NFA - Introduction

NFA - Non-deterministic Finite Automata

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Deterministic Finite Automata

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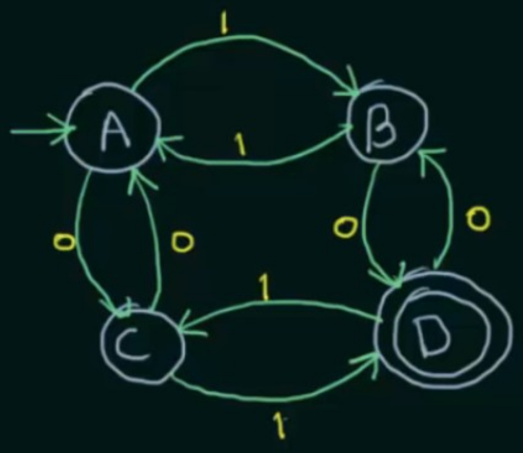
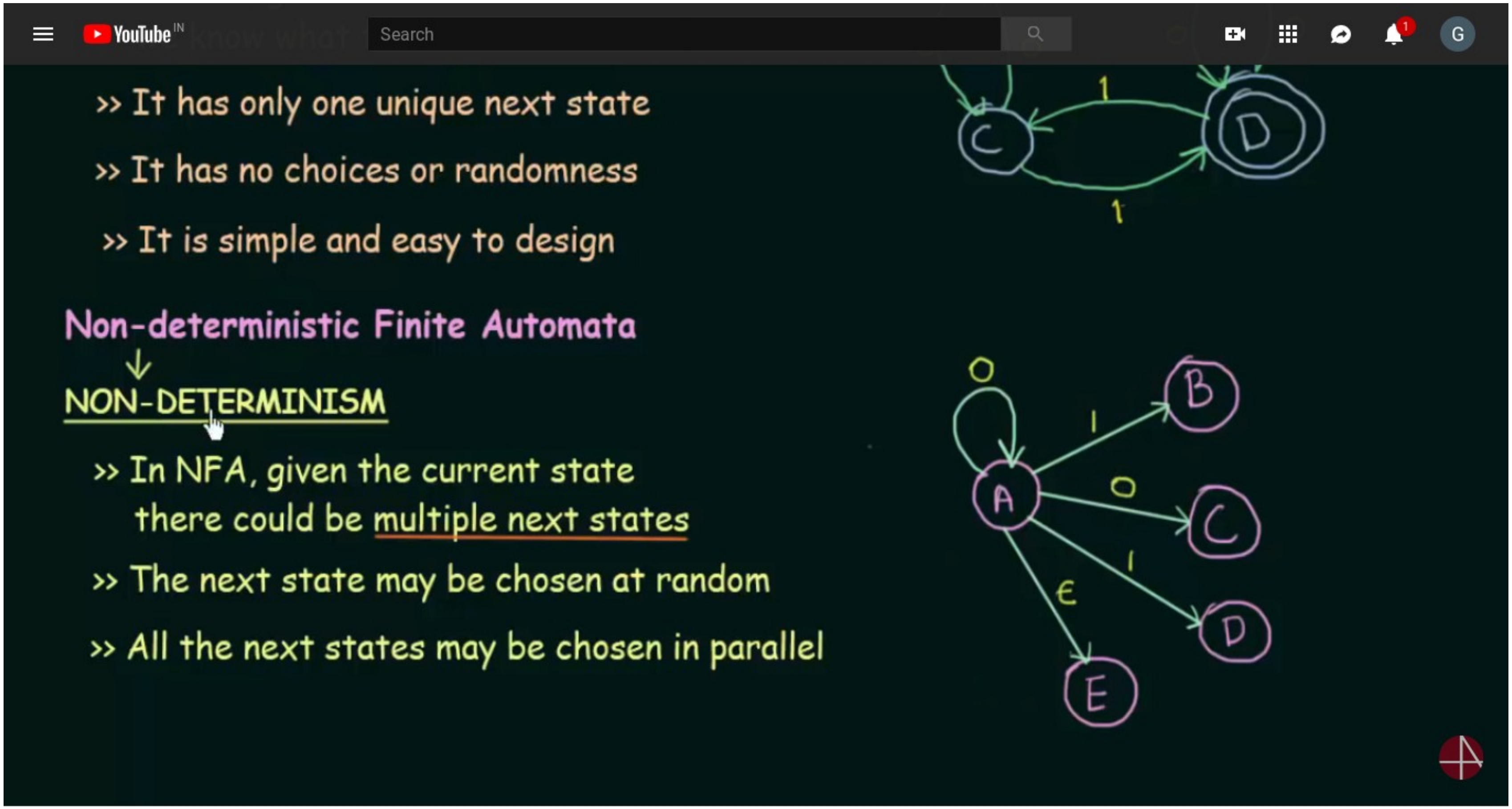
DETERMINISM

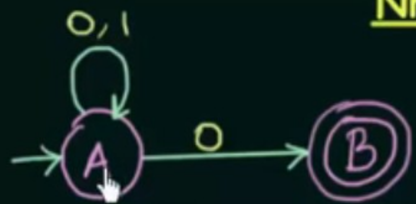
- >> In DFA, given the current state we know what the next state will be
- >> It has only one unique next state
- >> It has no choices or randomness
- >> It is simple and easy to design





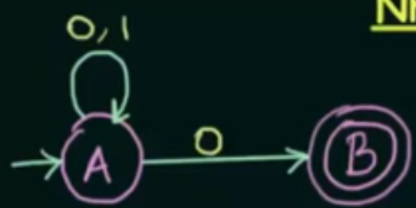
Non-deterministic Finite Automata

NFA - Formal Definition



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

NFA - Formal Definition

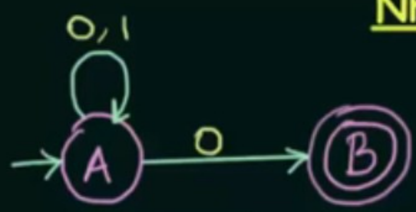


L = { Set of all strings that end with 0 }

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

$Q =$

NFA - Formal Definition



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

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

Q = Set of all states

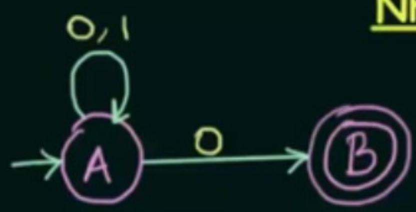
Σ = inputs

q_0 = start state | initial state

F = Set of final states

$\delta = Q \times \Sigma \rightarrow$ ____

NFA - Formal Definition



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

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

Q = Set of all states — $\{A, B\}$

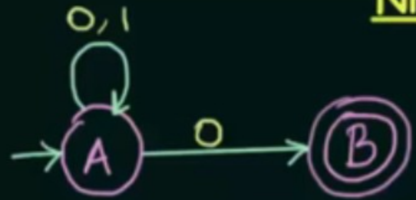
Σ = inputs — $\{0, 1\}$

q_0 = start state | initial state — A

F = Set of final states — B

$\delta = Q \times \Sigma \rightarrow$ ___ — ?

NFA - Formal Definition



L = { 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
$\delta = Q \times \Sigma \rightarrow$ ___	–	?

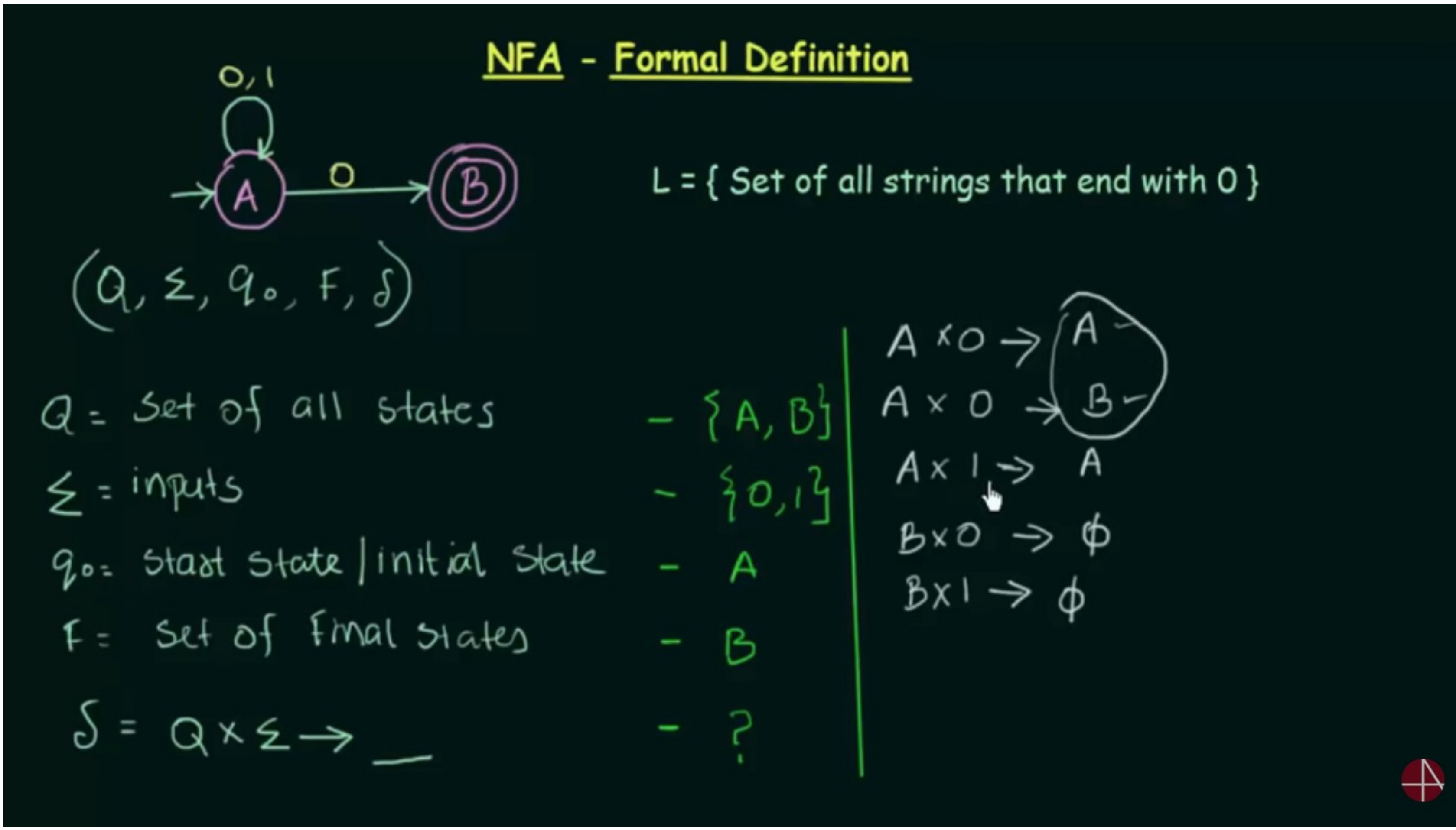
$A \times 0 \rightarrow A$

$A \times 0 \rightarrow B$

$A \times 1 \rightarrow A$

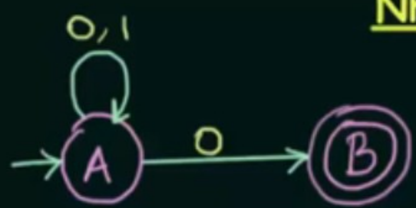
$B \times 0 \rightarrow \phi$

$B \times 1 \rightarrow \phi$



NFA - Formal Definition
0, 1
0
A
B
L = { Set of all strings that end with 0 }
(Q, Σ, q₀, F, δ)
Q = Set of all states – {A, B}
Σ = inputs – {0, 1}
q₀ = start state | initial state – A
F = set of final states – B
δ = Q × Σ → ___ – ?
A × 0 → A
A × 0 → B
A × 1 → A
B × 0 → ϕ
B × 1 → ϕ

NFA - Formal Definition



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

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

Q = Set of all states — $\{A, B\}$

Σ = inputs — $\{0, 1\}$

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F = Set of final states — B

$\delta = Q \times \Sigma \rightarrow$ ___ — ?

$A \times 0 \rightarrow A$

$A \times 0 \rightarrow B$

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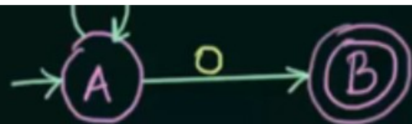
$B \times 0 \rightarrow \phi$

$B \times 1 \rightarrow \phi$

$A \xrightarrow{1} A, B, AB, \phi$



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$\delta = Q \times \Sigma \rightarrow$ ___ — ?

$A \times 0 \rightarrow A$

$A \times 0 \rightarrow B$

$A \times 1 \rightarrow A$

$B \times 0 \rightarrow \phi$

$B \times 1 \rightarrow \phi$

$A \xrightarrow{1} A, B, AB, \phi$ -

3 states - A, B, C

$A \xrightarrow{1} A, B, C, AB, AC, BC, ABC, \phi$

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

Q = Set of all states — $\{A, B\}$

Σ = inputs — $\{0, 1\}$

q_0 = start state | initial state — A

F = set of final states — B

$\delta = Q \times \Sigma \rightarrow \underline{2^Q}$ — ?

$A \times 0 \rightarrow A$

$A \times 0 \rightarrow B$

$A \times 1 \rightarrow A$

$B \times 0 \rightarrow \phi$

$B \times 1 \rightarrow \phi$

$A \xrightarrow{1} A, B, AB, \phi$ - 2^2 - 4

$\underline{3}$ states - A, B, C

$A \xrightarrow{1} A, B, C, AB, AC, BC, ABC, \phi$

2^3 - 8

- **Questions????**