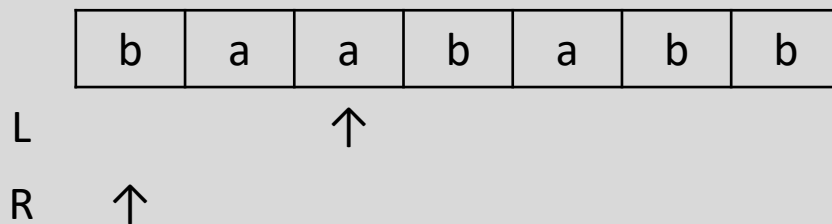


Stack

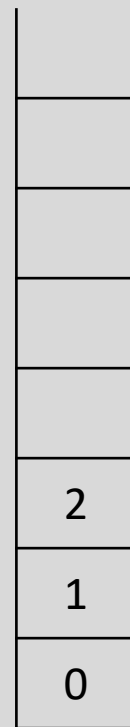


Examples

Example I: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

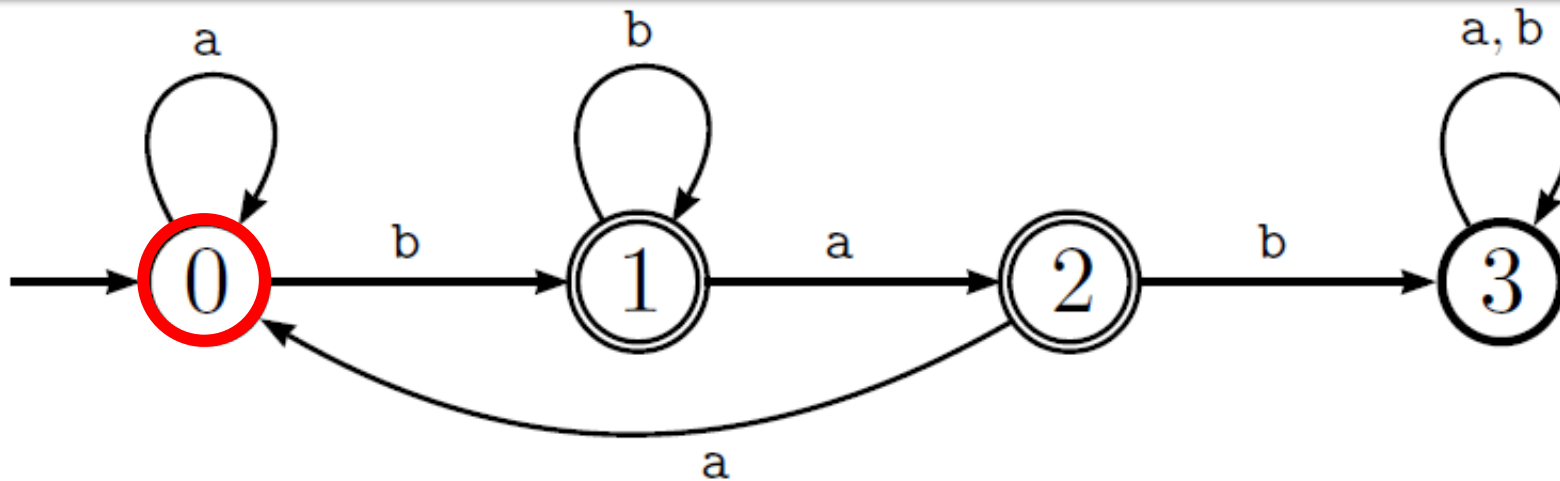
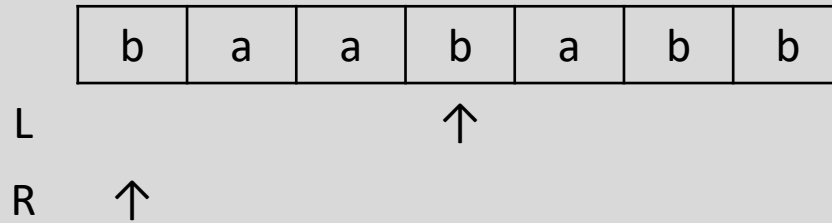


Stack

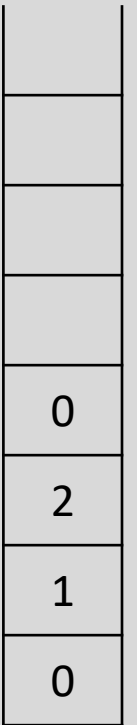


Examples

Example I: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2



Stack



b	a	a	b	a	b	b
---	---	---	---	---	---	---

R



0

b	a	a	b	a	b	b
---	---	---	---	---	---	---

R



2

1

0

2

1

0

b	a	a	b	a	b	b
---	---	---	---	---	---	---

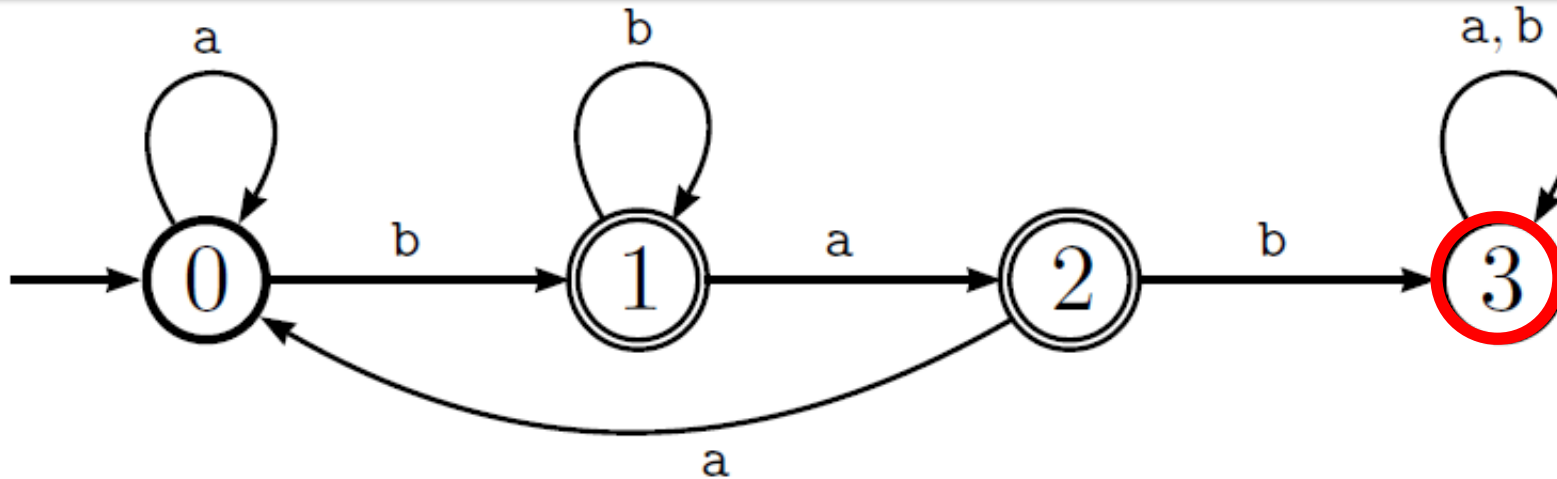
R



0

b	a	a	b	a	b	b
---	---	---	---	---	---	---

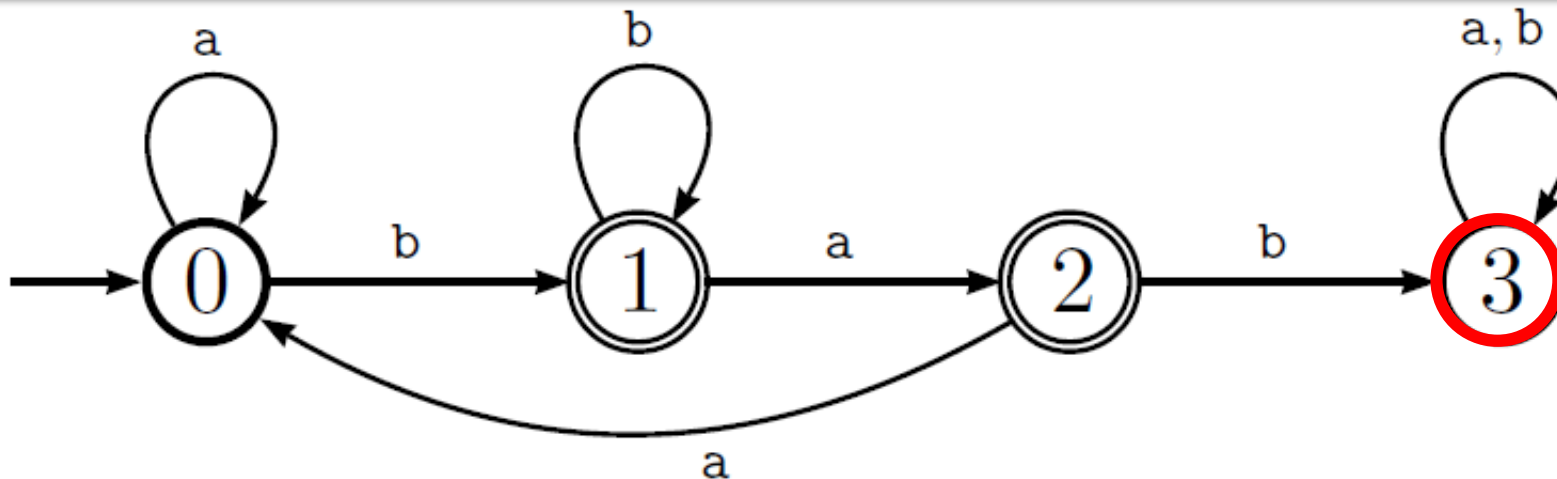
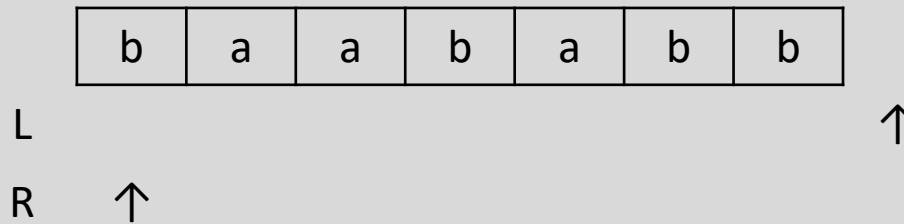
R



3
3
2
1
0
2
1
0

Examples

Example I: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2



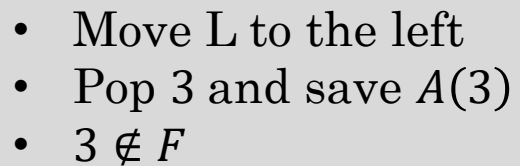
- simultaneously pop the stack and move L one step to the left until the stack gets empty or some $q_a \in F$ is popped

Stack

3
3
2
1
0
2
1
0

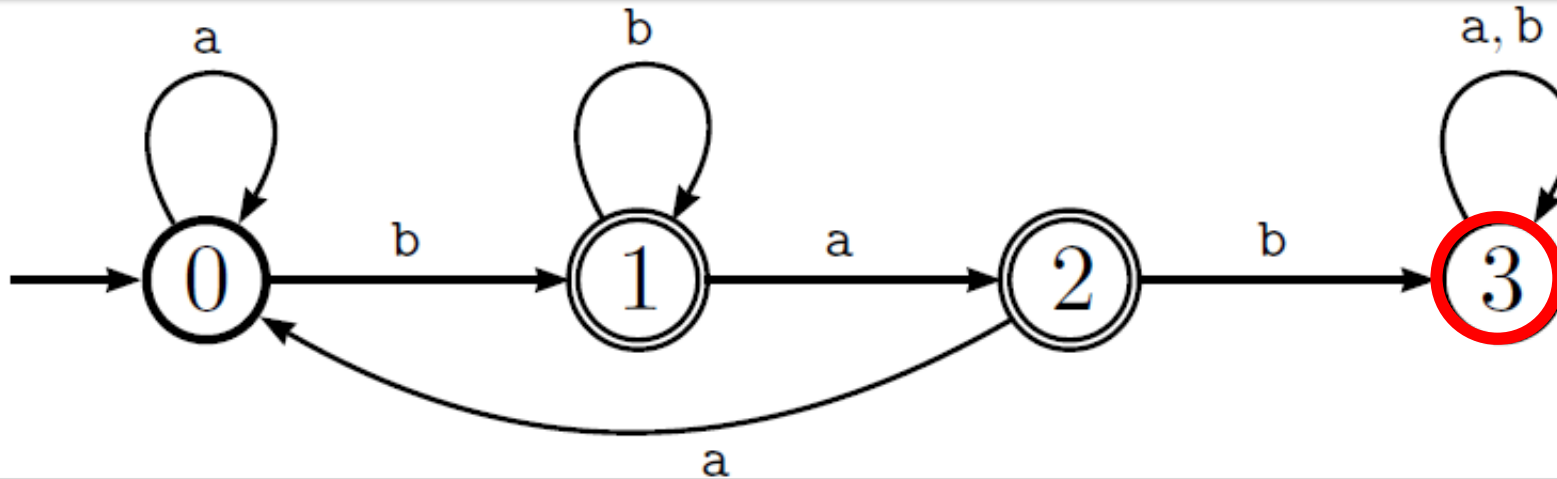
b	a	a	b	a	b	b
---	---	---	---	---	---	---

R



3
3
2
1
0
2
1
0

	b	a	a	b	a	b	b
L						↑	
R	↑						

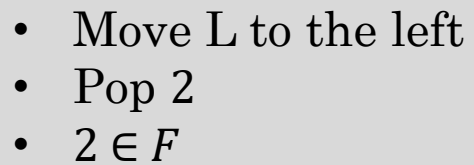


- # Stack

3
2
1
0
2
1
0

b	a	a	b	a	b	b
---	---	---	---	---	---	---

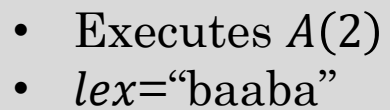
R



2
1
0
2
1
0

b	a	a	b	a	b	b
---	---	---	---	---	---	---

R



2
1
0
2
1
0

Examples

Example I: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

Output: baaba,2

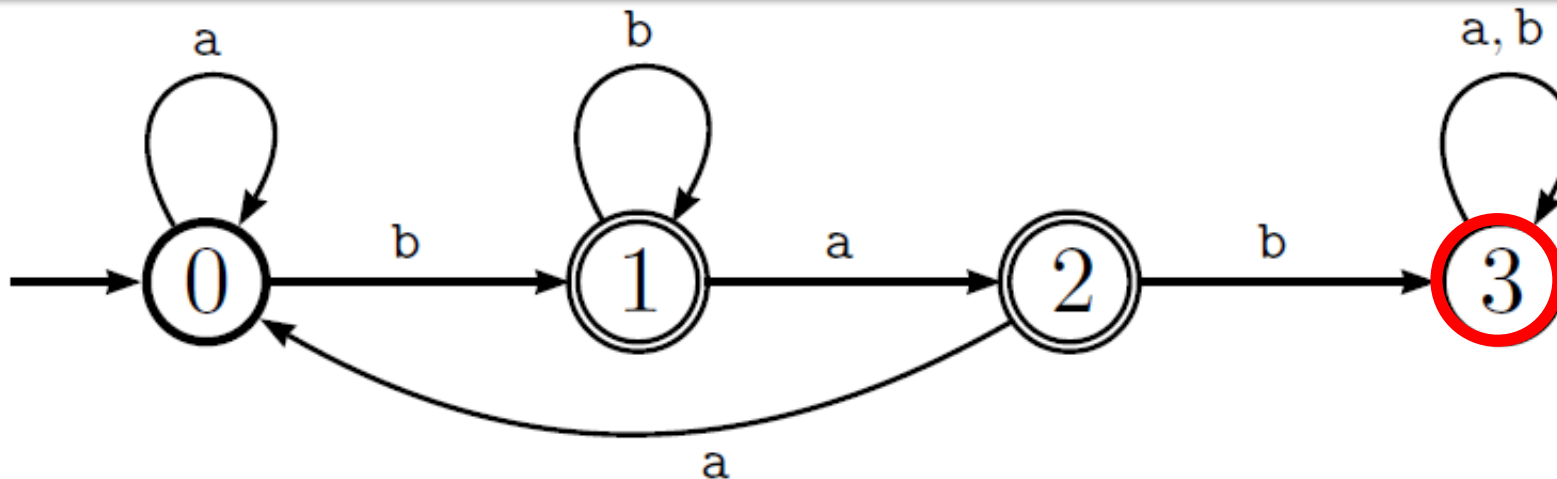
b	a	a	b	a	b	b
---	---	---	---	---	---	---

L

↑

R

↑



- Move L one step to the right
- Move R to where L is

Stack

2
1
0
2
1
0

Examples

Example I: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

Output: baaba,2

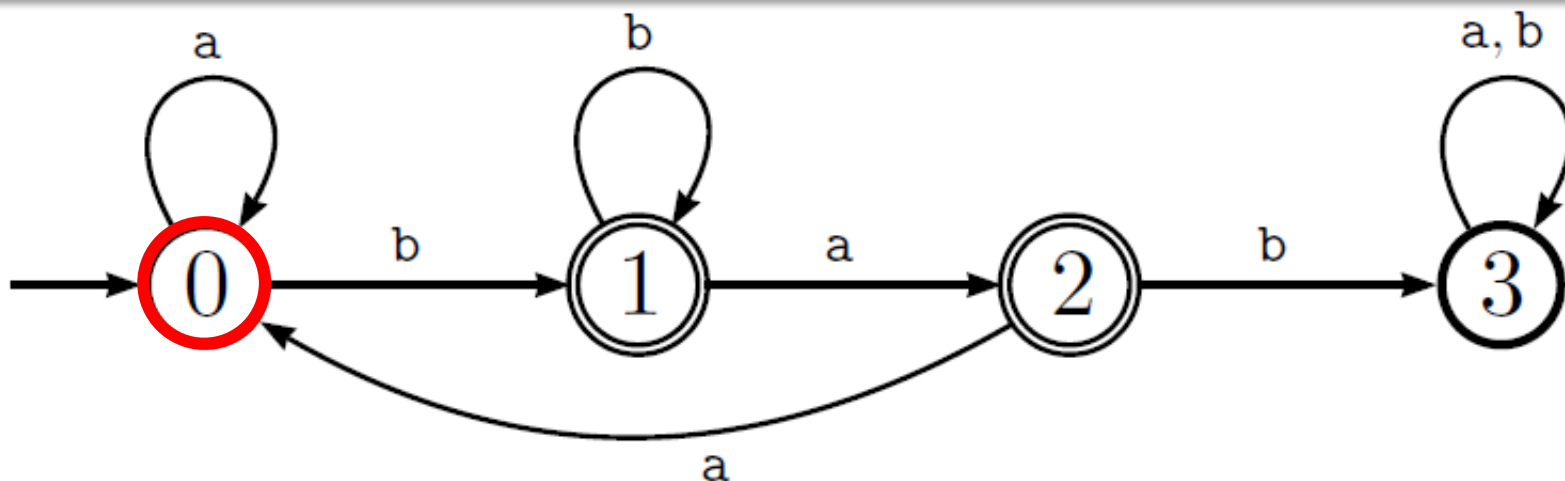
b	a	a	b	a	b	b
---	---	---	---	---	---	---

L

↑

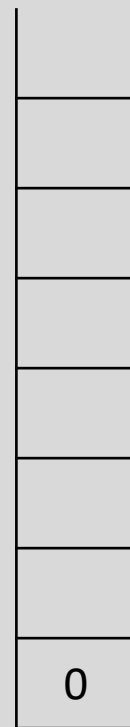
R

↑



- Empty the stack
- Enter q_0

Stack



Examples

Example I: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

Output: baaba,2

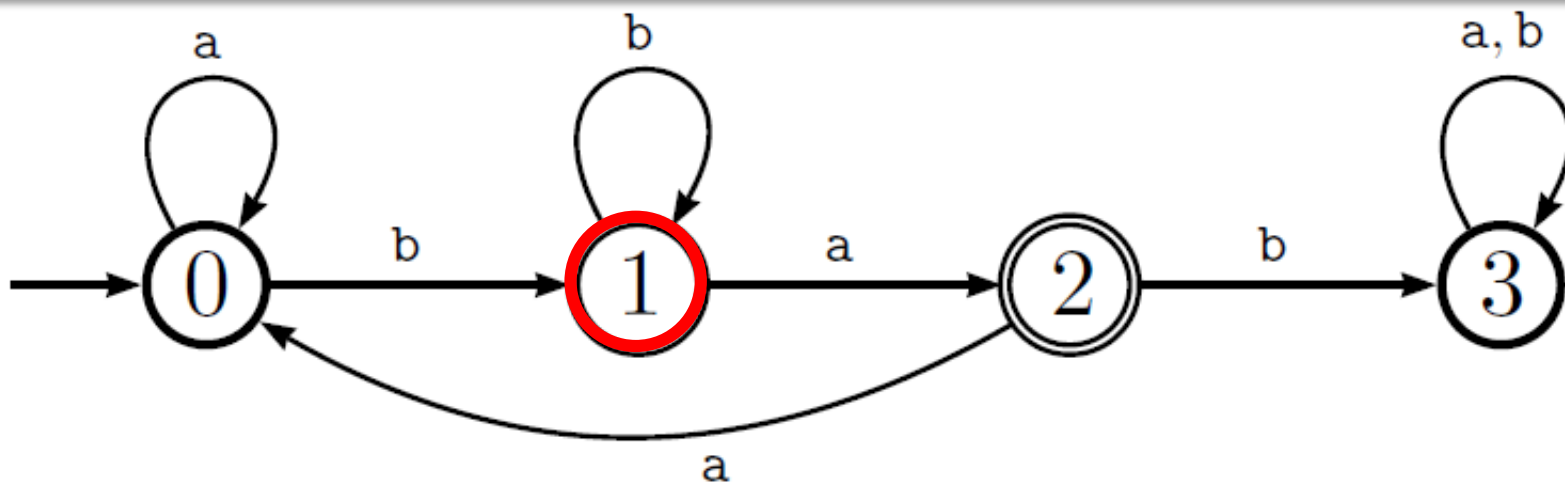
b	a	a	b	a	b	b
---	---	---	---	---	---	---

L

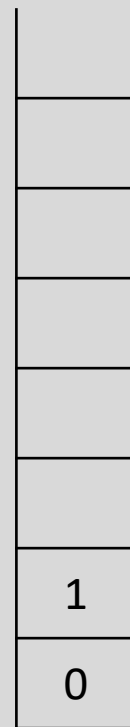
↑

R

↑



Stack



Examples

Example I: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

Output: baaba,2

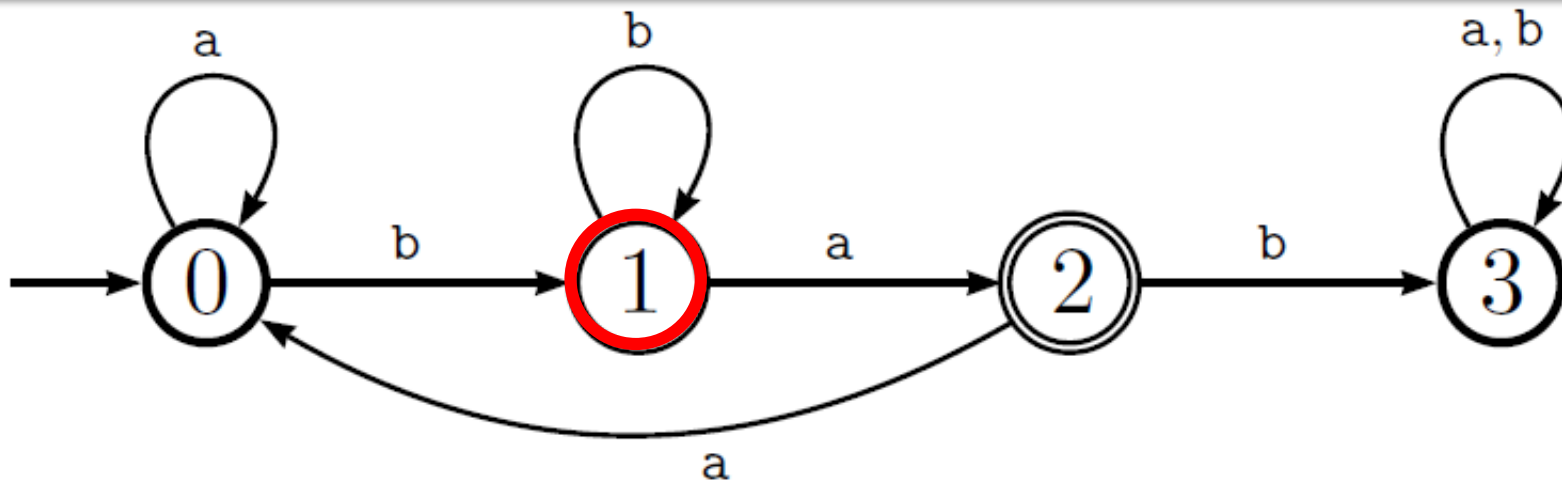
b	a	a	b	a	b	b
---	---	---	---	---	---	---

L

↑

R

↑



Stack



Examples

Example I: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

Output: baaba,2

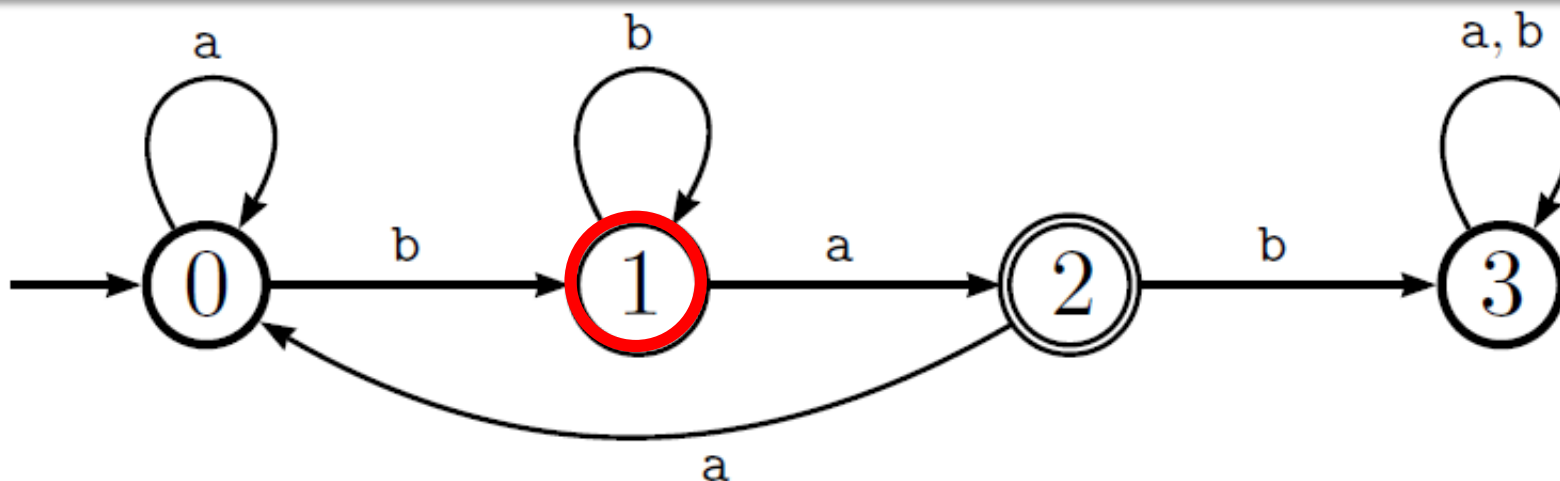
b	a	a	b	a	b	b
---	---	---	---	---	---	---

L

R

↑

↑



- simultaneously pop the stack and move L one step to the left until the stack gets empty or some $q_a \in F$ is popped

Stack



Examples

Example I: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

Output: baaba,2

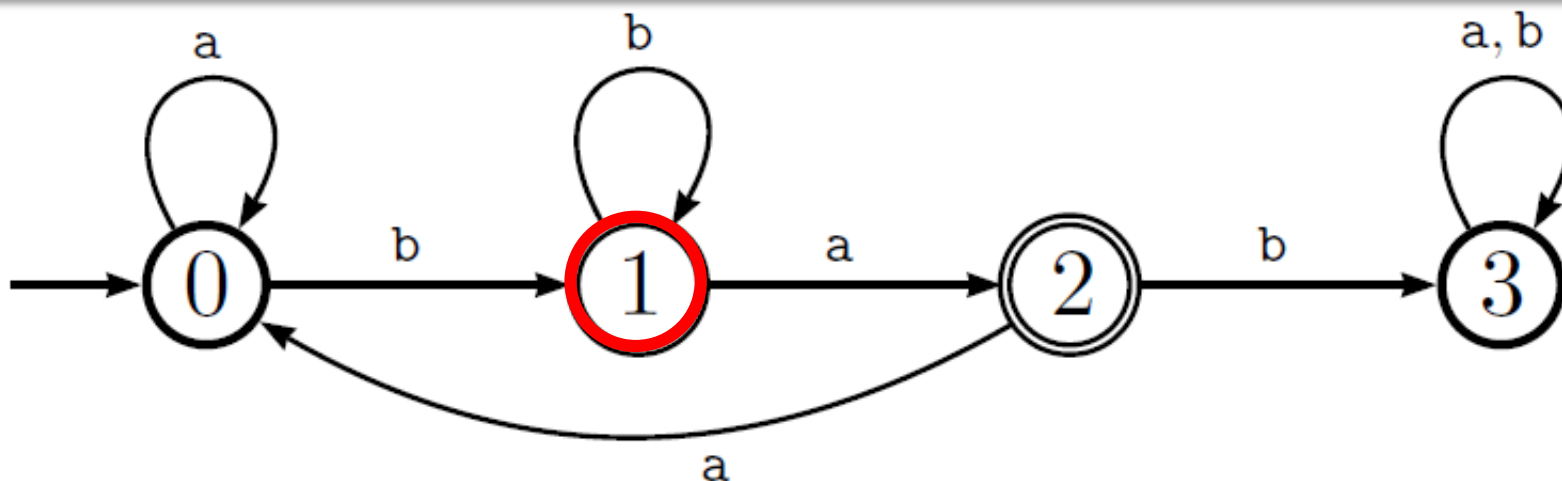
b	a	a	b	a	b	b
---	---	---	---	---	---	---

L

↑

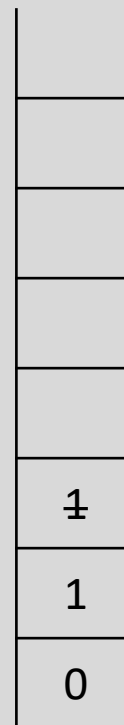
R

↑



- Move L to the left
- Pop 1
- $1 \in F$

Stack



Examples

Example I: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

Output: baaba,2

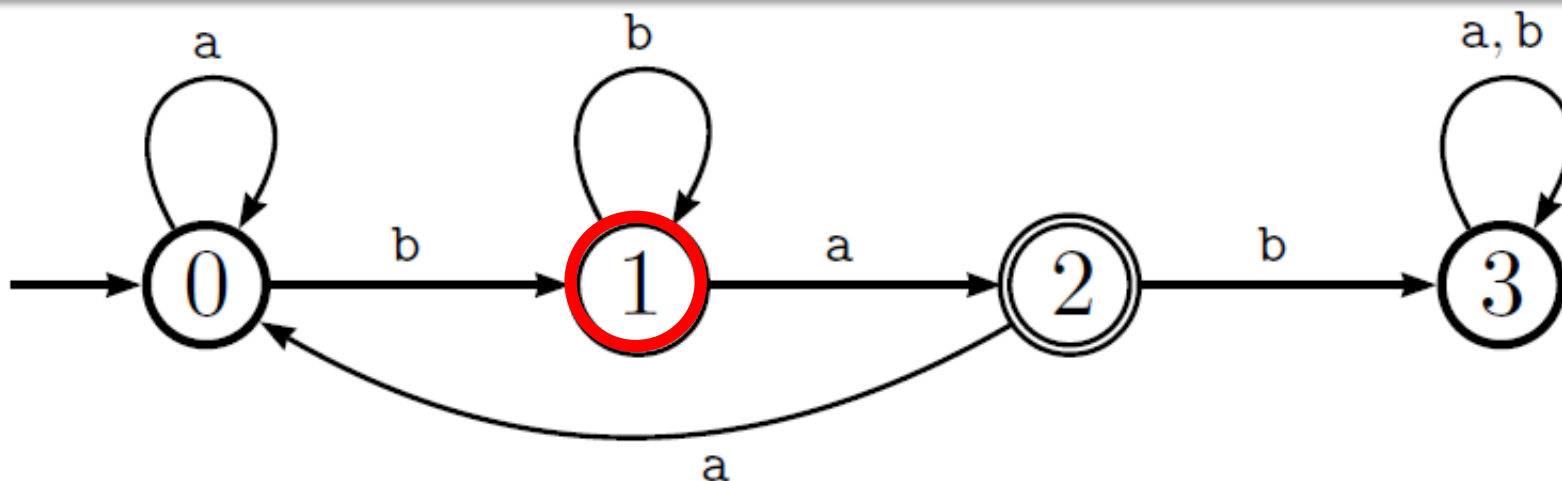
b	a	a	b	a	b	b
---	---	---	---	---	---	---

L

↑

R

↑



- Executes $A(1)$ and halts.
- $lex = "bb"$

Stack



b	a	a	b	a	b	b
---	---	---	---	---	---	---

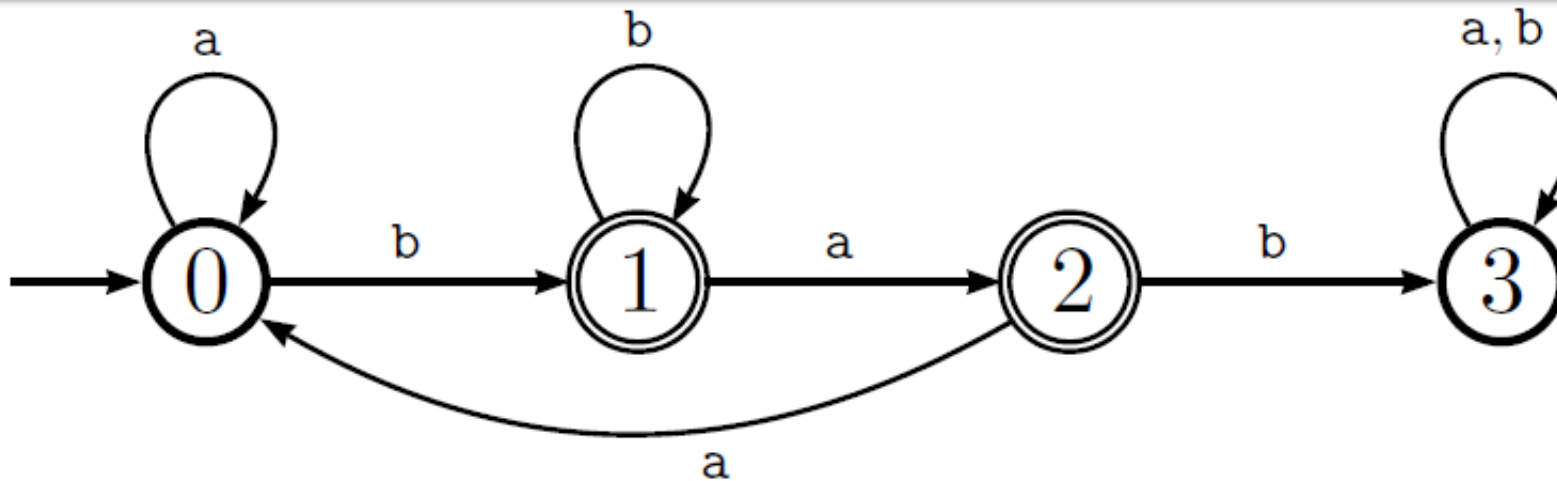
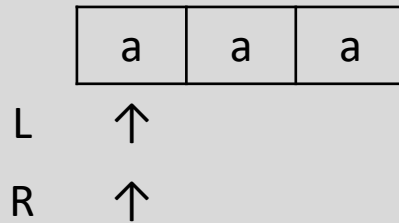


baaba,2;bb,1

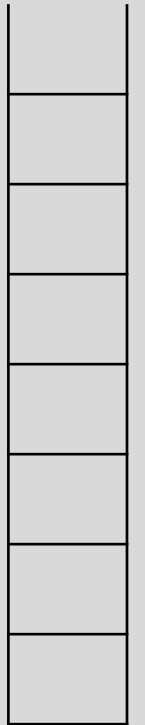
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Examples

Example II: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

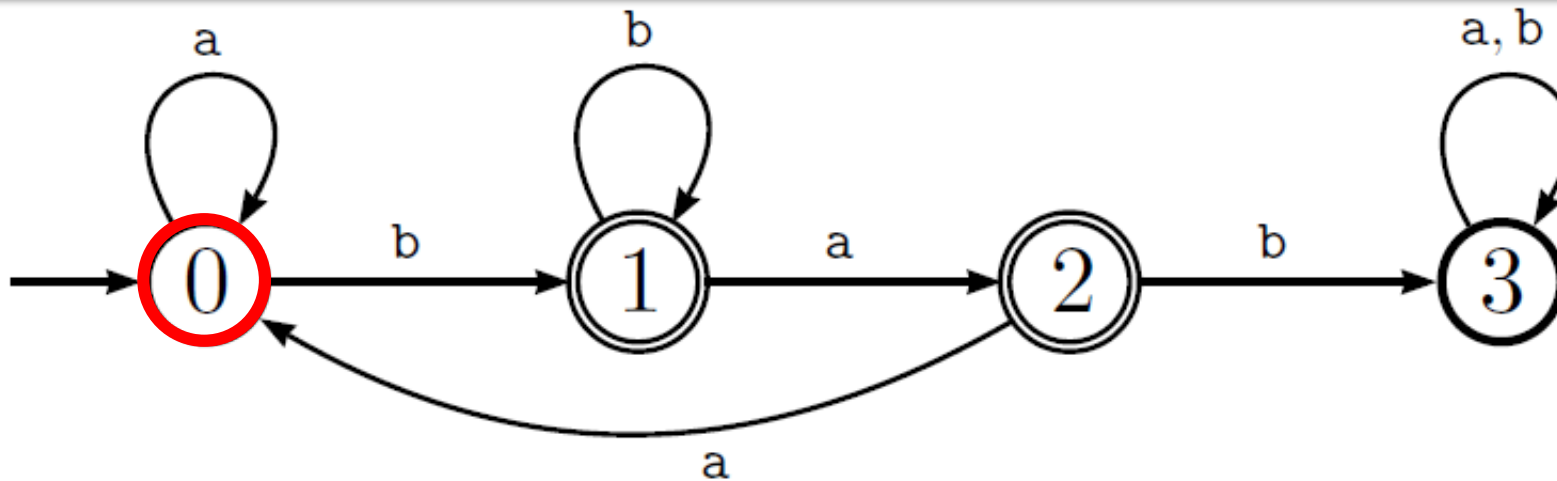
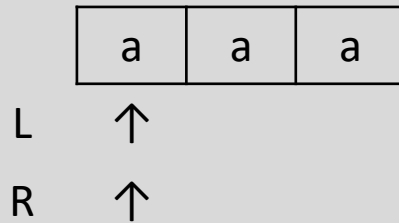


Stack

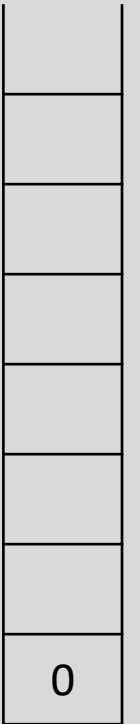


Examples

Example II: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

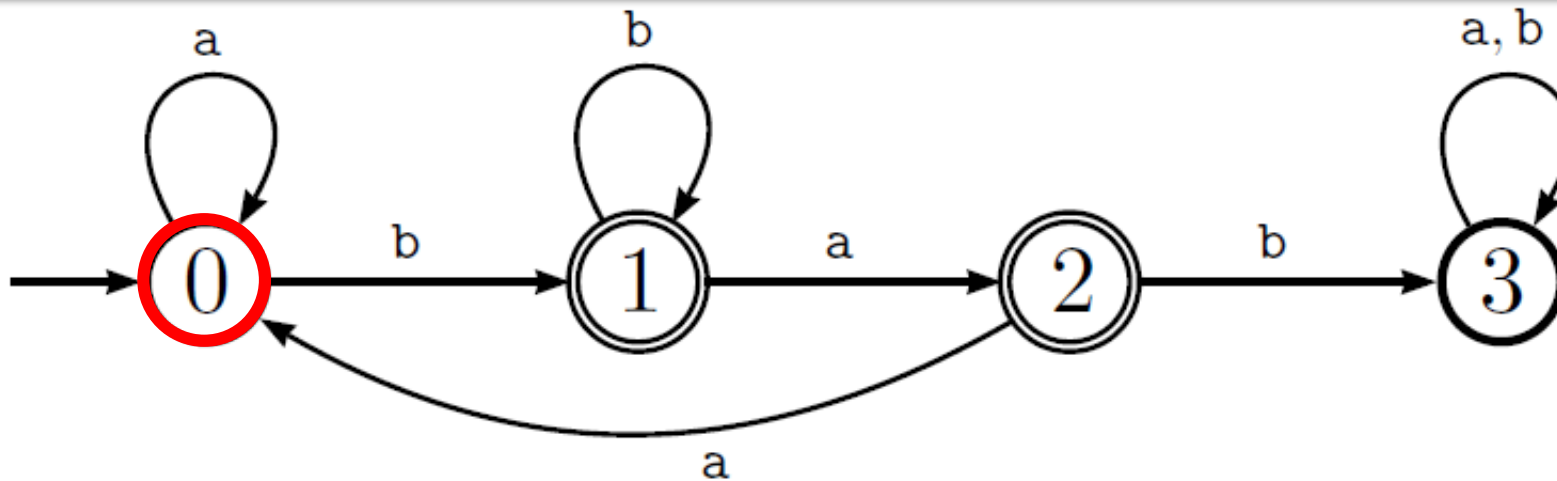
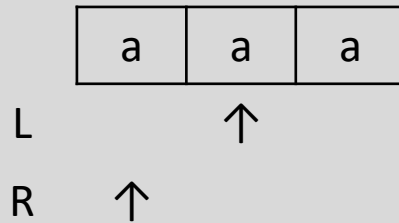


Stack

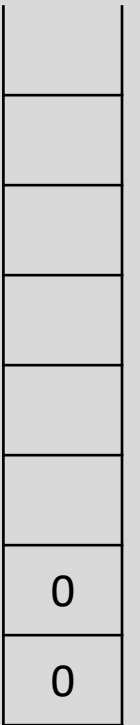


Examples

Example II: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

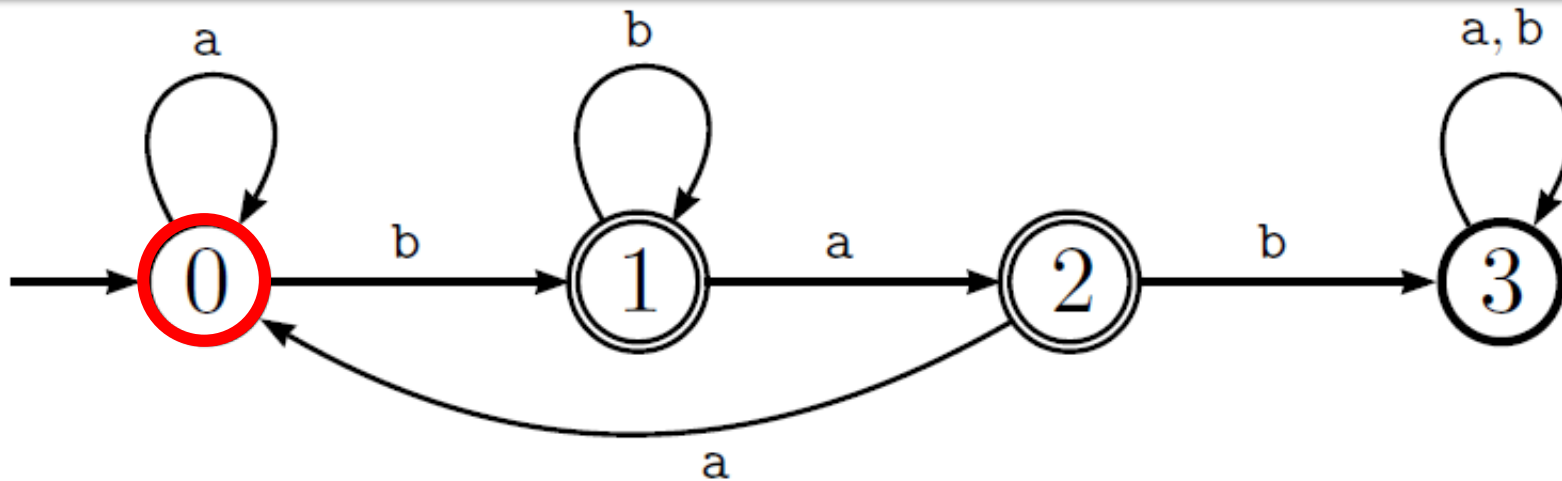
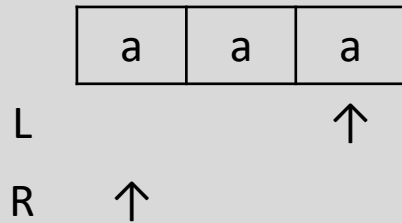


Stack

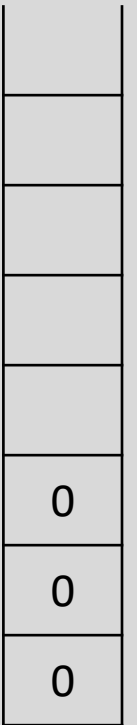


Examples

Example II: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

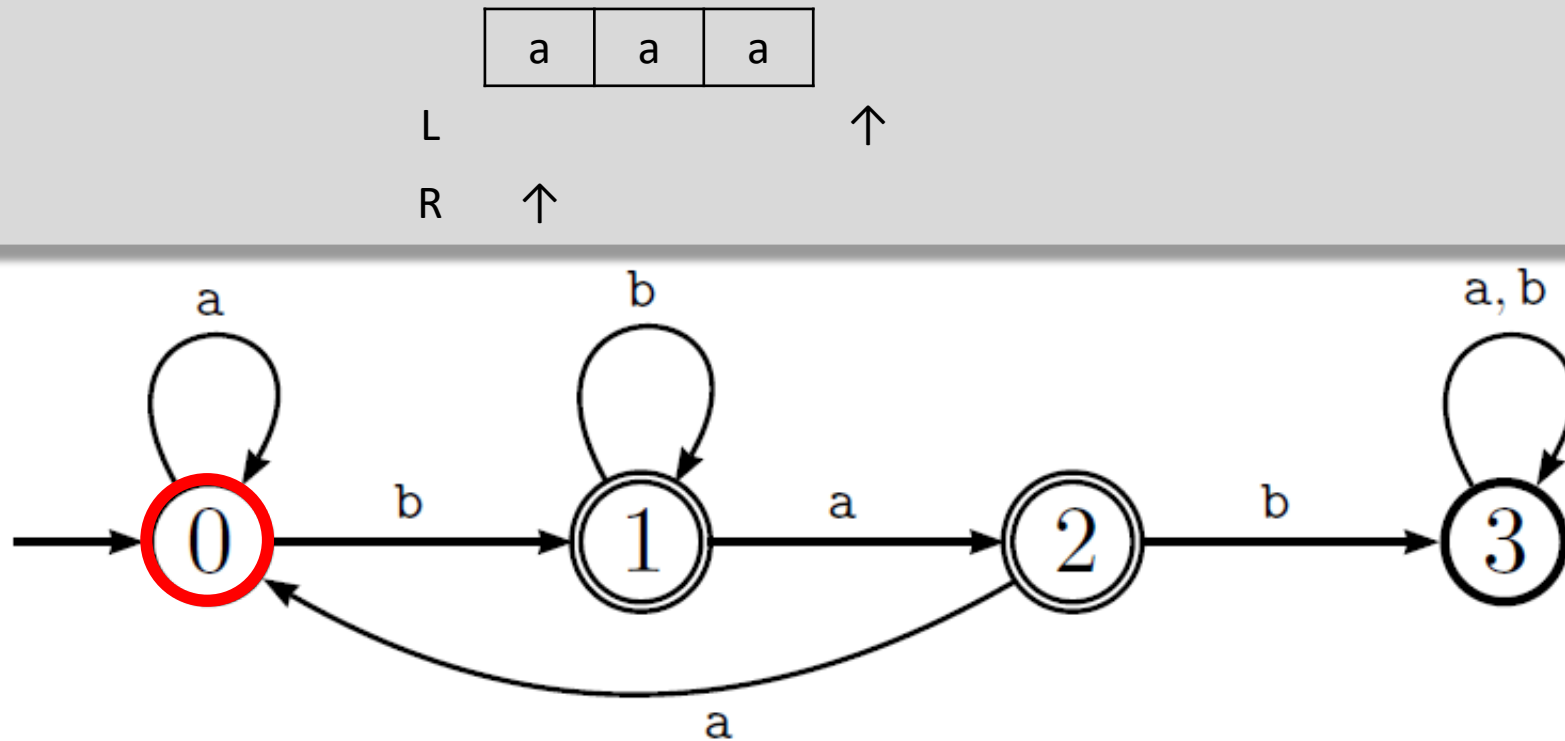


Stack

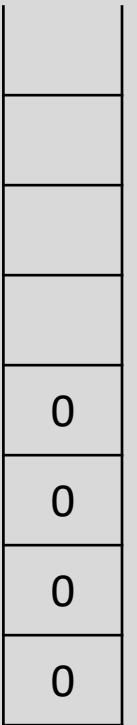


Examples

Example II: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

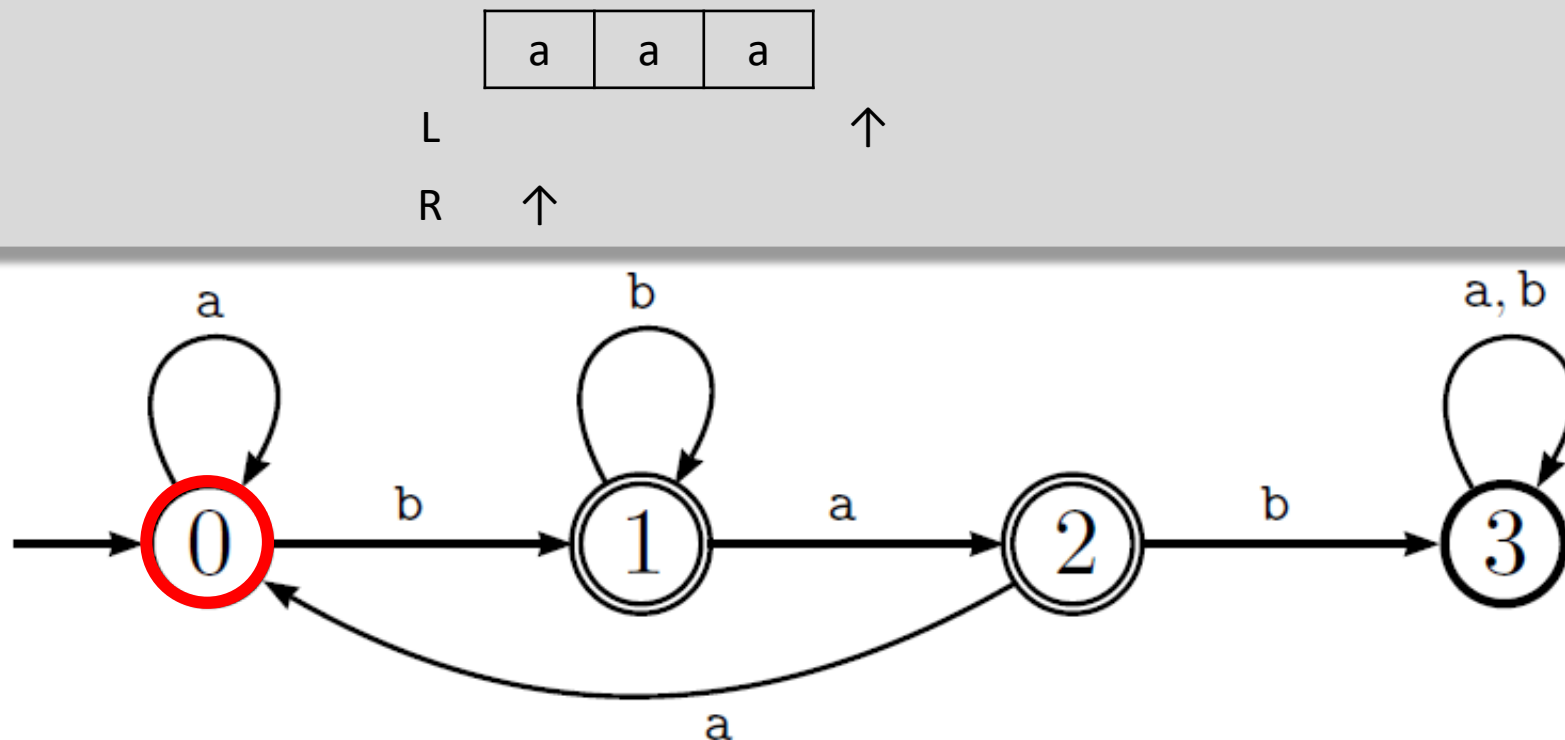


Stack



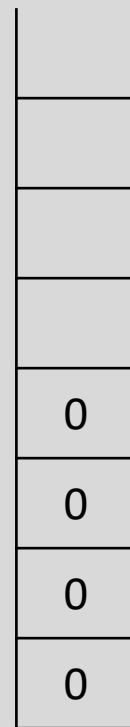
Examples

Example II: $0;1;2;3\#a;b\#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3\#0\#1;2$



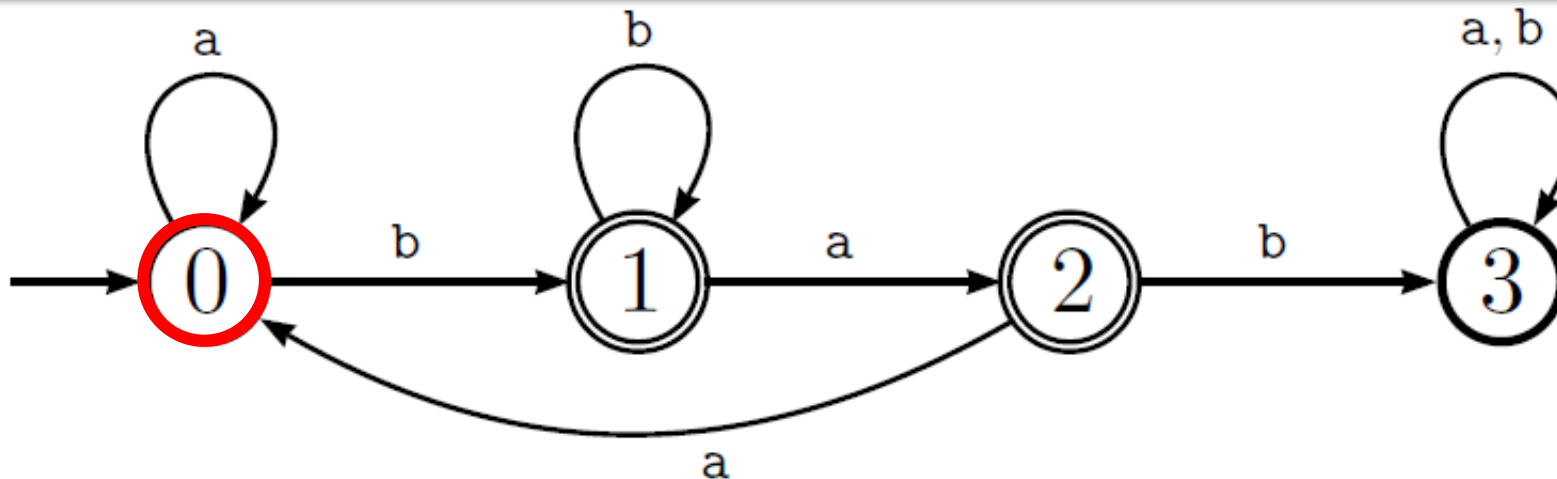
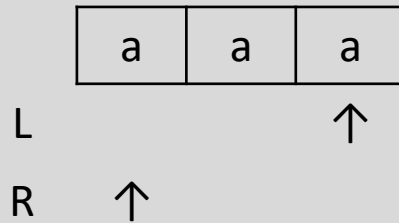
- simultaneously pop the stack and move L one step to the left until the stack gets empty or some $q_a \in F$ is popped

Stack



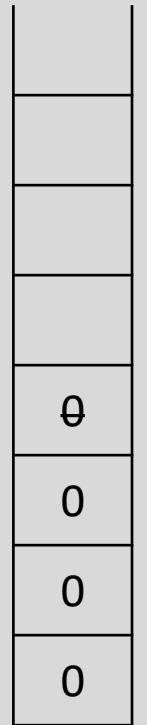
Examples

Example II: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2



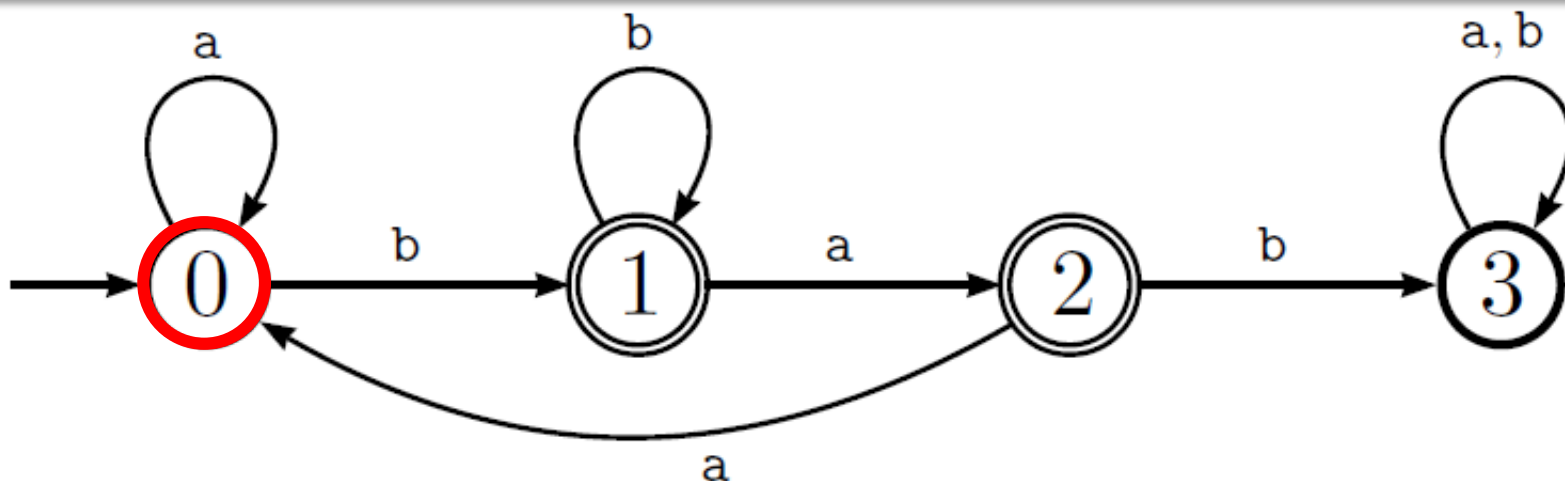
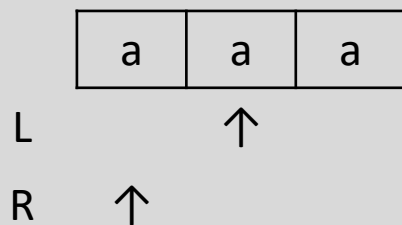
- Move L to the left
- Pop 0 and save $A(0)$
- $0 \notin F$

Stack



Examples

Example II: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2



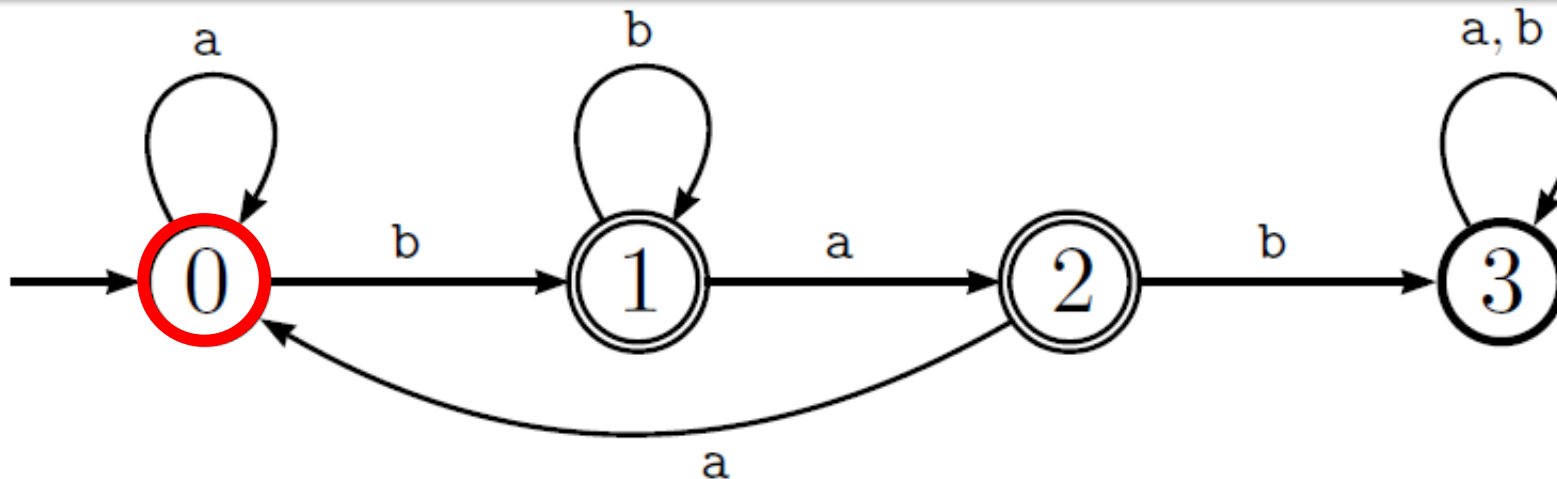
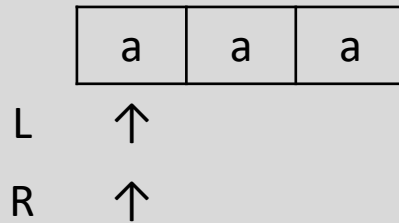
- Move L to the left
- Pop 0
- $0 \notin F$

Stack



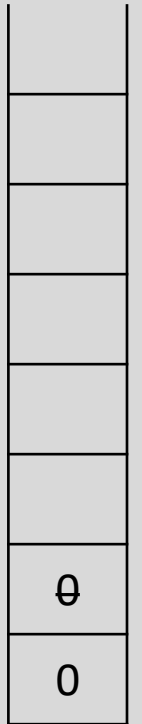
Examples

Example II: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2



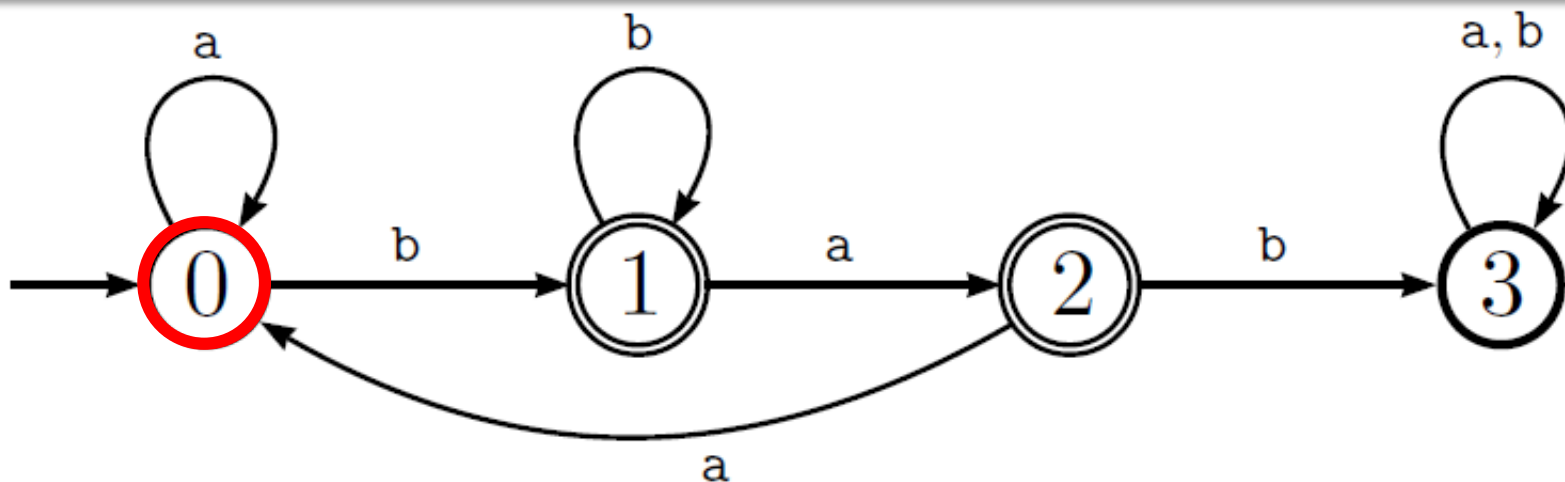
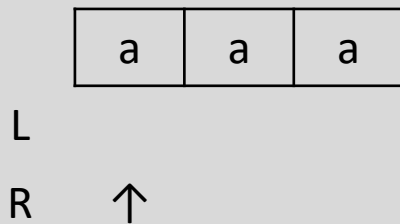
- Move L to the left
- Pop 0
- $0 \notin F$

Stack



Examples

Example II: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2



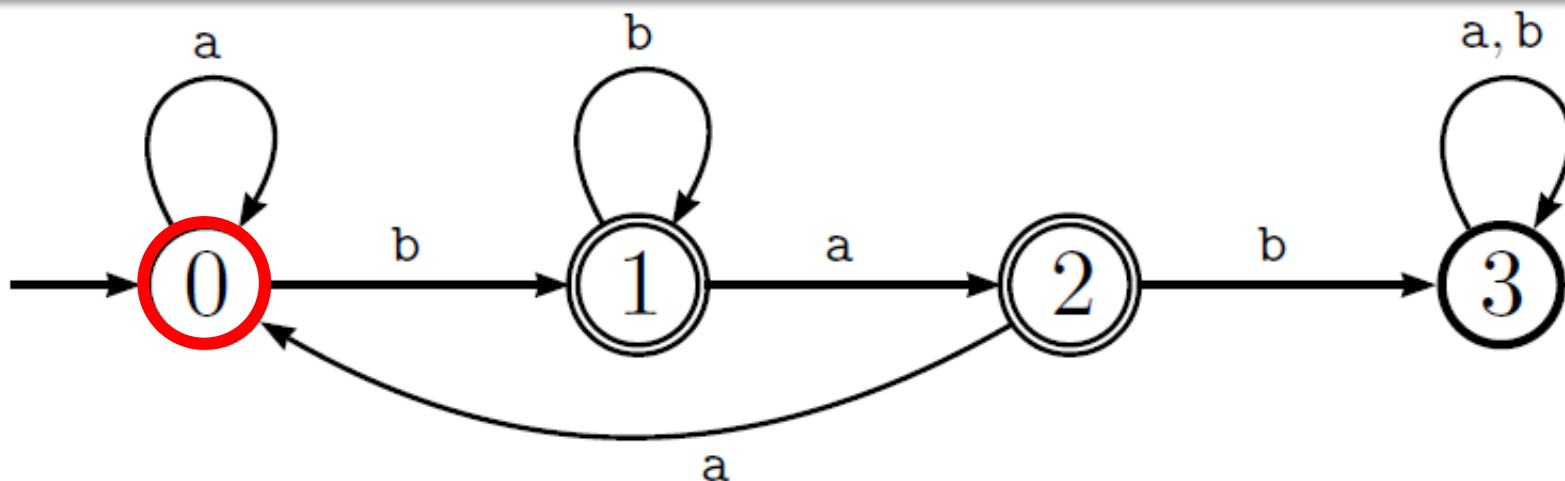
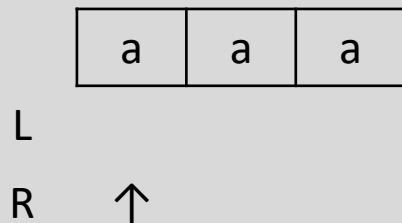
- Move L to the left
- Pop 0
- $0 \notin F$

Stack



Examples

Example II: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2



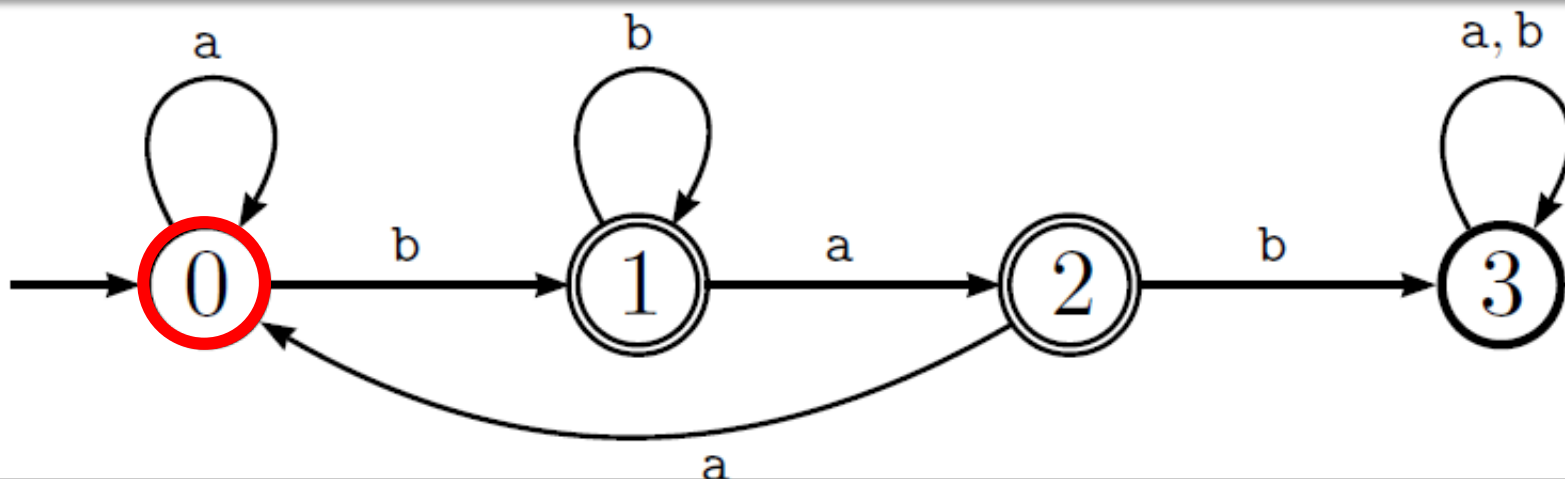
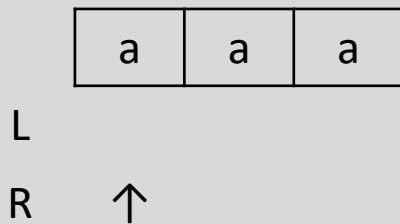
- *Stack is Empty*
- Executes $A(0)$ (*Saved previously*) and halts.
- $lex = \text{"aaa"}$

Stack



Examples

Example II: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2



Output

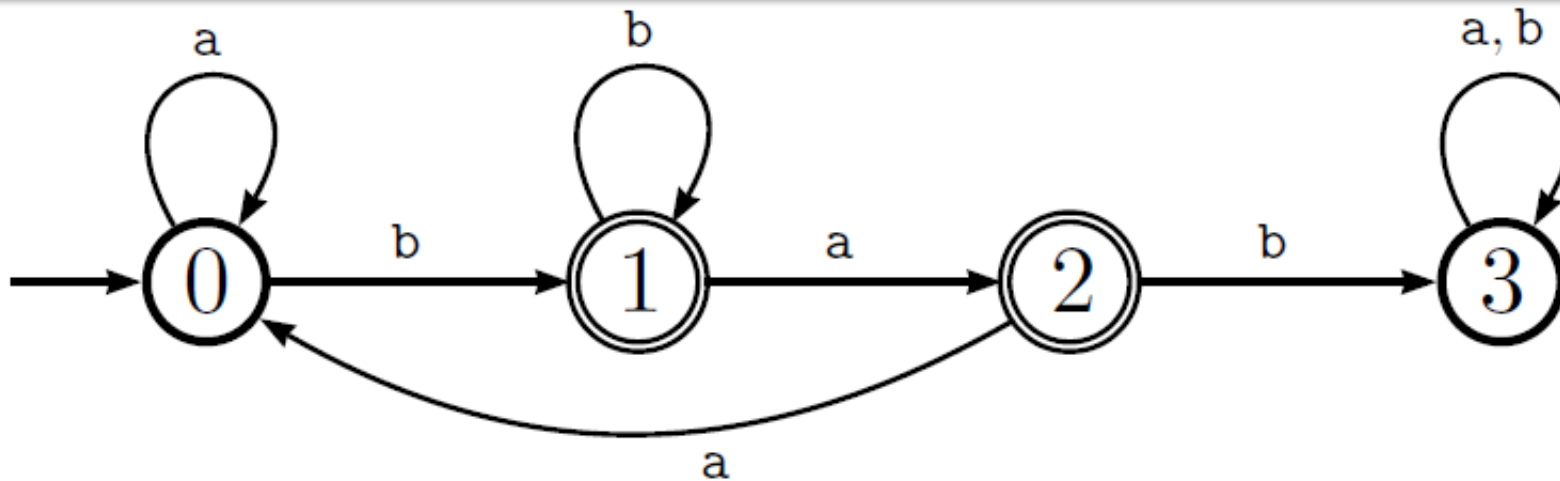
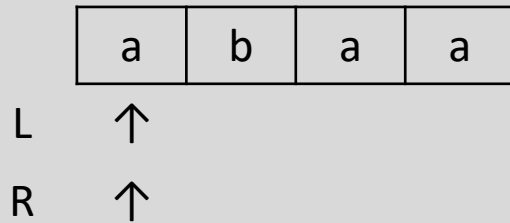
aaa,0

Stack

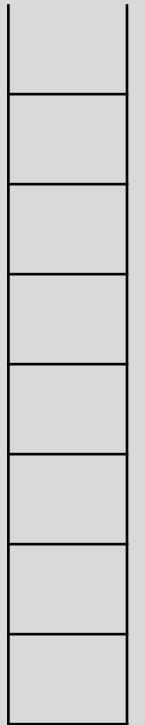


Examples

Example III: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

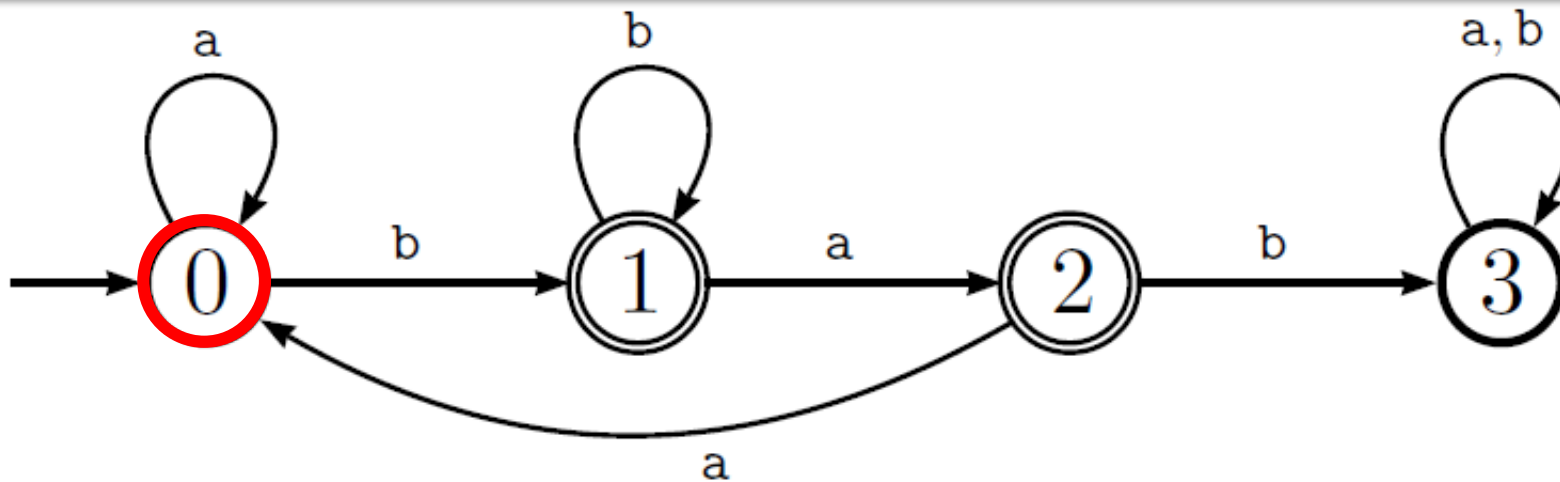
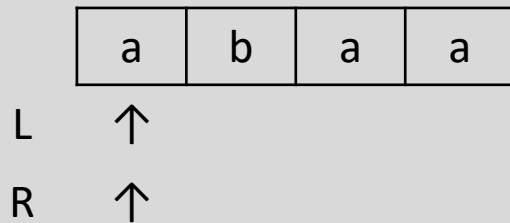


Stack

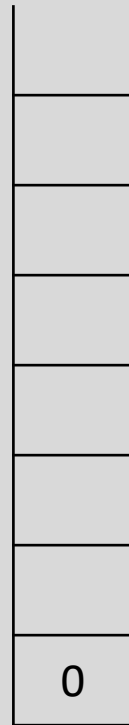


Examples

Example III: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

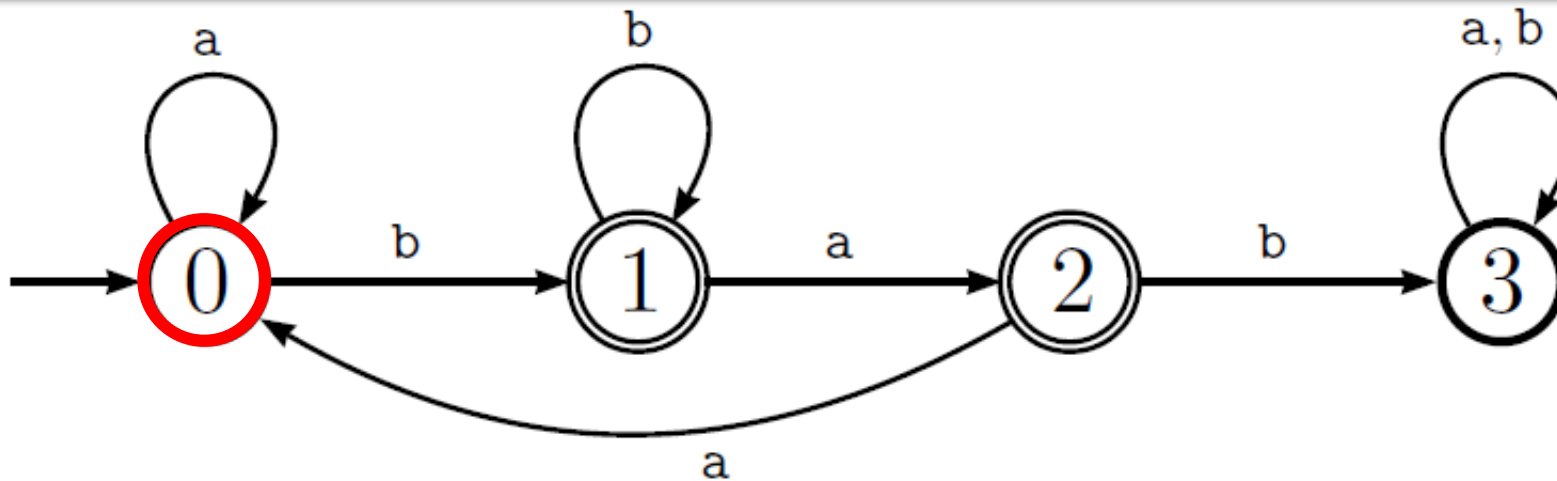
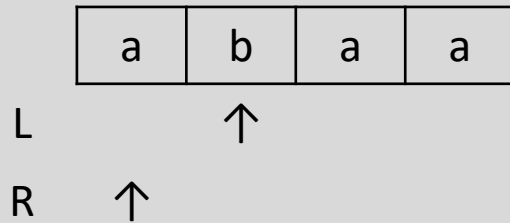


Stack

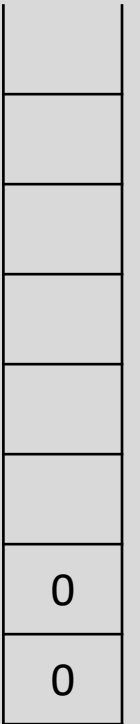


Examples

Example III: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

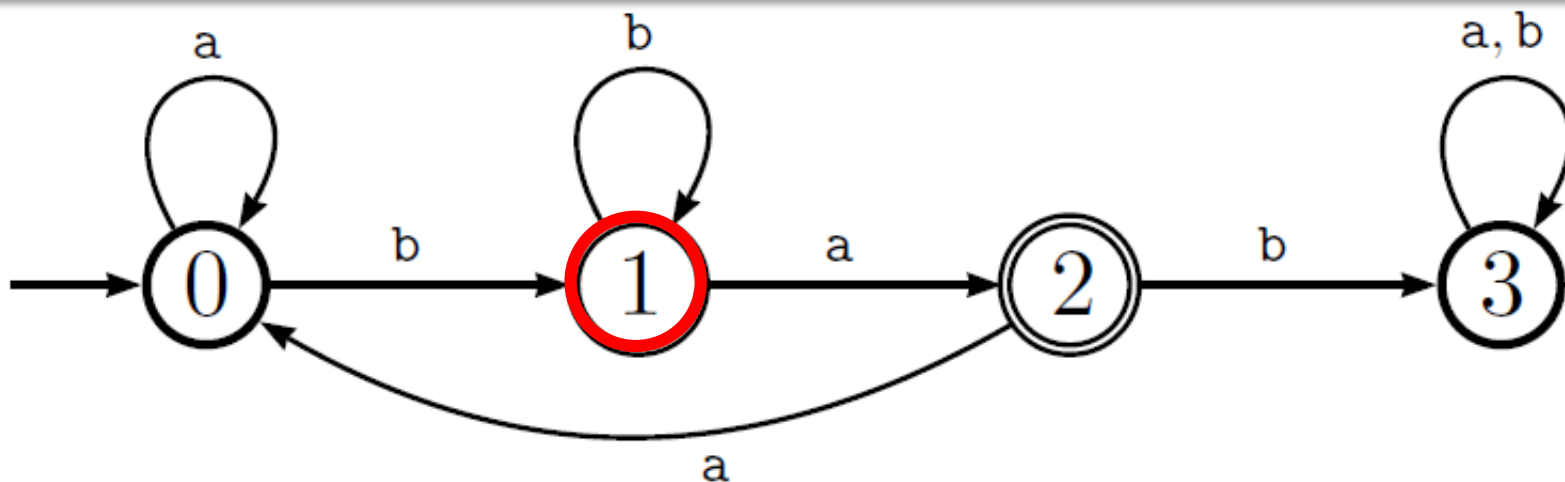
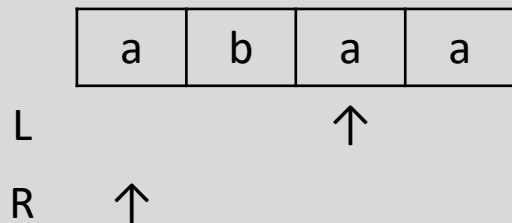


Stack



Examples

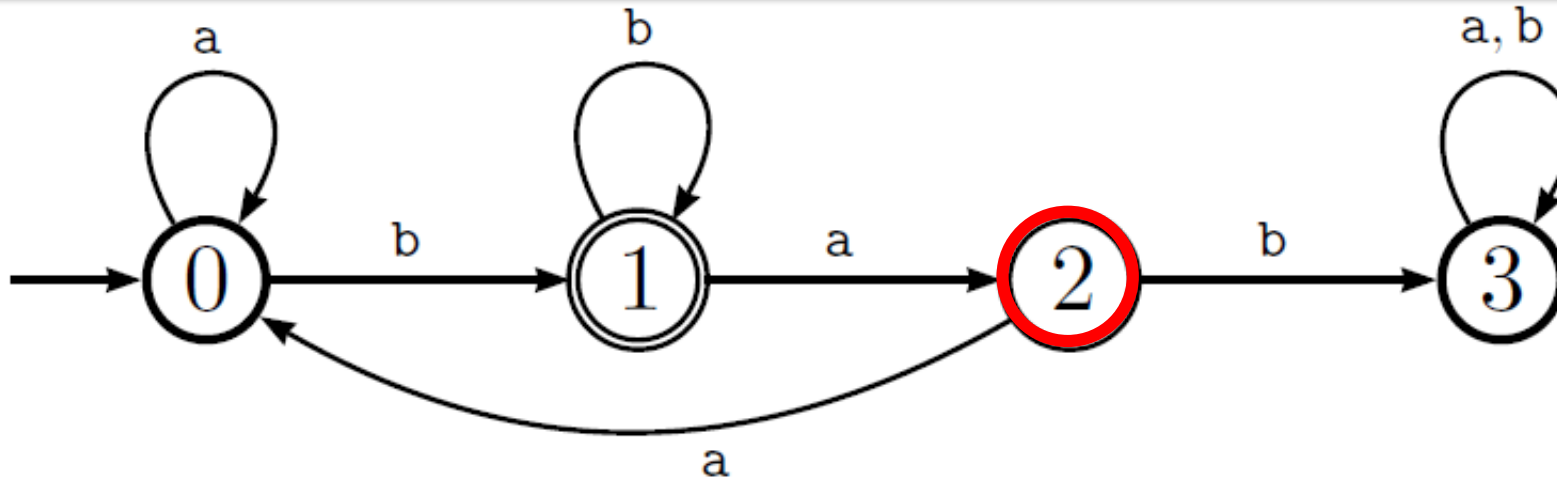
Example III: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2



Stack



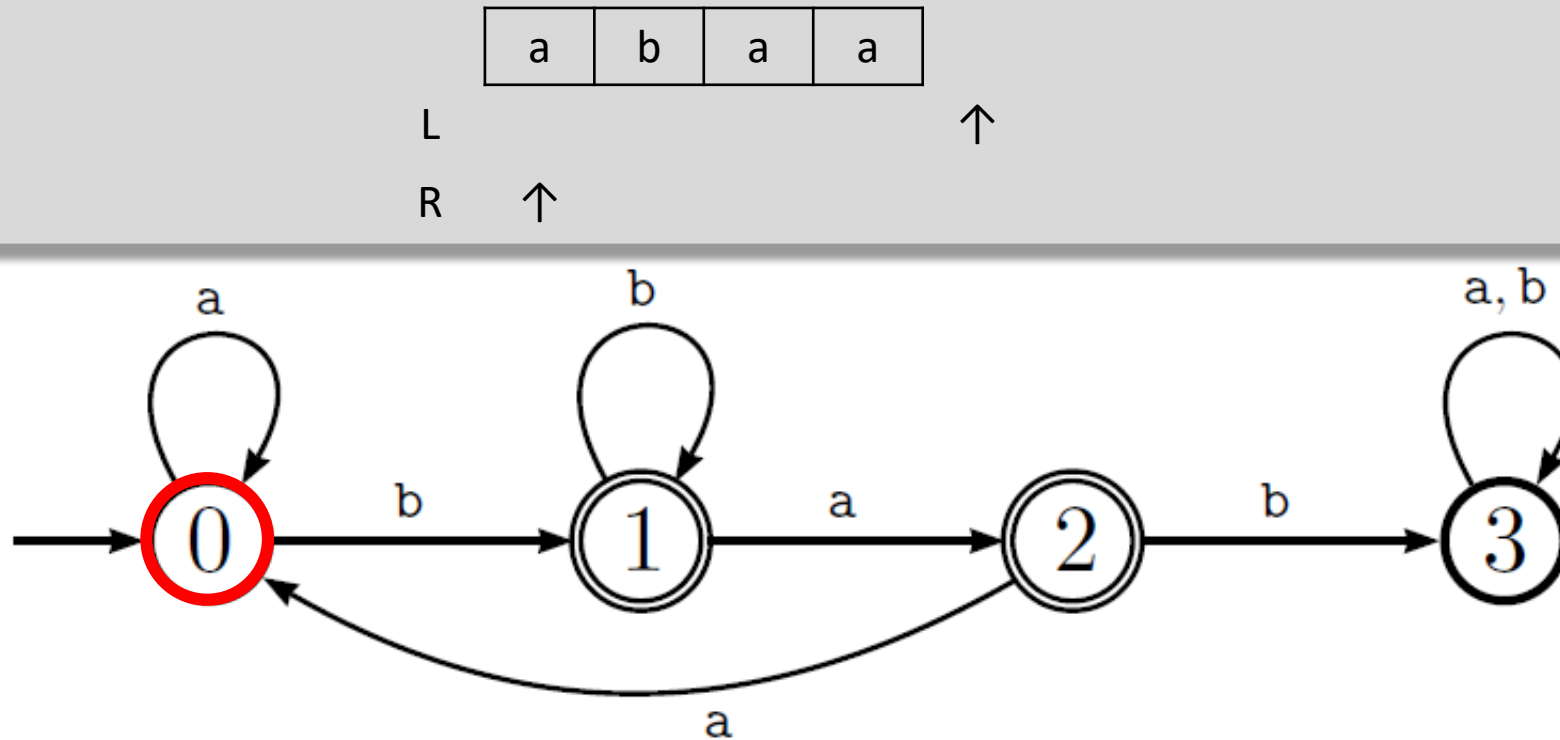
	a	b	a	a
L				↑
R	↑			



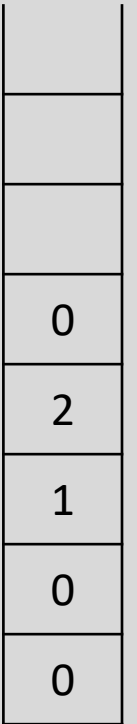
2
1
0
0

Examples

Example III: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

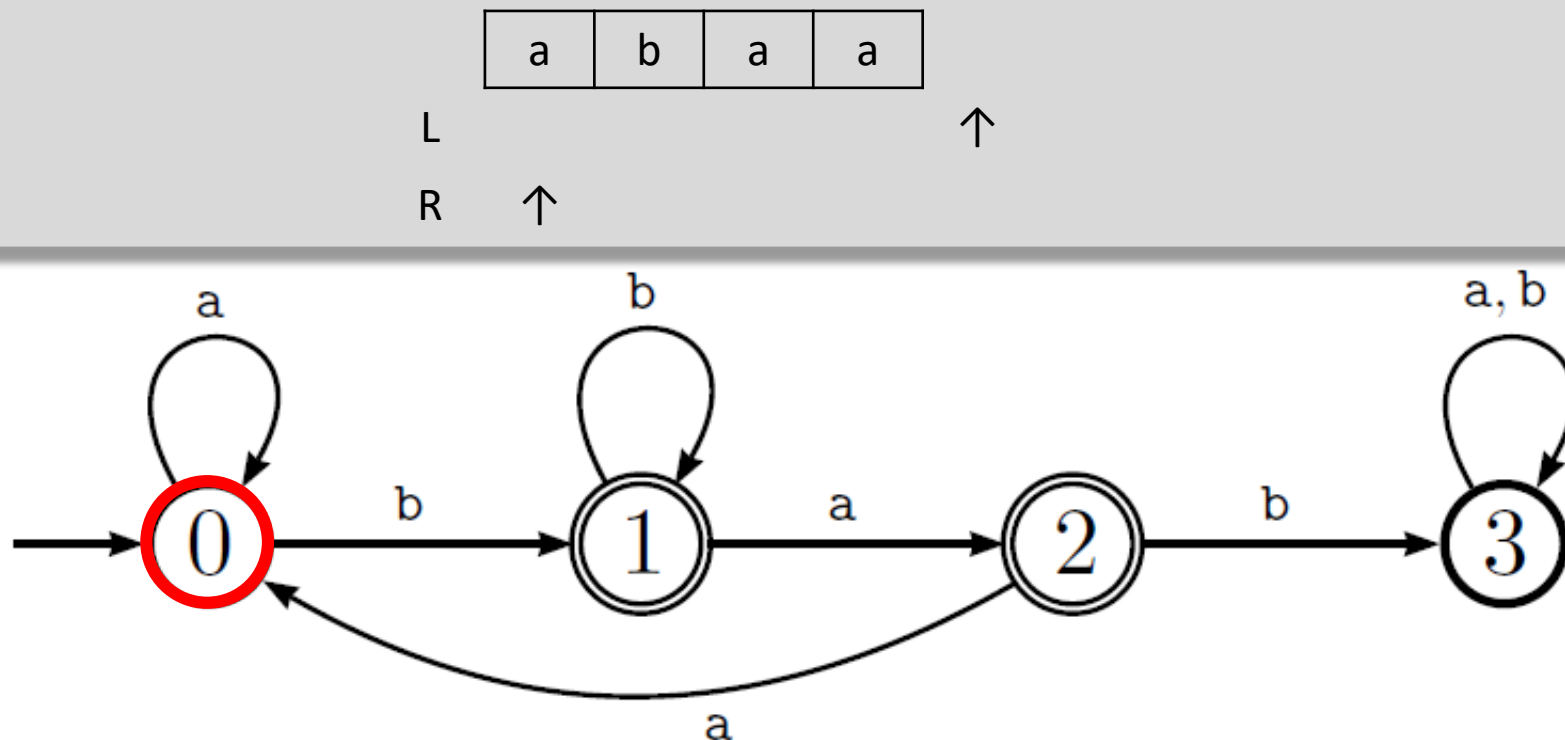


Stack



Examples

Example III: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2



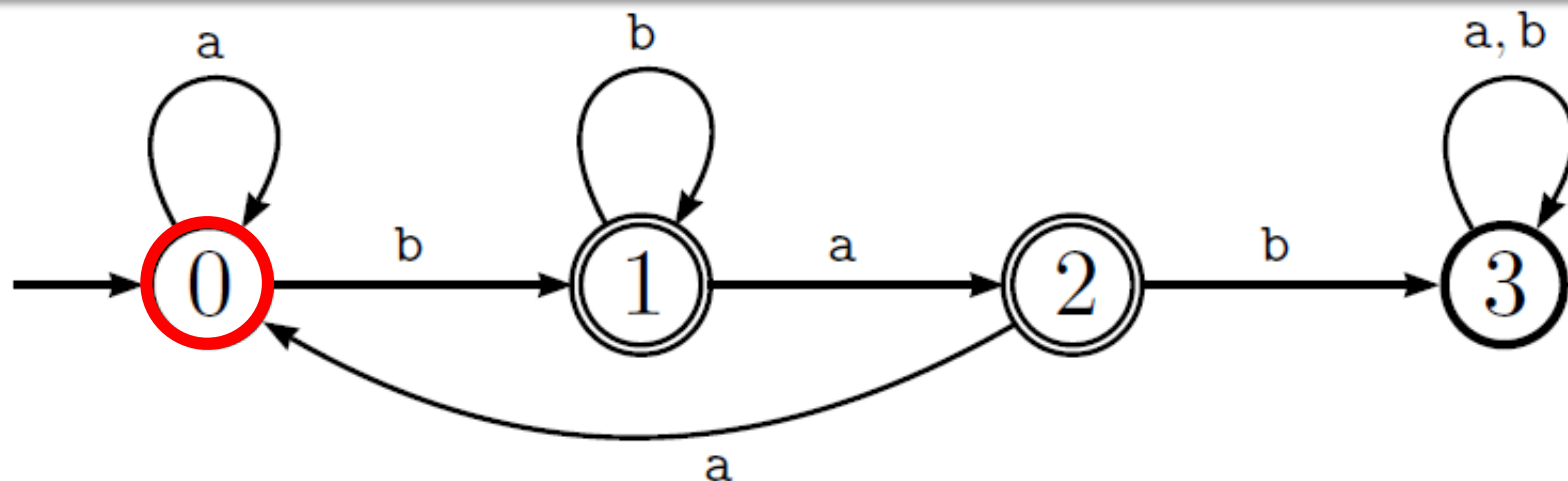
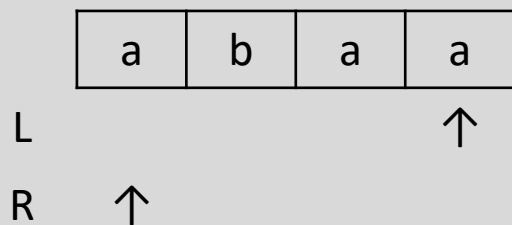
- simultaneously pop the stack and move L one step to the left until the stack gets empty or some $q_a \in F$ is popped

Stack



Examples

Example III: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2



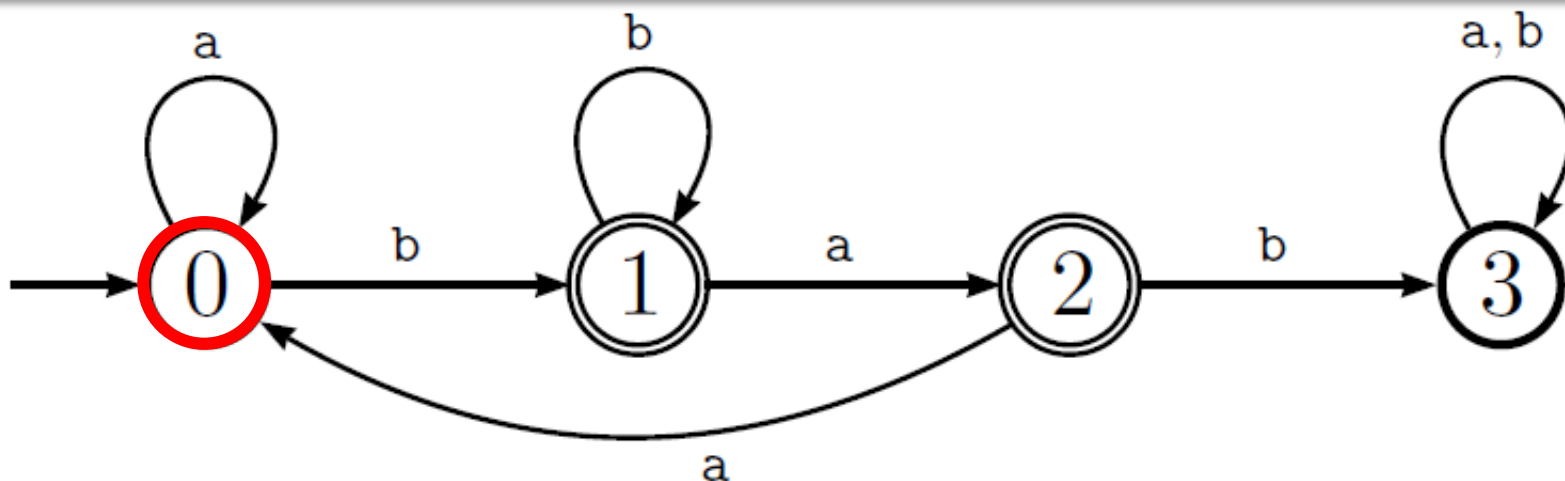
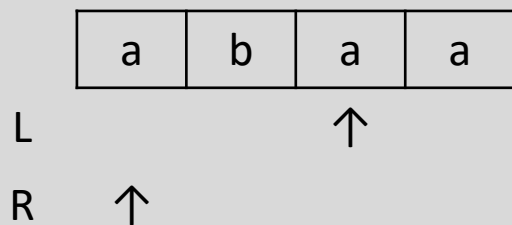
- Move L to the left
- Pop 0 and save $A(0)$
- $0 \notin F$

Stack



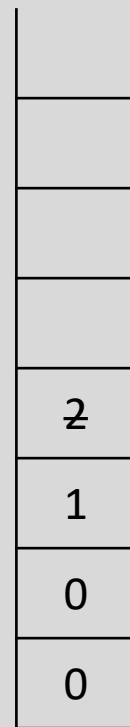
Examples

Example III: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2



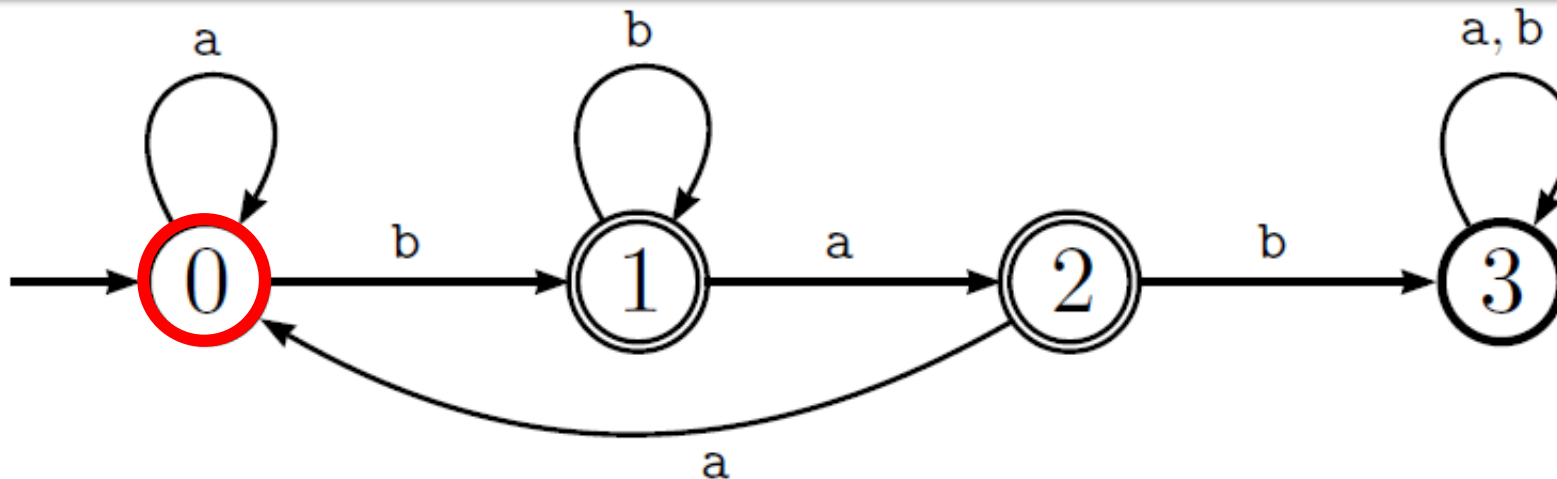
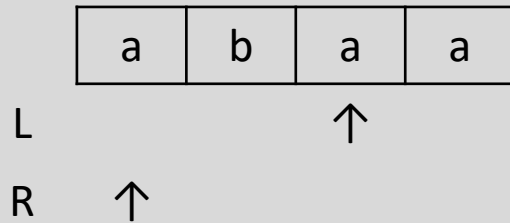
- Move L to the left
- Pop 2
- $2 \in F$

Stack



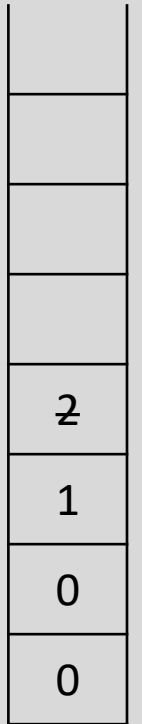
Examples

Example III: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

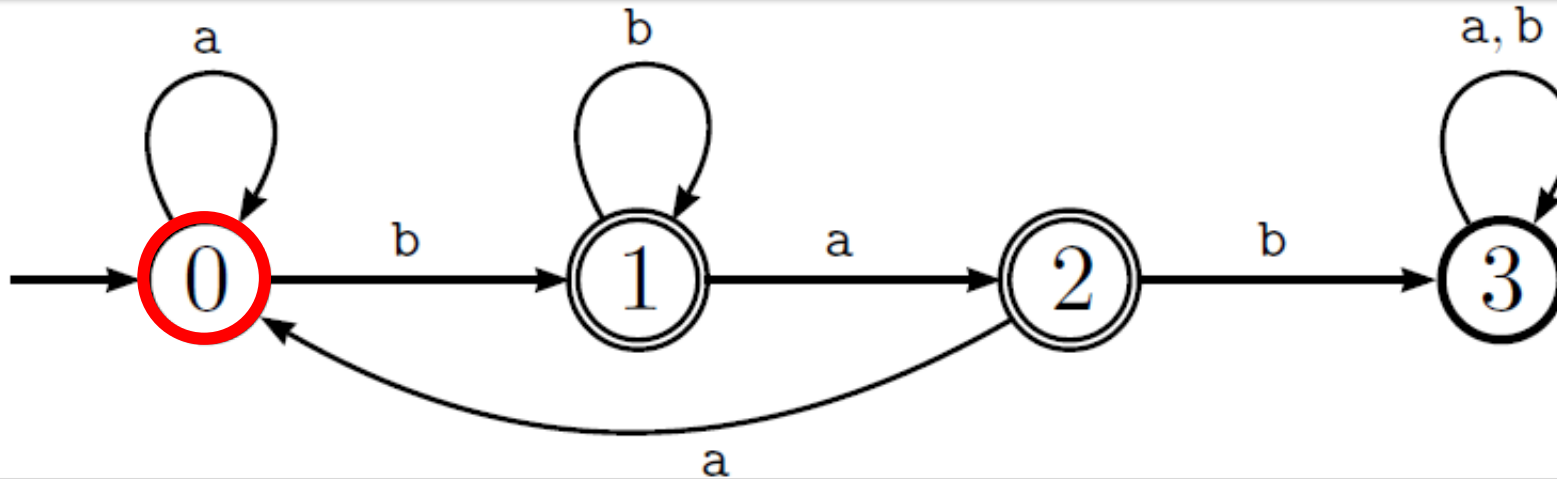
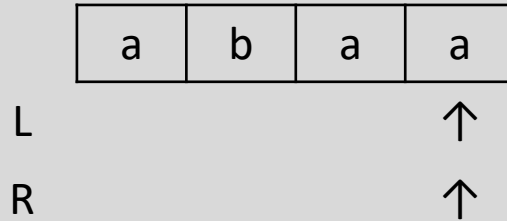


- Executes $A(2)$
- $lex = \text{"aba"}$

Stack

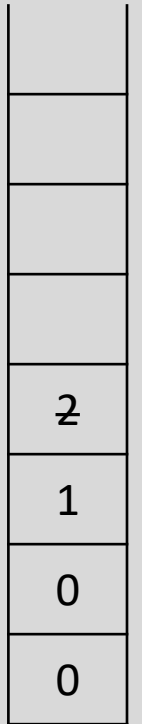


Output: aba,2

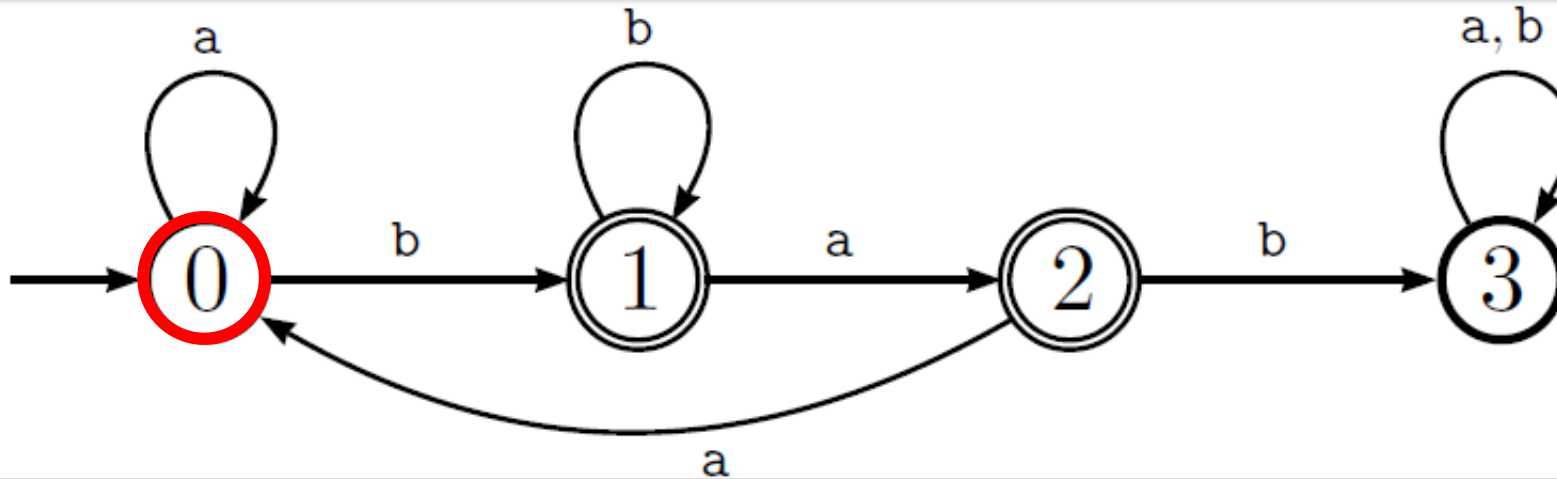
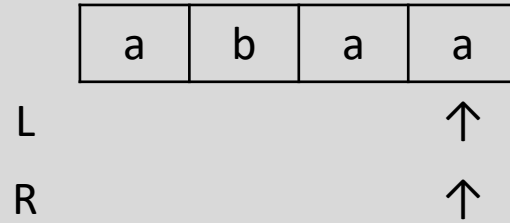


- Move L one step to the right
- Move R to where L is

Stack

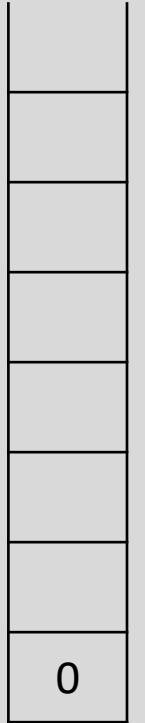


Output: aba,2



- Empty the stack
- Enter q_0

Stack



Examples

Example III: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

Output: aba,2

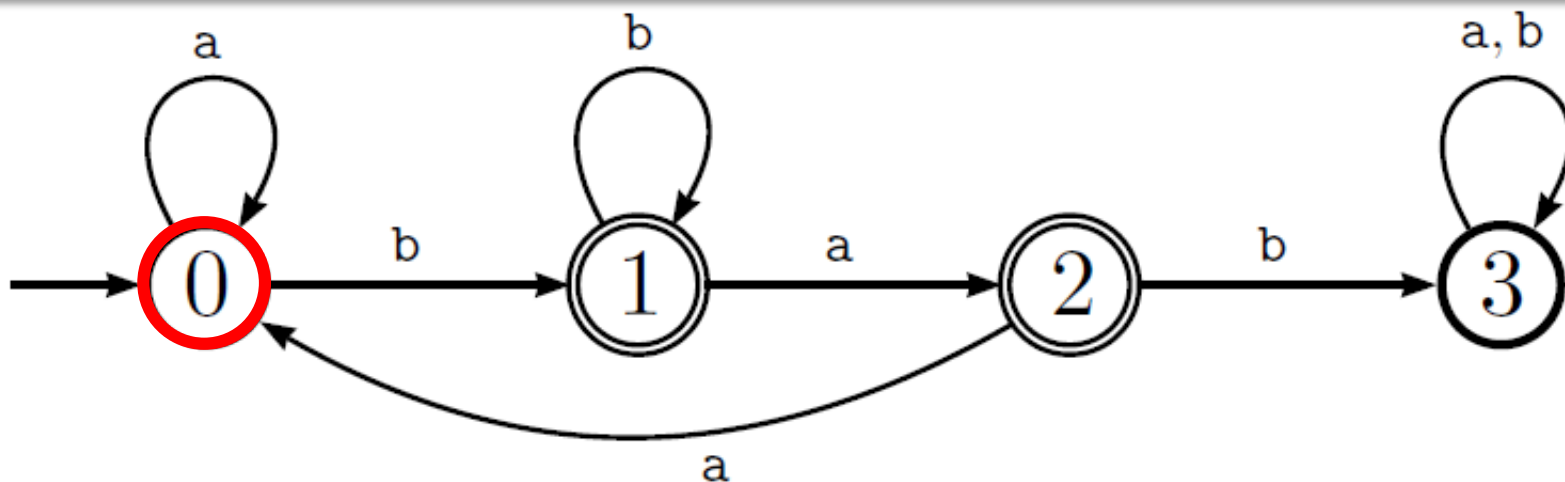
a	b	a	a
---	---	---	---

L

↑

R

↑



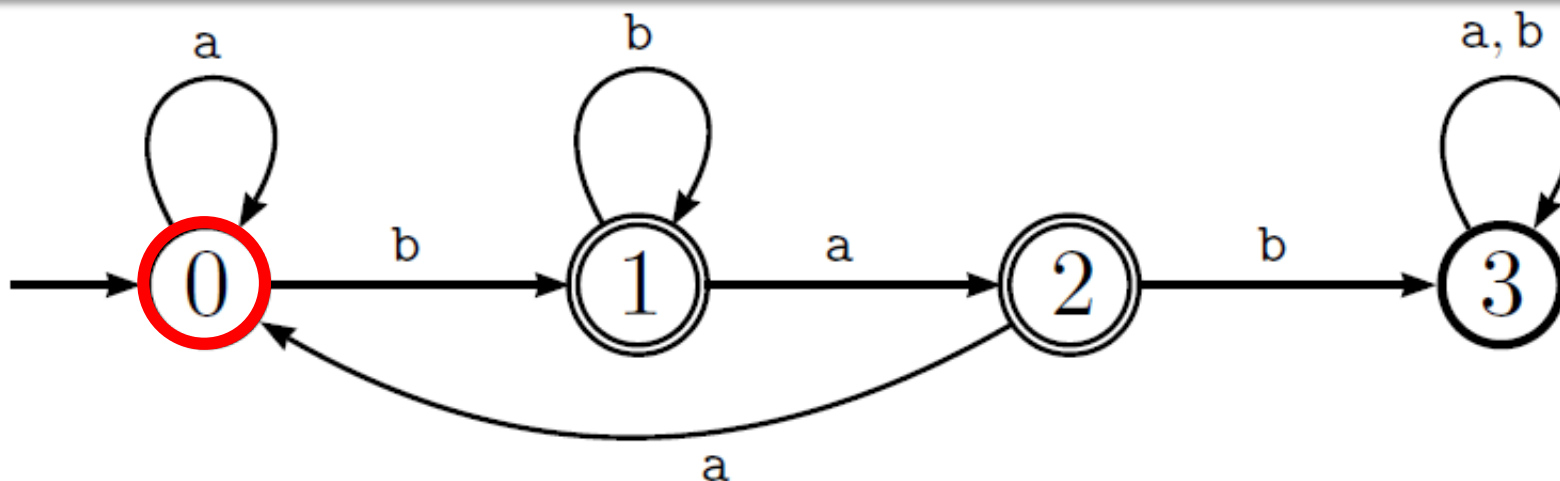
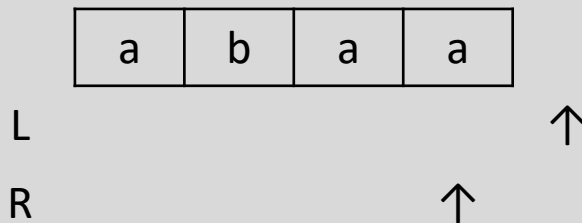
Stack



Examples

Example III: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

Output: aba,2

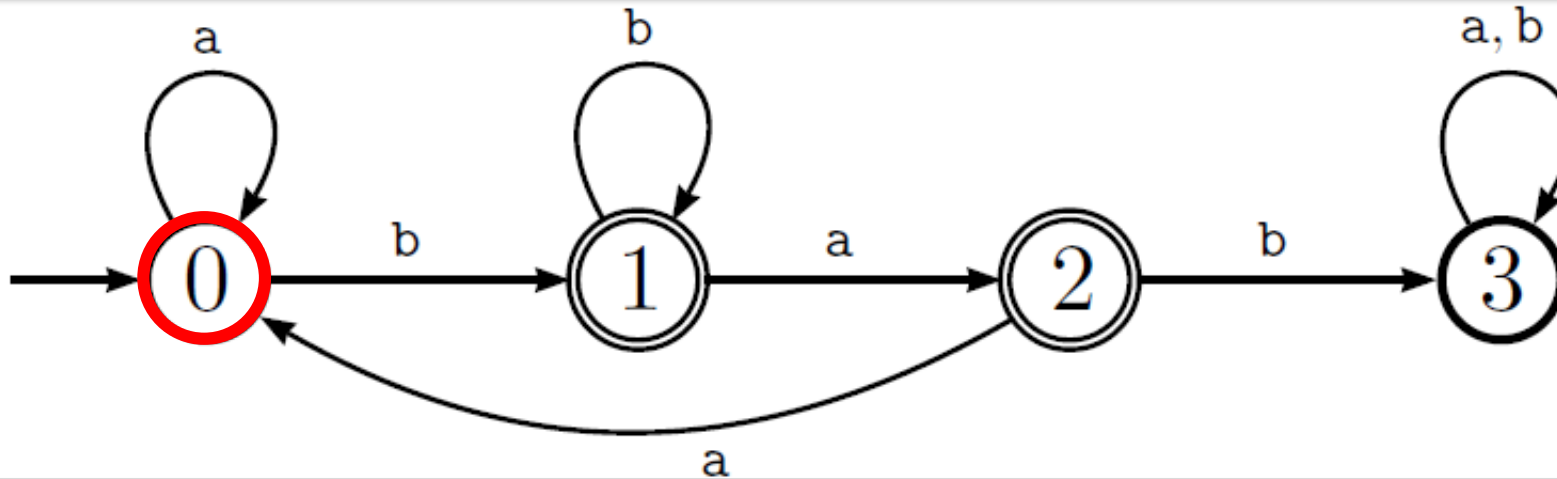
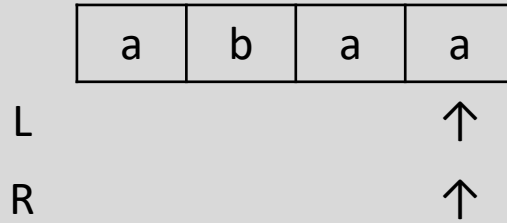


- simultaneously pop the stack and move L one step to the left until the stack gets empty or some $q_a \in F$ is popped

Stack

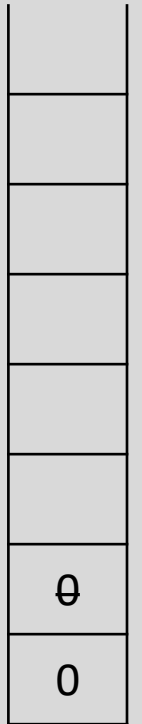


Output: aba,2



- Move L to the left
- Pop 0 and save $A(0)$
- $0 \notin F$

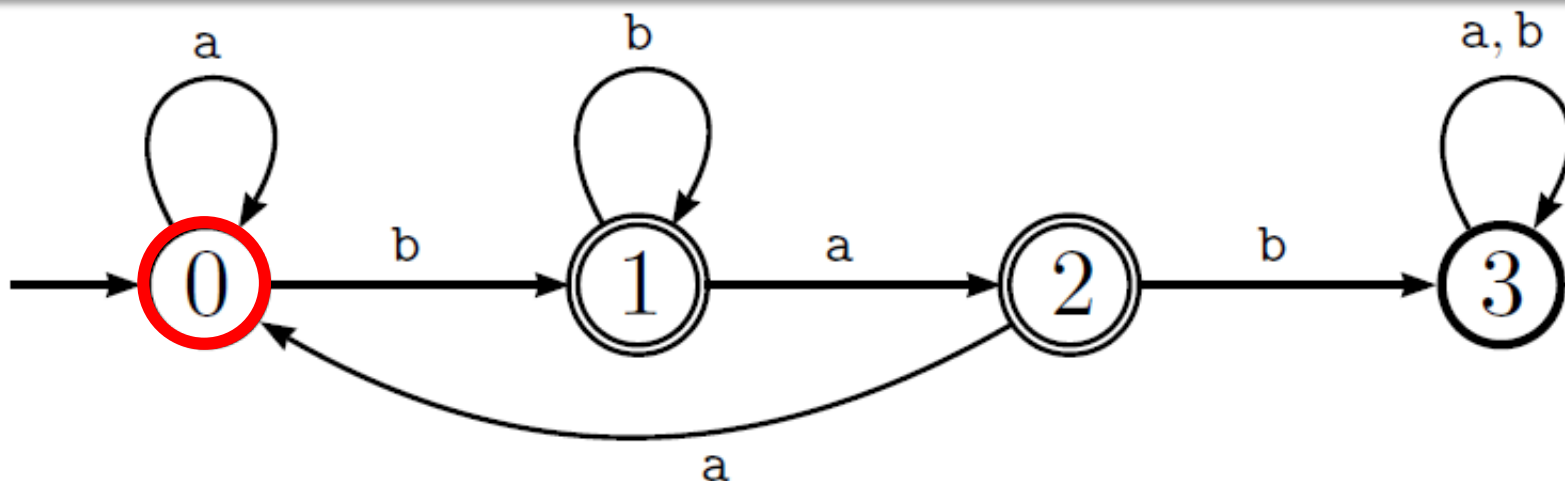
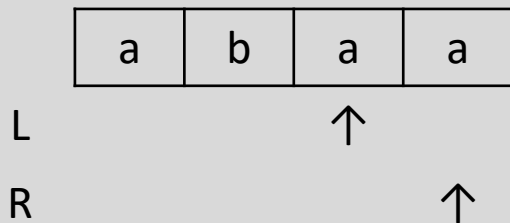
Stack



Examples

Example III: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

Output: aba,2



- Move L to the left
- Pop 0
- $0 \notin F$

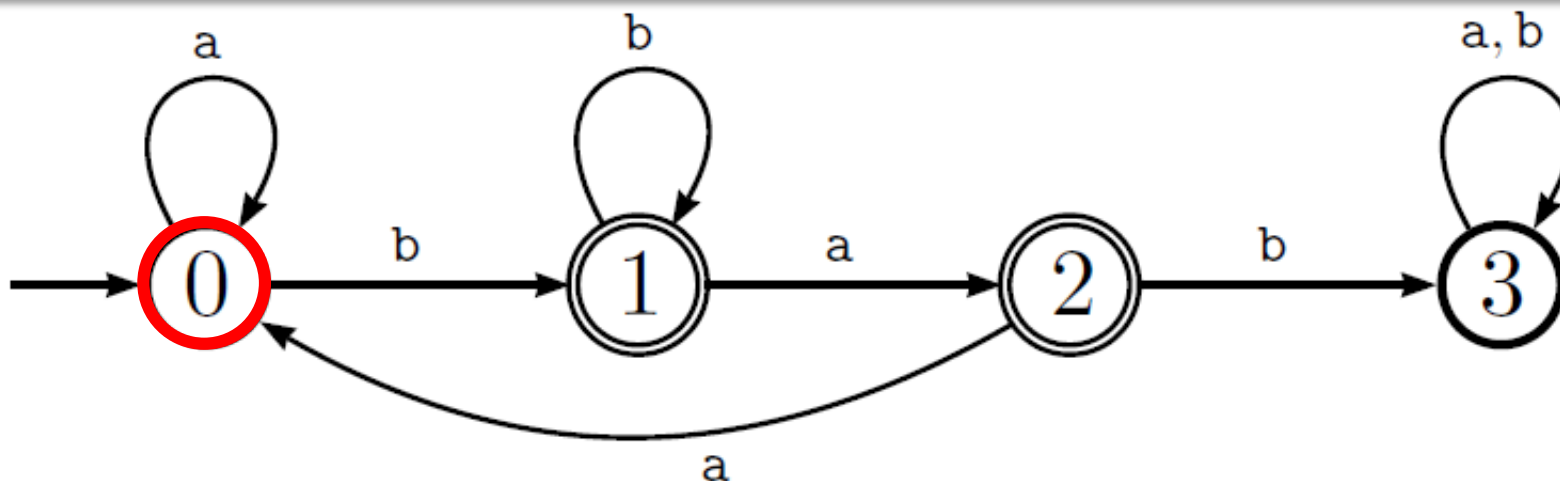
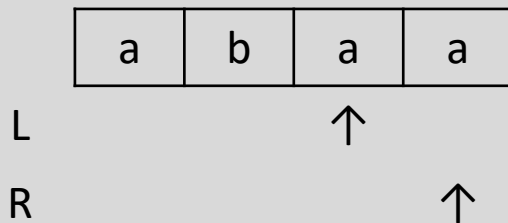
Stack



Examples

Example III: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2

Output: aba,2



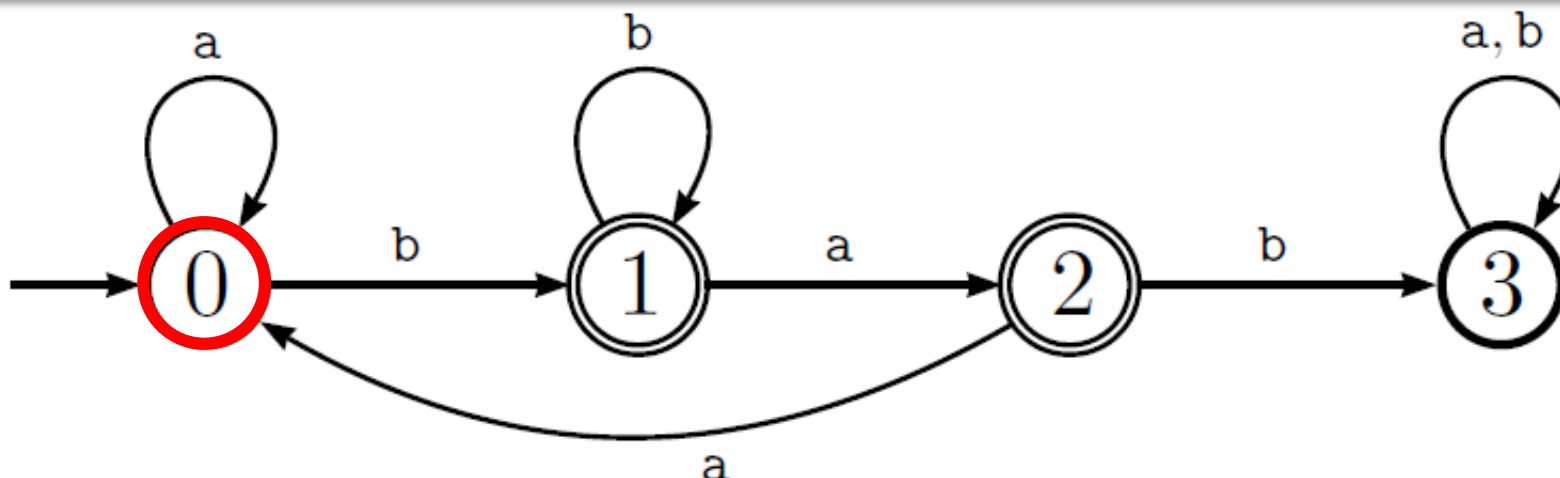
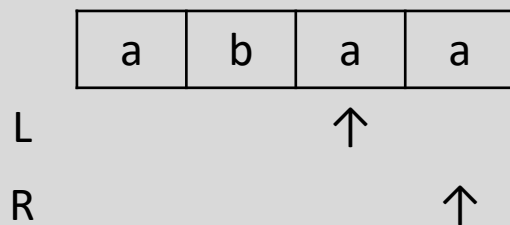
- *Stack is Empty*
- Executes $A(0)$ (*Saved previously*) and halts.
- $lex = "a"$

Stack



Examples

Example III: 0;1;2;3#a;b#0,a,0;0,b,1;1,a,2;1,b,1;2,a,0;2,b,3;3,a,3;3,b,3#0#1;2



Output

aba,2;a,0

Stack

