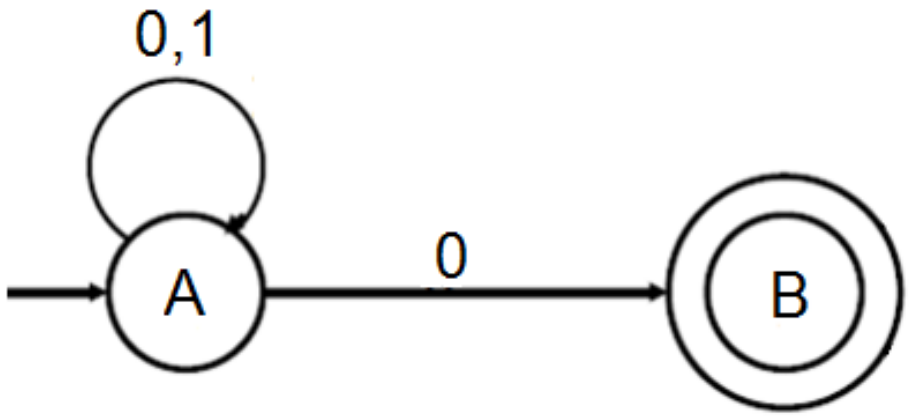
NONDETERMINISTIC FINITE AUTOMATA

NONDETERMINISTIC FINITE AUTOMATA (NFA)

- A *nondeterministic finite automaton* has the ability to be in several states at once.
- Transitions from a state on an input symbol can be to any set of states.
- Accept if any sequence of choices leads to a final state.

NONDETERMINISTIC FINITE AUTOMATA (NFA)

- state transition diagram

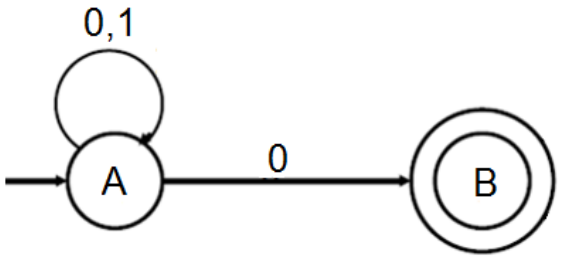


FORMAL DEFINITION

- A deterministic finite automaton M is a 5-tuple, $(Q, \Sigma, \delta, q_0, F)$, consisting of:
  - Q = set of all states
  - Σ = input symbols
  - δ = transition function $(Q \times \Sigma \rightarrow 2^Q)$
  - q0 = start state / initial state
  - F = set of final states

EXAMPLE 1

- **From the given NFA diagram, describe an NFA accepting the language by:**
  - a.) determining the 5-tuple
  - b.) building a DFA transition table



- **5-tuple**
  - Q = {A,B}
  - Σ = {0,1}
  - δ = {A × 0 → A; A × 0 → B; A × 1 → A; B × 0 → Φ; B × 1 → Φ}
  - q0 = A
  - F = B

- **Transition Table**

	0	1
→ **A**	A	AB
* **B**	Φ	Φ

EXAMPLE 2

- **For each of the following languages, describe a NFA accepting the language by drawing an NFA diagram**
  - L1 = set of all strings over {0,1} that ends with 1
  - L2 = set of all strings over {0,1} that contains 0
  - L3 = set of all strings over {a,b} that starts with ba