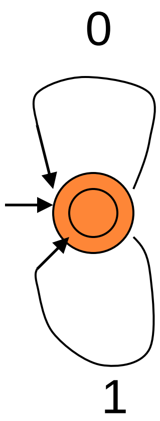
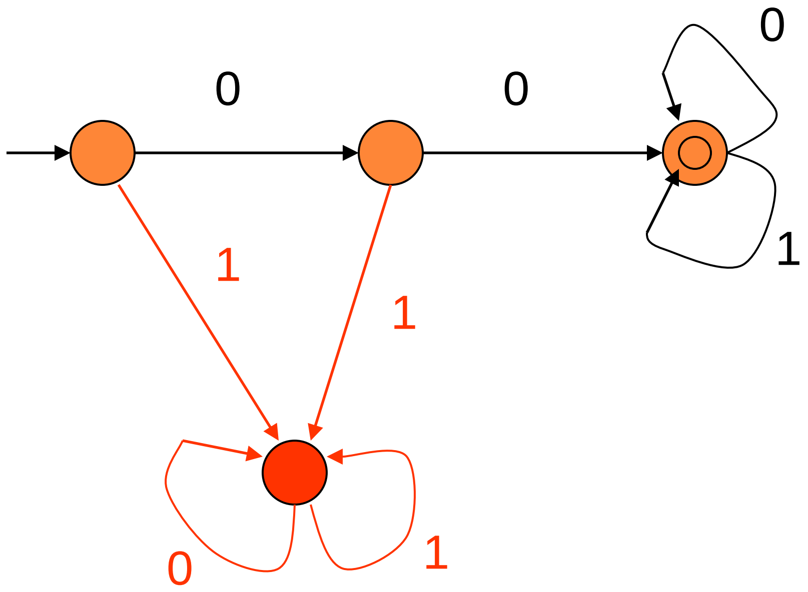
DFA

CONSTRUCT DFA TO ACCEPT (0+1)*

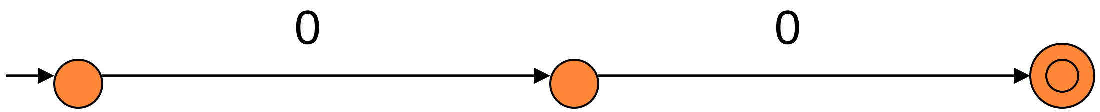


Construct DFA to accept 00(0+1)*



$(0+1)^*00(0+1)^*$

- Idea: Suppose the string $x_1x_2 \cdots x_n$ is on the tape. Then we check x_1x_2, x_2x_3, ..., $x_{n-1}x_n$ in turn.
- Step 1. Build a checker



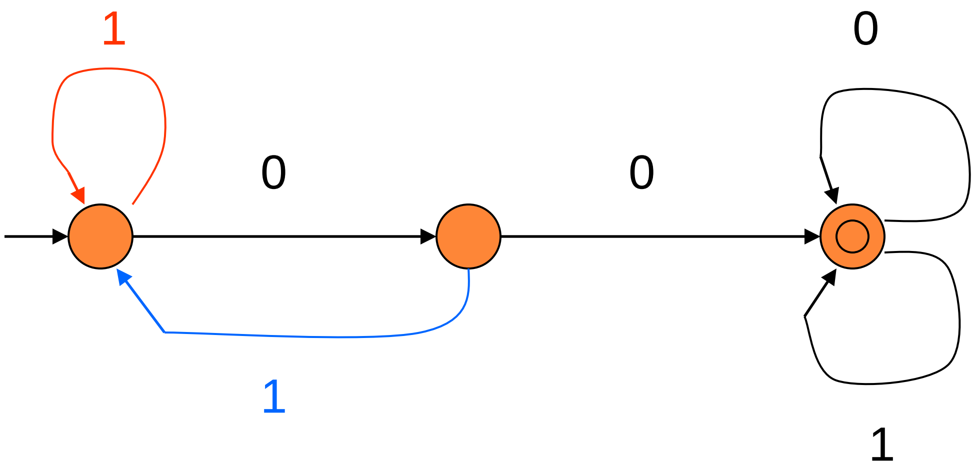
- Step 2. Find all edges by the following consideration:

  Consider x1x2.
- If $x_1=1$, then we give up x_1x_2 and continue to check x_2x_3. So, we have $\delta(q_0, 1) = q_0$.
- If $x_1x_2 = 01$, then we also give up x_1x_2 and continue to check x_2x_3. So,

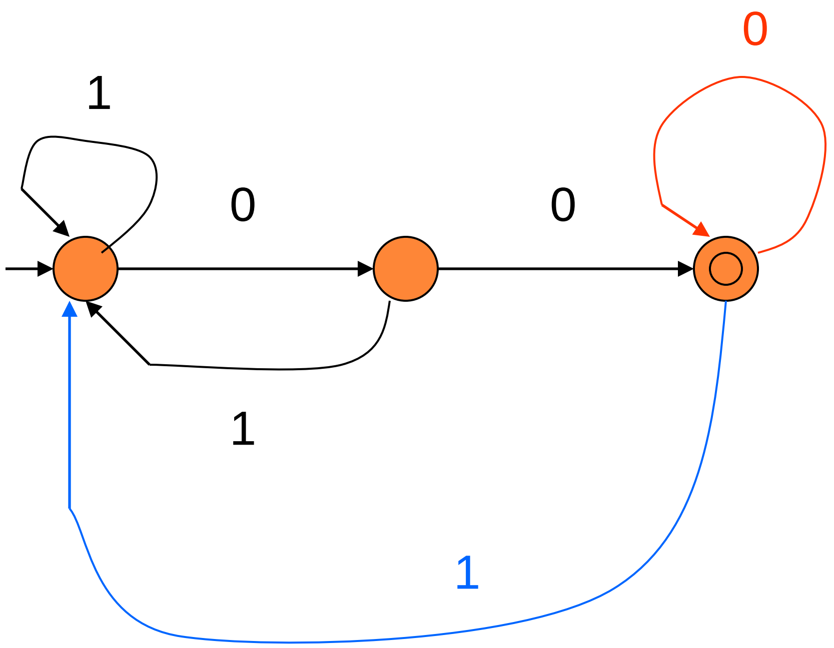
$$\delta(q_1, 1) = \delta(q_0, 1) = q_0.$$

- If $x_1x_2 = 00$, then $x_1x_2\cdots x_n$ is accepted for any $x_3\cdots x_n$. So, $\delta(q_2,0)=\delta(q_2,1)=q_2$.

(0+1)*00(0+1)*



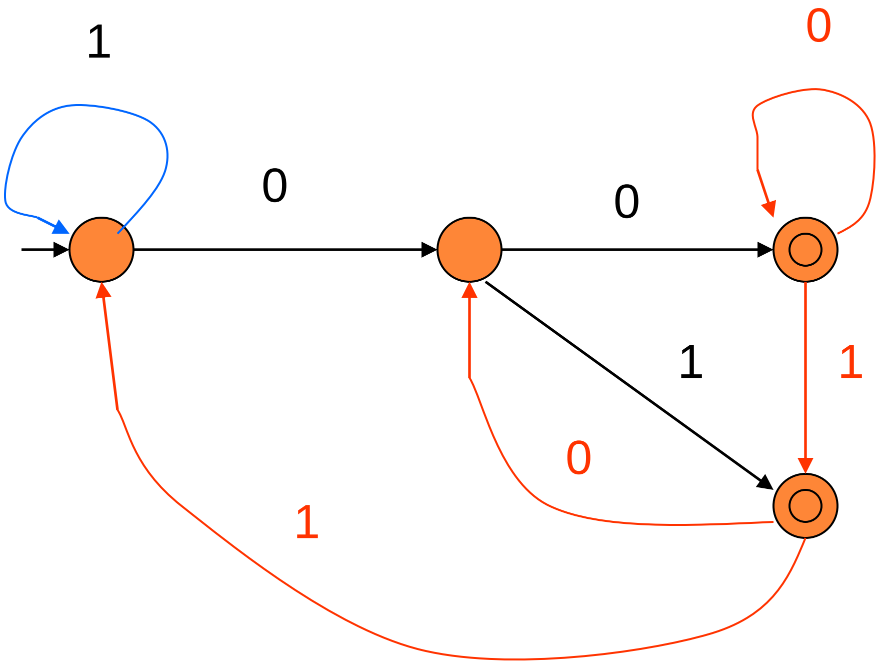
(0+1)*00



In general, suppose $x_1\ x_2\ \ldots\ x_n$ is the string on the tape
And we want check $x_1 \ldots x_k$, $x_2 \ldots x_{k+1}$, …, in turn. If $x_1 \ldots x_k$
Is not the substring that we want and we need to check
$x_2 \ldots x_{k+1}$, then we set that for and $i \leq k$,

$$\delta(\delta(s, x_1 \ldots x_i), x_{i+1}) = \delta(s, x_1 \ldots x_i\ x_{i+1}).$$

(0+1)*(00+01)



2ND SOLUTION-PARALLEL MACHINE

L(M) = (0+1)*00 M=(Q, Σ, δ, s, F)

L(M')= (0+1)*01 M'=(Q', Σ, δ', s', F')

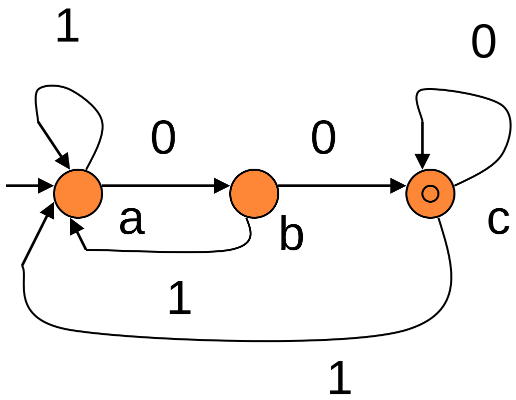
L(M'') = (0+1)(00+01) = L(M) U L(M')

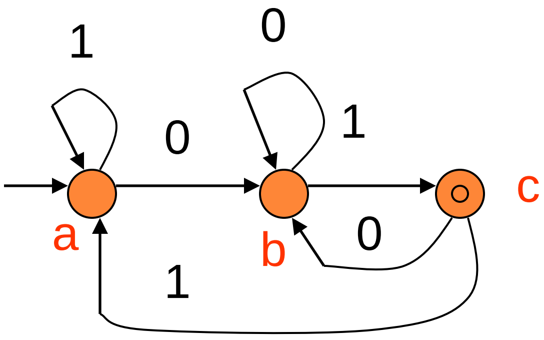
Q'' = {(q, q') | q in Q, q' in Q'}

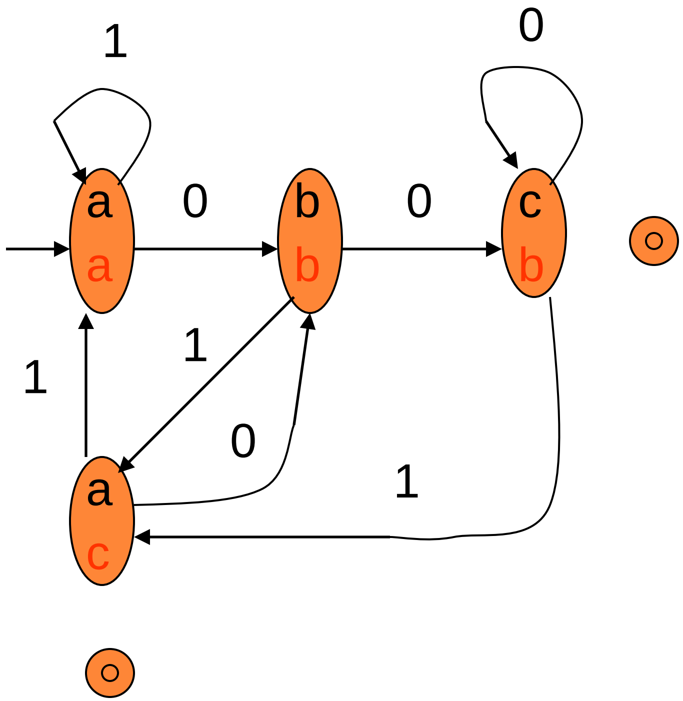
δ''((q, q'), a) = (δ(q, a), δ'(q', a))

s'' = (s, s')

F'' = { (q, q') | q in F or q' in F' }.


1
0
0
0
a
b
c
1
1


1
0
0
1
c
a
b
0
1


1
0
a
a
0
b
b
0
c
b
1
1
0
1
a
c

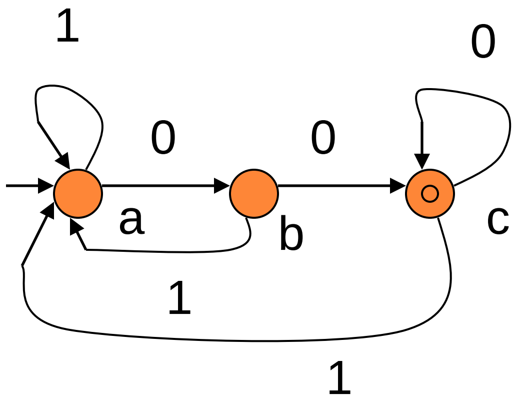
Union, Intersection, subtraction

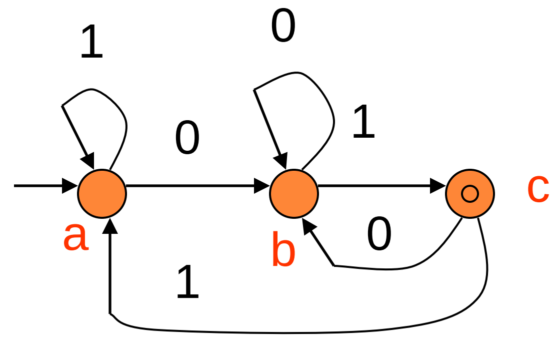
Union: F'' = {(q,q') | q in F or q' in F'}

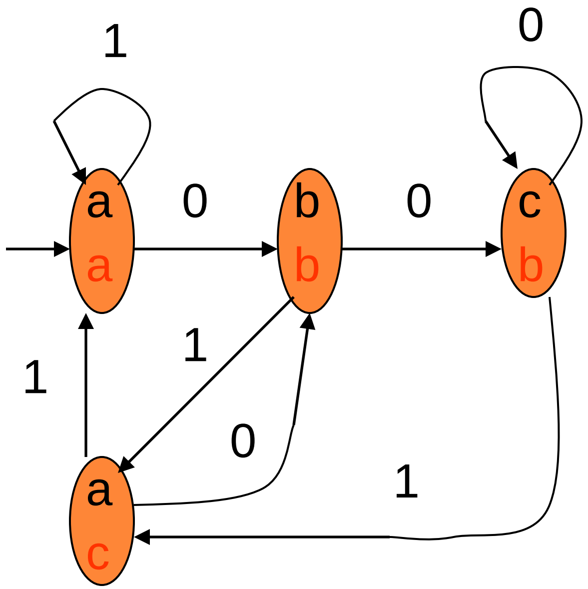
Intersection: F''= {(q,q') | q in F and q' in F'}

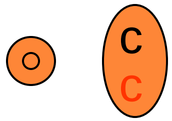
Subtraction: L(M) \ L(M')

F'' = {(q,q') | q in F and q' not in F'}

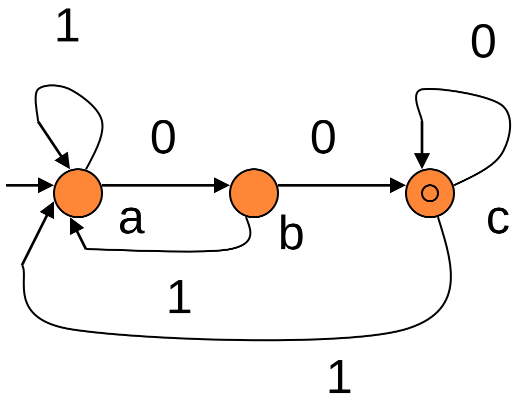


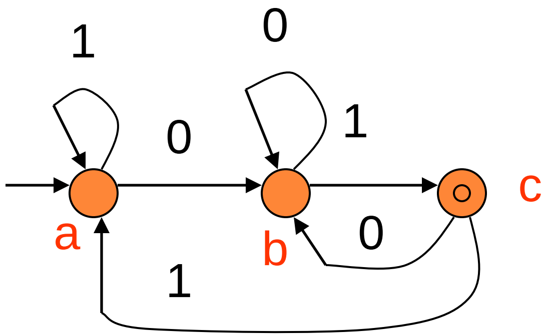


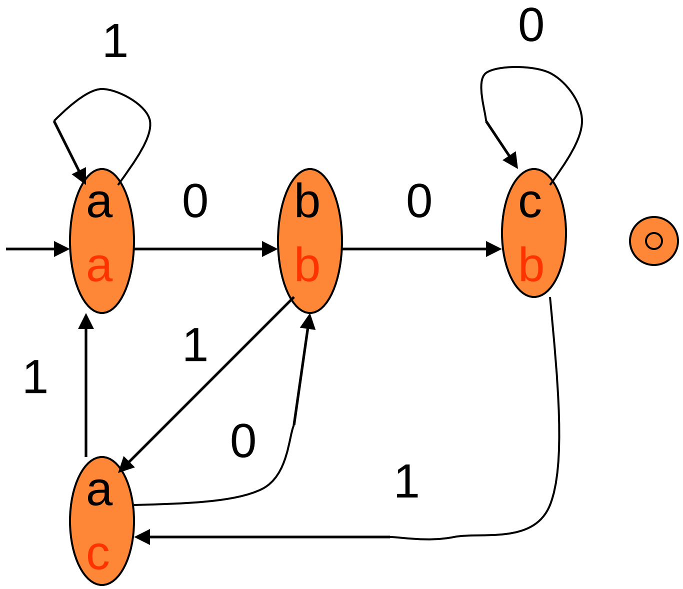




(0+1)*00 ∩ (0+1)*01





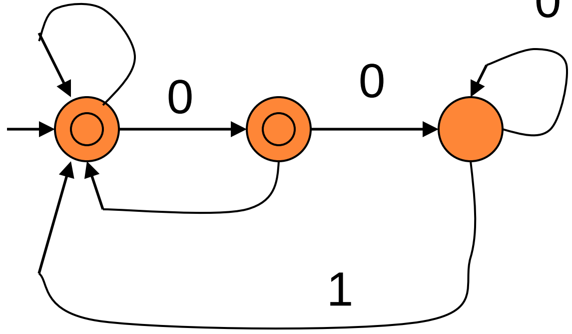


(0+1)*00 \ (0+1)*01

Complement

- L(M')= Σ*-L(M)

  F' = Q - F



$$\overline{(0+1)^*00}$$

THE SET OF ALL BINARY STRINGS BEGINNING WITH 1 WHICH INTERPRETED AS A BINARY REPRESENTATION OF AN INTEGER, IS CONGRUENT TO ZERO MODULO 5.

- Idea: To construct a DFA, we need to figure out what should be states and where each edge should go. Usually, states can be found through studying the condition for accepting. The condition for accepting a string $x_1x_2 \cdots x_n$ is $x_1x_2 \cdots x_n \equiv 0 \bmod(5)$. So, we first choose residues 0, 1, 2, 3, 4 as states.

$2i + 0 \equiv ?\ (\text{mod } 5)$

$2i + 1 \equiv ?\ (\text{mod } 5)$