

NFA - Introduction

NFA - Non-deterministic Finite Automata

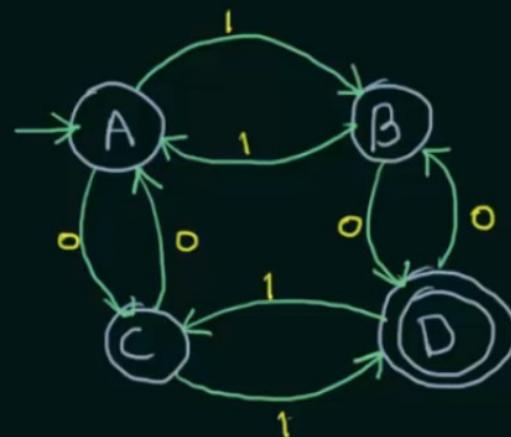


NFA - Non-deterministic Finite Automata

Deterministic Finite Automata

DETERMINISM

- » In DFA, given the current state we know what the next state will be
- » It has only one unique next state
- » It has no choices or randomness
- » It is simple and easy to design

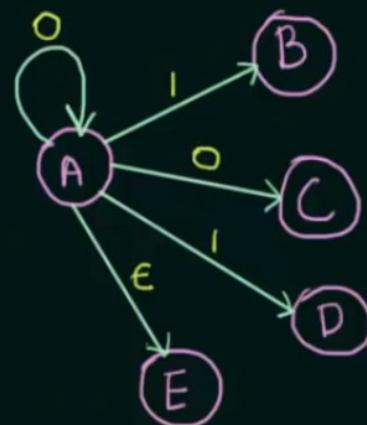
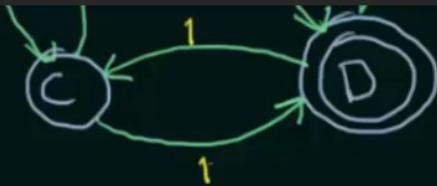


- >> It has only one unique next state
- >> It has no choices or randomness
- >> It is simple and easy to design

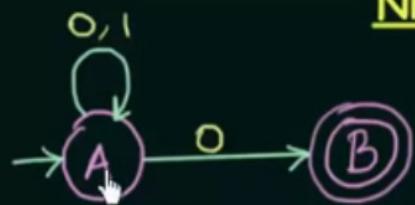
Non-deterministic Finite Automata

NON-DETERMINISM

- >> In NFA, given the current state there could be multiple next states
- >> The next state may be chosen at random
- >> All the next states may be chosen in parallel

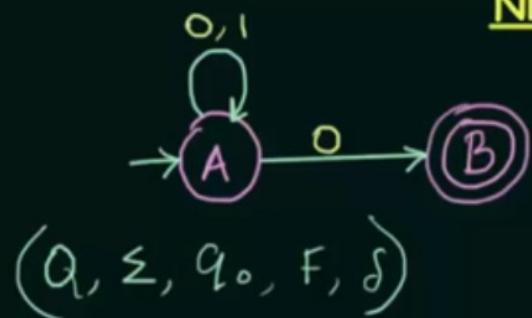


NFA - Formal Definition



$L = \{ \text{Set of all strings that end with } 0 \}$

NFA - Formal Definition



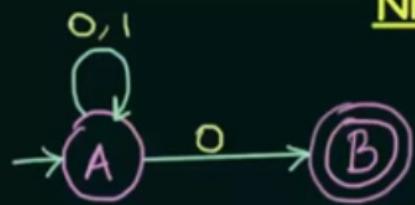
$L = \{ \text{Set of all strings that end with } 0 \}$

$$(Q, \Sigma, q_0, F, \delta)$$

$$Q = \boxed{\text{ }}$$



NFA - Formal Definition



$L = \{ \text{Set of all strings that end with } 0 \}$

$(Q, \Sigma, q_0, F, \delta)$

Q = Set of all states

Σ = inputs

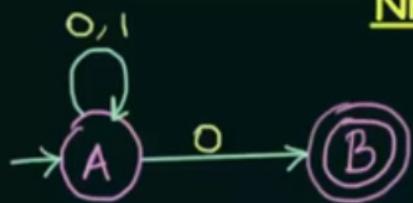
q_0 = start state / initial state

F = set of final states

$\delta = Q \times \Sigma \rightarrow \underline{\quad}$



NFA - Formal Definition



$L = \{ \text{Set of all strings that end with } 0 \}$

$(Q, \Sigma, q_0, F, \delta)$

Q = Set of all states

- $\{A, B\}$

Σ = inputs

- $\{0, 1\}$

q_0 = start state / initial state

- A

F = set of final states

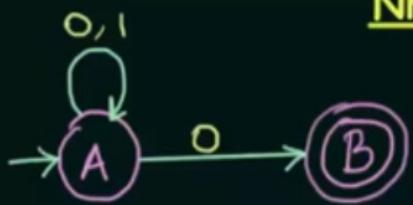
- B

$\delta = Q \times \Sigma \rightarrow \underline{\quad}$

- ?



NFA - Formal Definition



$L = \{ \text{Set of all strings that end with } 0 \}$

$(Q, \Sigma, q_0, F, \delta)$

Q = Set of all states

Σ = inputs

q_0 = start state / initial state

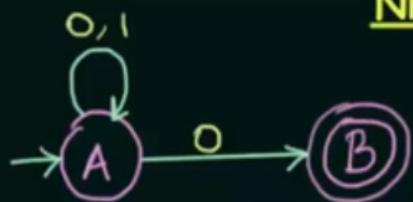
F = set of final states

δ = $Q \times \Sigma \rightarrow \underline{\quad}$

-	$\{A, B\}$	$A \times 0 \rightarrow A$
-	$\{0, 1\}$	$A \times 0 \rightarrow B$
-	A	$A \times 1 \rightarrow A$
-		$B \times 0 \rightarrow \emptyset$
-		$B \times 1 \rightarrow \emptyset$
-	$?$	



NFA - Formal Definition

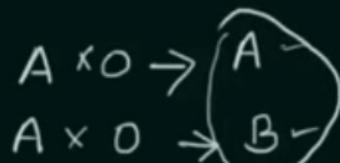


$L = \{ \text{Set of all strings that end with } 0 \}$

$(Q, \Sigma, q_0, F, \delta)$

Q = Set of all states

- $\{A, B\}$



Σ = inputs

- $\{0, 1\}$



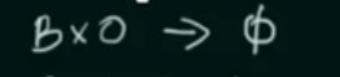
q_0 = start state / initial state

- A



F = set of final states

- B

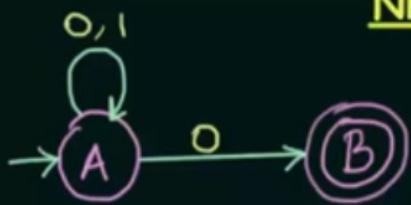


$\delta = Q \times \Sigma \rightarrow \underline{\quad}$

- ?



NFA - Formal Definition

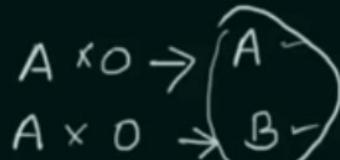


$L = \{ \text{Set of all strings that end with } 0 \}$

$(Q, \Sigma, q_0, F, \delta)$

Q = Set of all states

- $\{A, B\}$



Σ = inputs

- $\{0, 1\}$



q_0 = start state / initial state

- A

$B \times 0 \rightarrow \emptyset$

F = set of final states

- B

$B \times 1 \rightarrow \emptyset$

$\delta = Q \times \Sigma \rightarrow \underline{\quad}$

- ?

$A \xrightarrow{'} A, B, AB, \emptyset$





$L = \{ \text{Set of all strings that end with } 0 \}$

$(Q, \Sigma, q_0, F, \delta)$

$Q = \text{Set of all states}$

$\Sigma = \text{inputs}$

$q_0 = \text{start state / initial state}$

$F = \text{set of final states}$

$\delta = Q \times \Sigma \rightarrow \underline{\quad}$

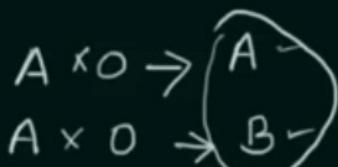
- $\{A, B\}$

- $\{0, 1\}$

- A

- B

- ?



$A \times 0 \rightarrow A$

$A \times 1 \rightarrow B$

$B \times 0 \rightarrow \emptyset$

$B \times 1 \rightarrow \emptyset$

$A \xrightarrow{?} A, B, AB, \emptyset -$

3 States - A, B, C

$A \xrightarrow{?} A, B, C, AB, AC, BC, ABC, \emptyset$



$(Q, \Sigma, q_0, F, \delta)$

Q = Set of all states

- $\{A, B\}$

$A \times 0 \rightarrow A$

$A \times 0 \rightarrow B$

$A \times 1 \rightarrow A$

$B \times 0 \rightarrow \emptyset$

$B \times 1 \rightarrow \emptyset$

$A^1 \rightarrow A, B, AB, \emptyset - 2^2 - 4$

3 States - A, B, C

$A^1 \rightarrow A, B, C, AB, AC, BC, ABC, \emptyset$

$2^3 - 8$

Σ = inputs

- $\{0, 1\}$

$B \times 0 \rightarrow \emptyset$

q_0 = start state / initial state

- A

$B \times 1 \rightarrow \emptyset$

F = set of final states

- B

$A^1 \rightarrow A, B, AB, \emptyset - 2^2 - 4$

$\delta = Q \times \Sigma \rightarrow \underline{Q^Q}$

- ?

3 States - A, B, C



- Questions????