Theory of Automata

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Lecture 5

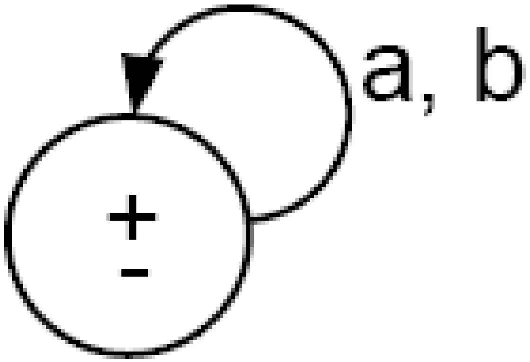
FA and their Languages

- We will study FA from two different angles:

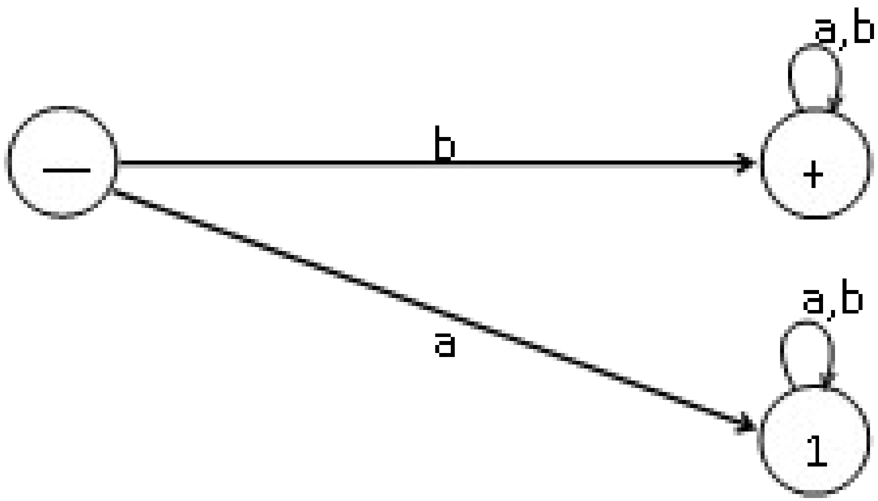
1. Given a language, can we build a machine for it?
2. Given a machine, can we deduce its language?

- **Note:**
  - **Every state has as many outgoing edges as there are letters in the alphabet.**
  - **It is possible for a state to have no incoming edges or to have many.**

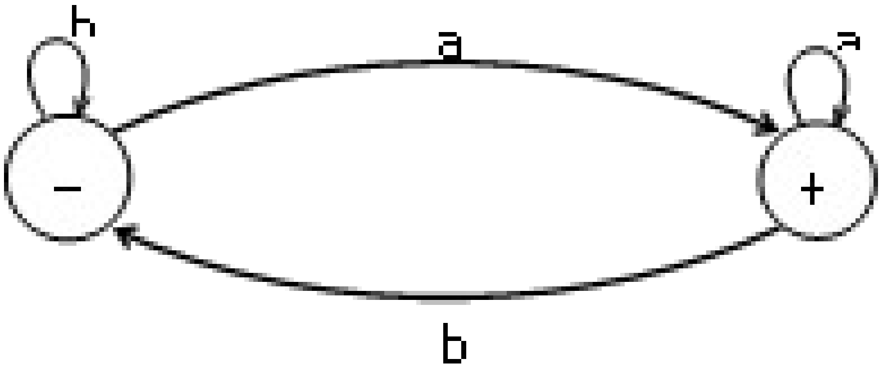
(a + b)*



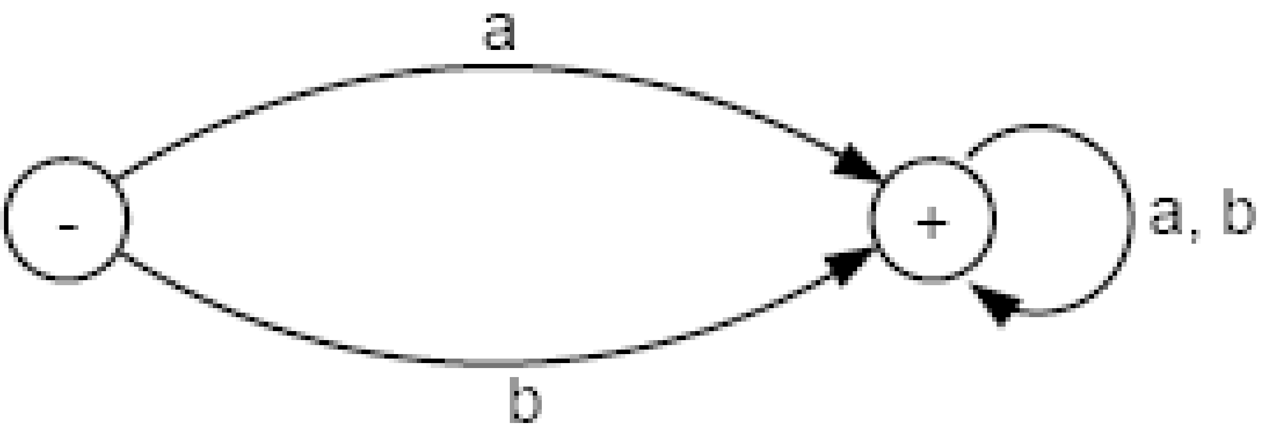
starting with b=b(a + b)*



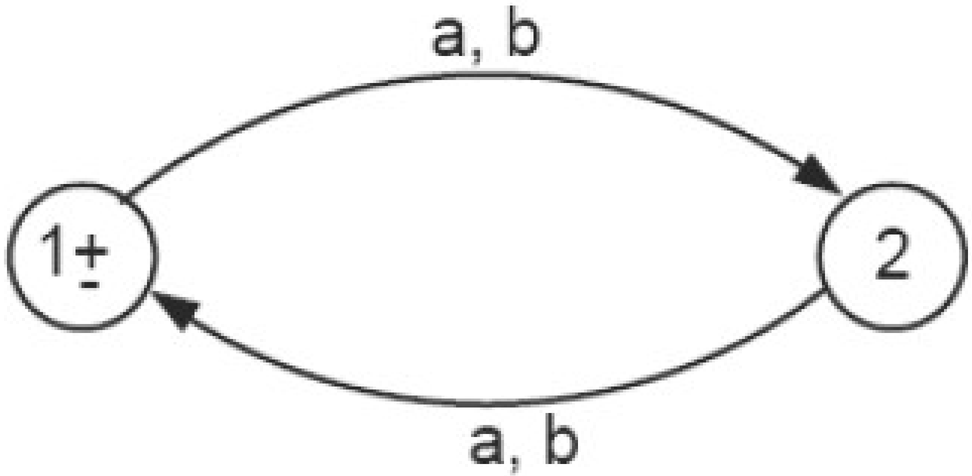
ending in a=(a+b)*a



(a+b)(a+b)*

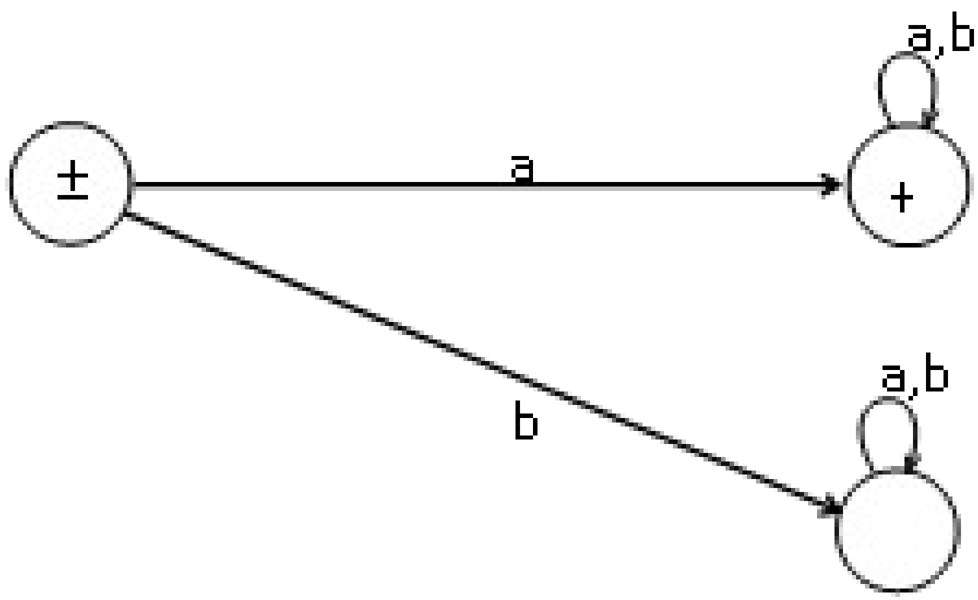


Even length

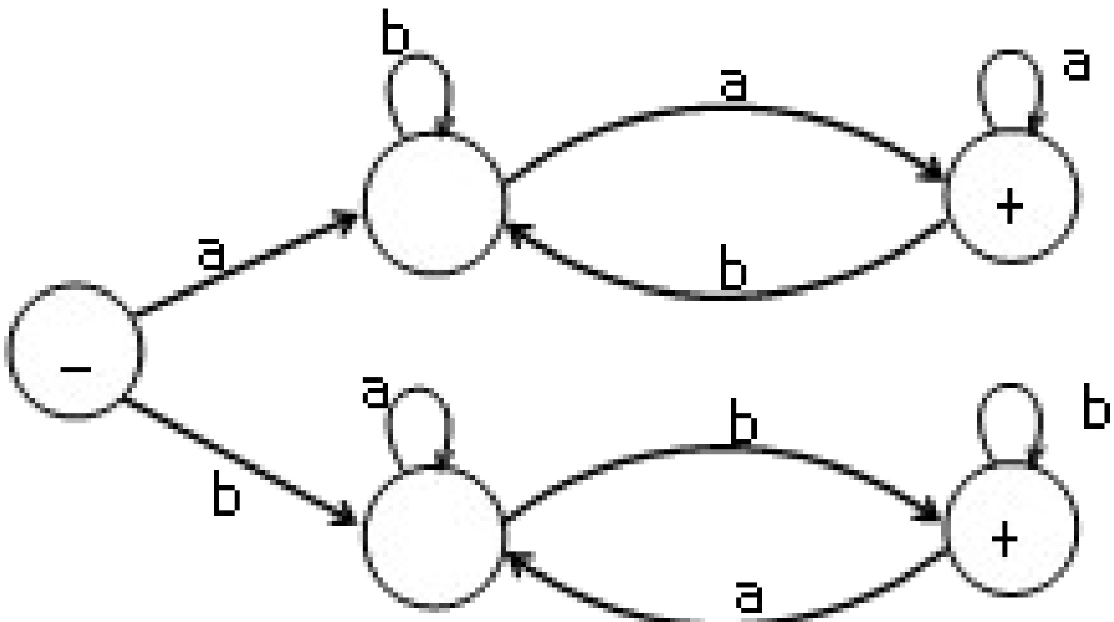


not beginning with a

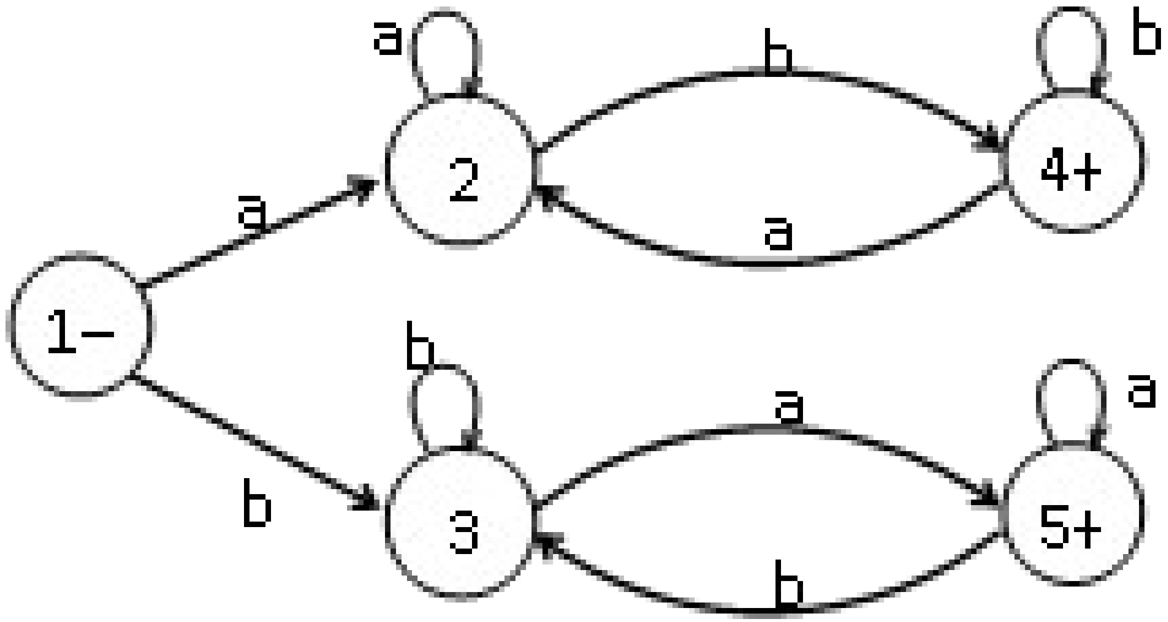
$b(a + b)^* + \Lambda$



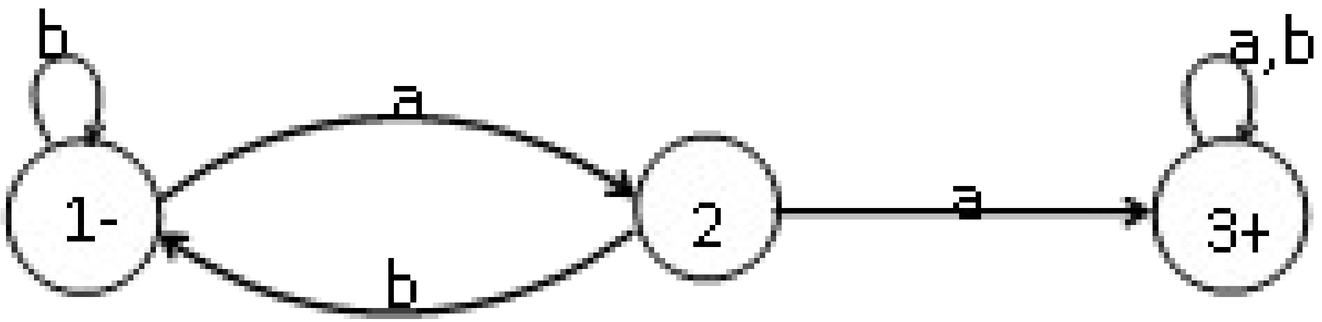
beginning with and ending in same letters. $a(a + b)^*a + b(a + b)^*b$



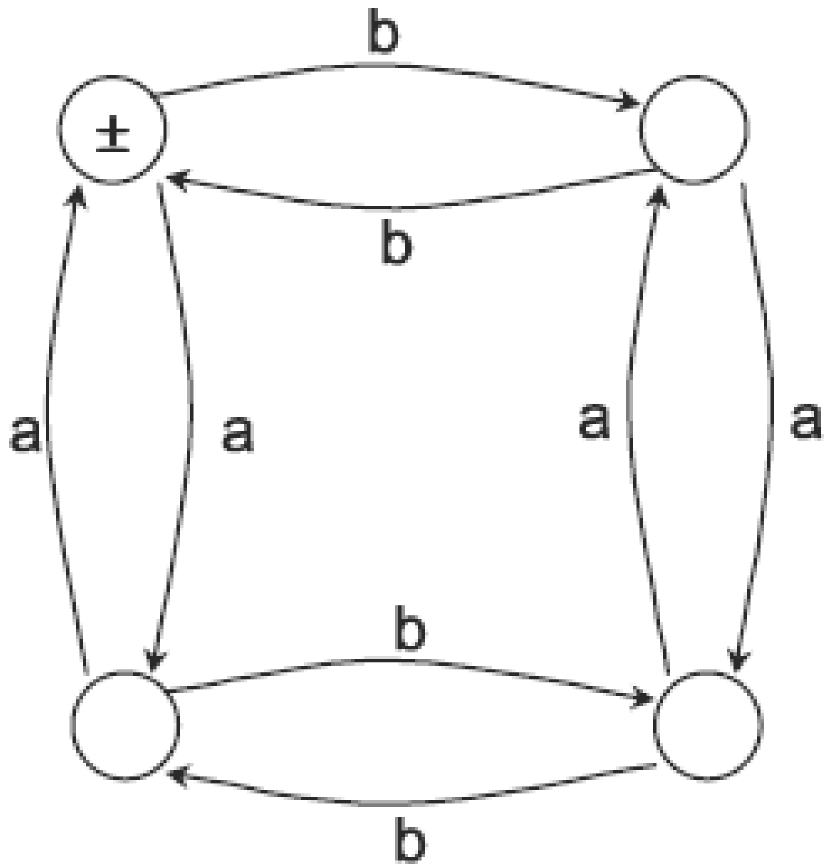
beginning with and ending in different letters. a(a + b)*b + b(a + b)*a



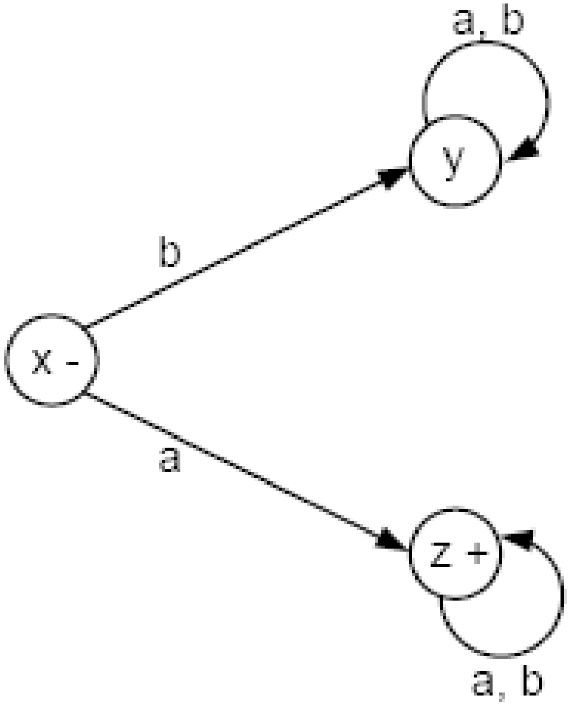
containing double a=$(a+b)^*(aa)(a+b)^*$.



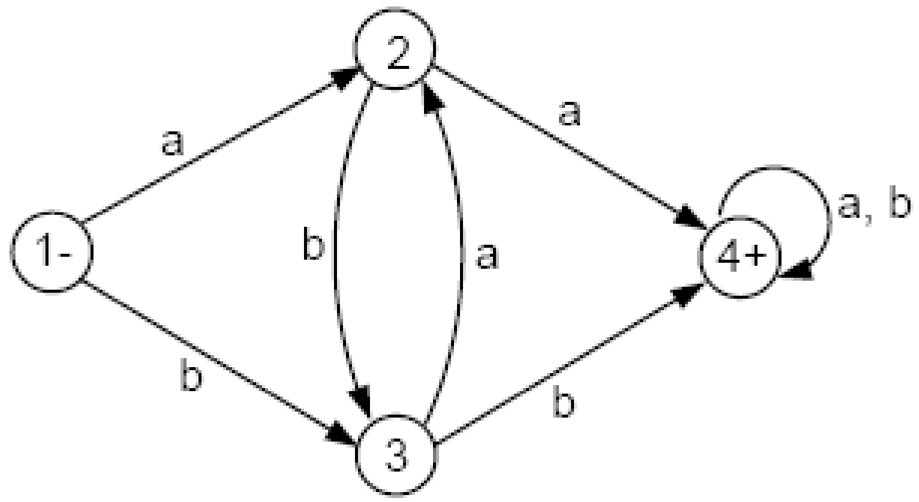
EVEN-EVEN



a(a + b)*

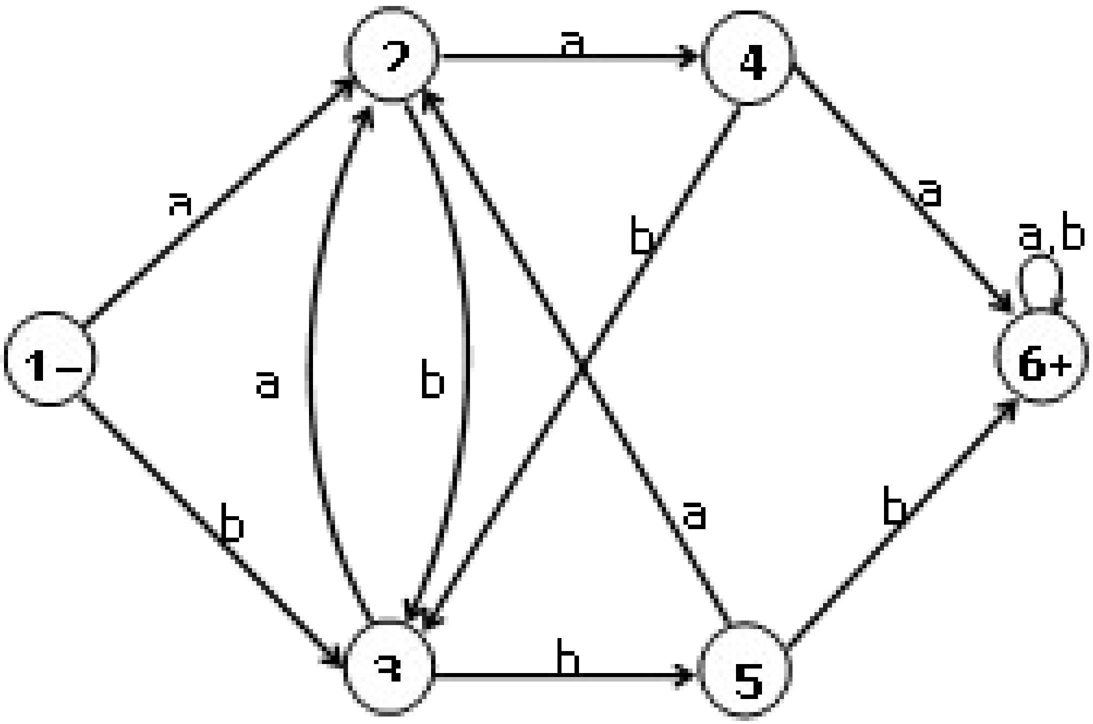


$(a + b)^*(aa + bb)(a + b)^*$



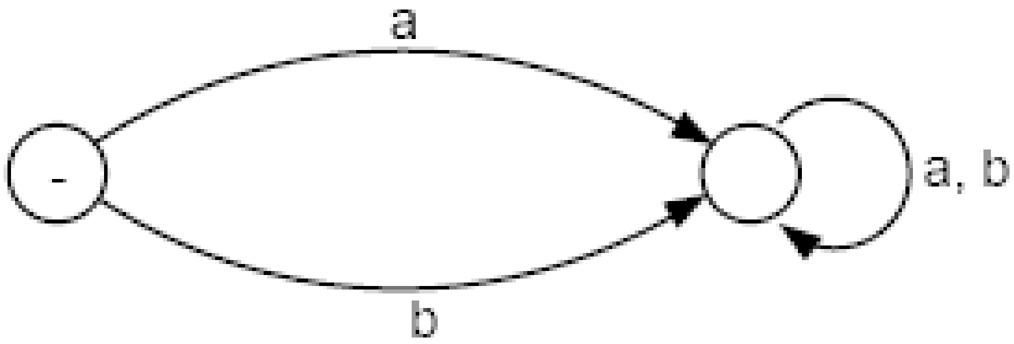
containing a triple letter, either

aaa or *bbb*



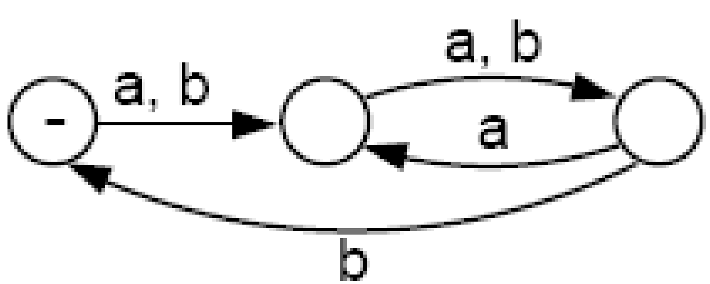
FAs that accept no language

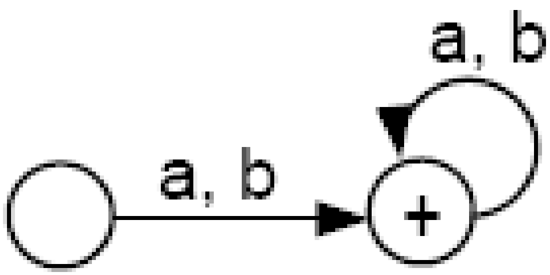
- There are FAs that accept no language. These are of two types:
- The first type includes FAs that have no final states, such as



FAs that accept no language

- The second type include FAs of which the final states can not be reached from the start state.
- This may be either because the diagram is in two separate components. In this c s **disco** elow:





- Or it is because the final state has no incoming edges, as shown below: