Finite Automata

* Deterministic Finite Automaton (DFA):
  - for any given state with any given input character, there is never more than one possible outgoing transition labeled by that character
  - no ambiguity

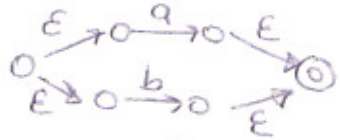
* Three steps to convert a regular expression to a DFA
  1) Convert regular expression into NFA

     NFA : Non-deterministic Finite Automaton

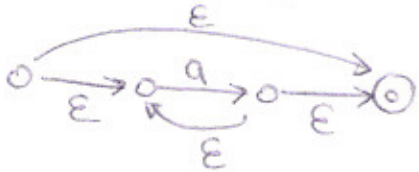
     NFA = DFA + a) there maybe more than one transition out of a given state labeled by a given character.
     b) there may be ε transitions.
  2) Translate NFA into DFA
  3) Space optimization (=final DFA with minimum number of possible states)

* Concatenation : 

$\{ ab$

* Alternation : 

$\{ a|b$

* Kleene Closure : 

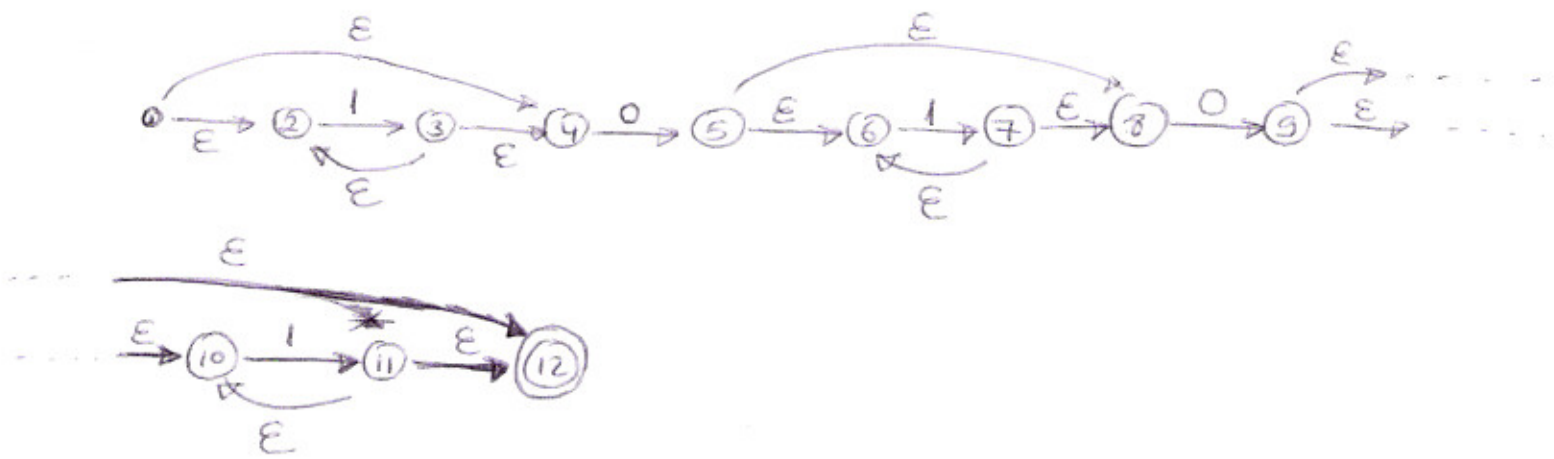
$\{ a^*$

*Example:

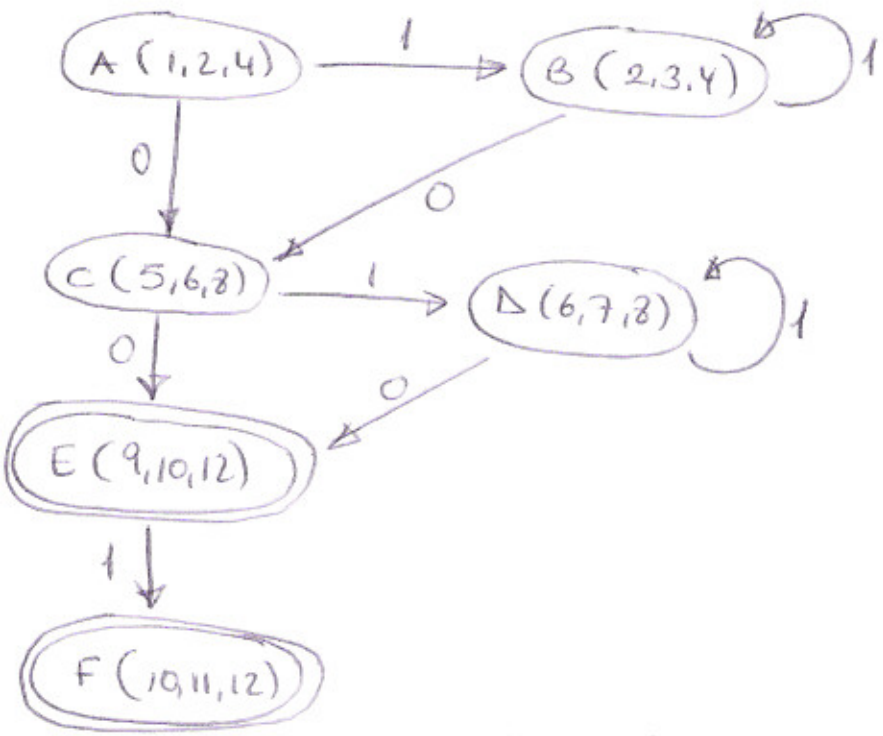
- Strings of all 0's and 1's where there is exactly two 0's:

a) Regular expression: $1^*01^*01^*$

1) NFA:



2) DFA



3) Optimized DFA: