Theory of Computation

RegLang_NFAtoDFA

Lecture 15_16

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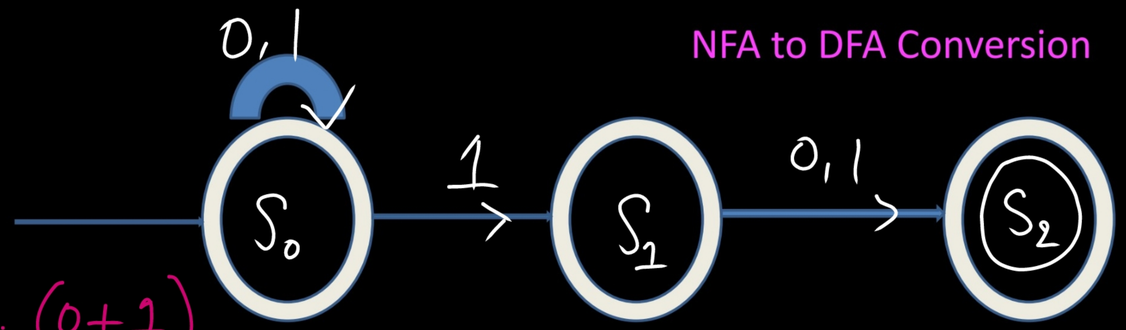
NFA to DFA Conversion



$(0+1)^* \cdot 1 \cdot (0+1)$

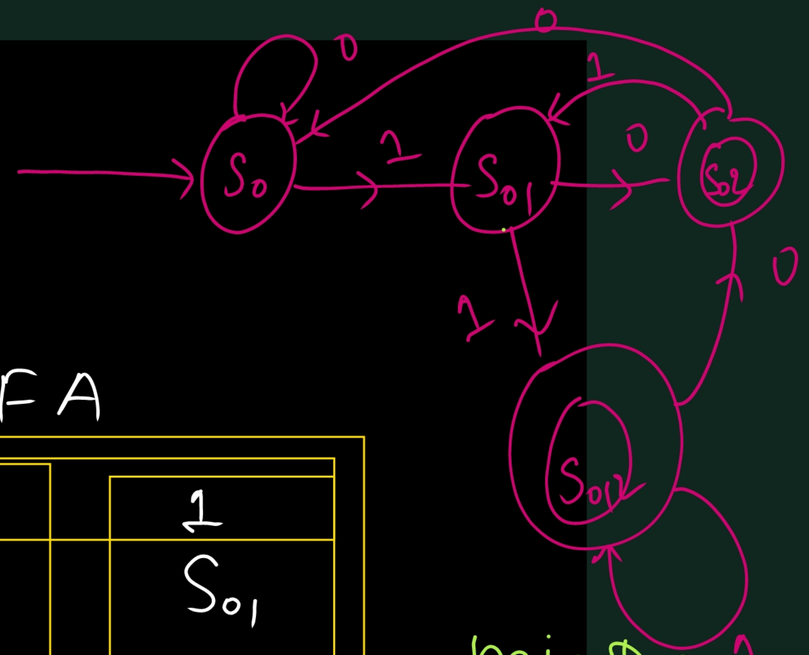
Second last Symbol

NFA

	0	1
$\rightarrow S_0$	S_0	S_0, S_1
S_1	S_2	S_2
$*S_2$	—	—

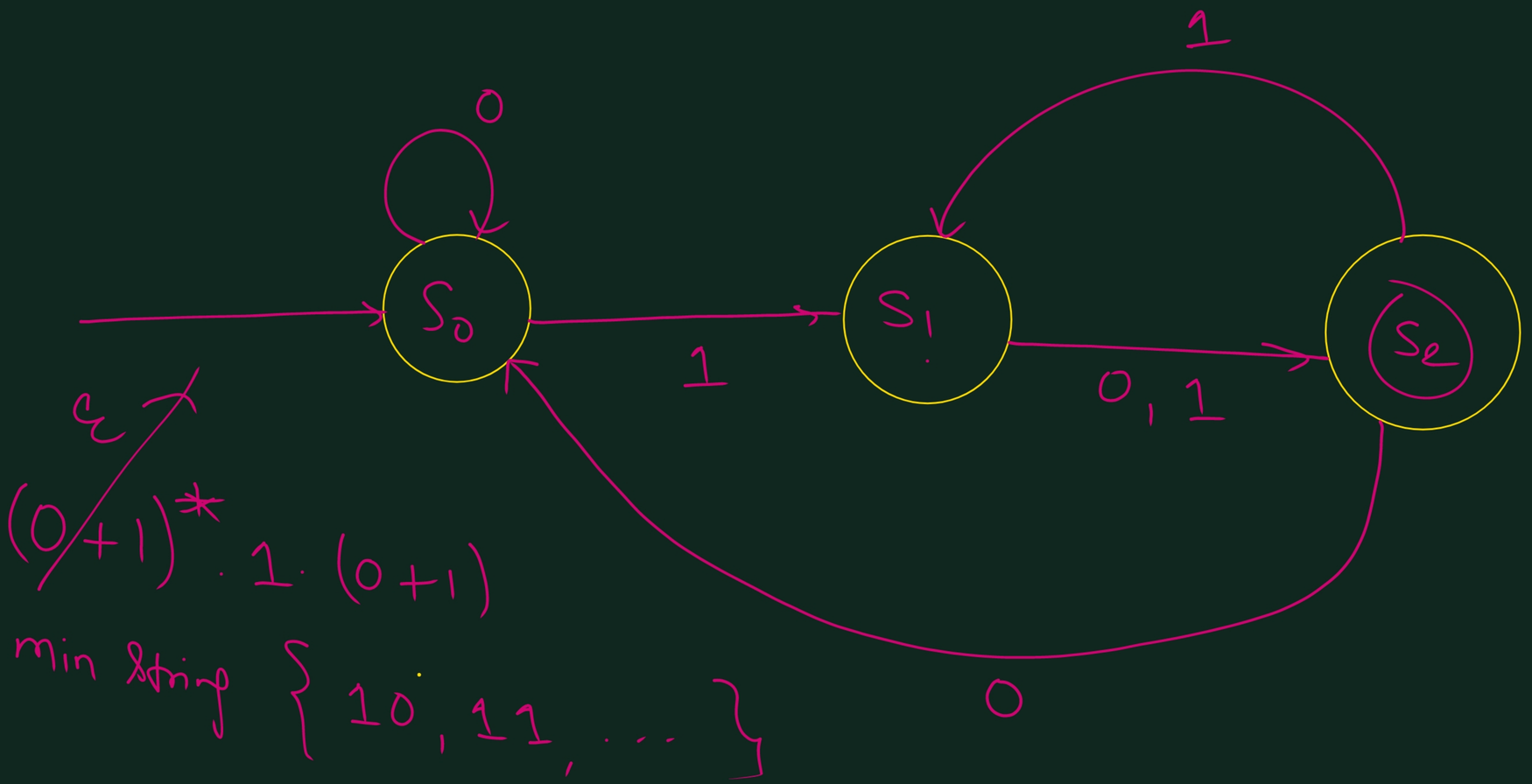
DFA

	0	1
$\rightarrow S_0$	S_0	S_{01}
S_{01}	S_{02}	S_{012}
S_{02}	S_0	S_{01}
S_{012}	S_{02}	S_{012}



min DFA

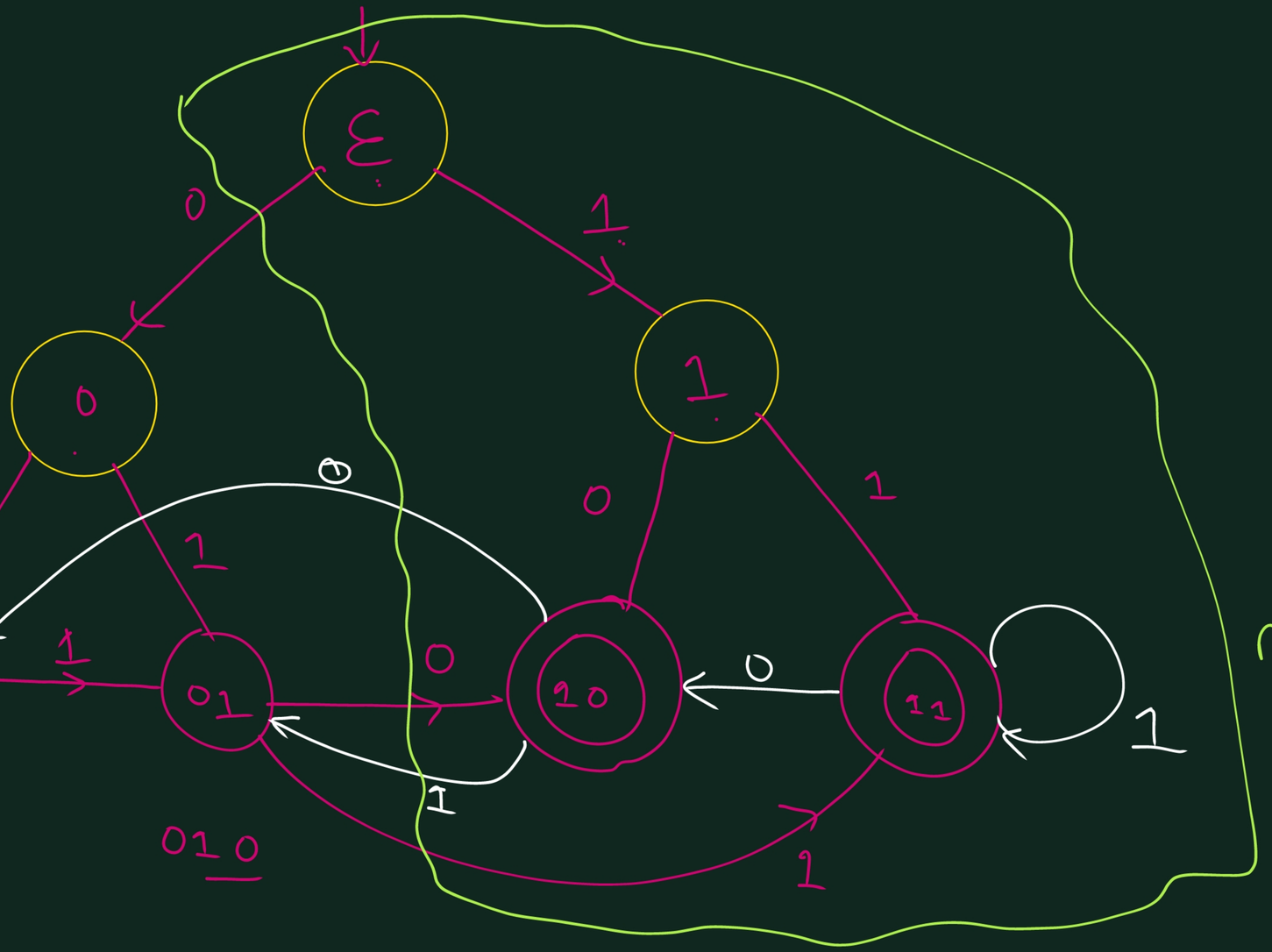
# of states $= 2^2$


1
0
S_0
S_1
S_2
1
0, 1
0
ε
$(0+1)^* \cdot 1 \cdot (0+1)$
min string $\{10, 11, \ldots\}$

$(0+1)^* 1 (0+1)$

↓

Second from last



$\Sigma^0 = \varepsilon$

Min States

= 4

= 2^2

00 0

00 1

0

010

1. (a+b)*a(a+b)

1. $(a+b)*a(a+b)^2$

+	.
ε + ε = ε	ε.ε = ε
φ + φ = φ { } + { } = { }	φ.φ = φ
a + a = a	a.a = aa
R + R = R	R.R = R^2

$\phi \neq \varepsilon$

+	.
$a + \varphi = a$	$a.\varepsilon = a$
$\varepsilon + \varphi = \varepsilon$	$\varphi.\varepsilon = \phi$
$\varphi - a = \phi$ not valid operator	$\varepsilon.a = a$
$R + \varphi = R$	$R.\varepsilon = R$

$\{ \quad \} + \varepsilon$

1. $(a + \varepsilon)^* = (a+\varepsilon)^* = (a+\varepsilon)^0 + (a+\varepsilon)^+ = a^*$
2. $(a + \varepsilon)^+ = (a+\varepsilon)' = \{a, \varepsilon \dots\} = a^*$
3. $(aa)^* + a(aa)^* = a^*$
4. $((aa)^*)^* = (aa)^*$
5. $(a(aa)^*)^* = a^*$
6. $a^+ + a^* = a^*$
7. $a^+.a^* = a^+$
8. $(aa + aaa)^* =$
9. $(aaa + aaaaa)^* =$ $\overline{3}\ \overline{5}$

$R^* = \varepsilon + R^+$

$R^0 + R^+$

$(aa)^* = \{\varepsilon, aa, aaaa, \dots\}$ even

$+$

$a(aa)^* = \{a, aaa, aaaaa\}$ odd

a^*

$(\varepsilon + a + aa + \dots).aa + \varepsilon$

$a^*(aa) + \varepsilon$

$a^+ a + \varepsilon$

$aaa + aaaaa + aaaaaaa + aaaaaaa(a)^+$

1. $[a(aa)^*]^+ =$
2. $[a + (aa)^*]^+ =$ $a^*\left[a + \varepsilon + aa + aaaa + \cdots\right]^+ \longrightarrow \Sigma^1 = \varepsilon$
3. $(a + b)^* = a^* + b^*$? ab ✗ $\{\varepsilon + a + aa \ldots\} \cup \{\varepsilon, b, bb, \ldots\}$
4. $(a + b)^* = a^*b^* + b^*a^*$? aba
5. $(a + b)^* = (a^* b^*)^*$? True $\left[a.(aa)^*\right]^+ = \left[a(\varepsilon + aa + \ldots)\right]^+$
6. $(a + b)^* = (b^*a)^*b^*$?
7. $(a + b)^* = a^*(ba^*)^*$? $\left[(\varepsilon + a + \ldots).(\varepsilon + b + \ldots)\right]^*$ $= \left[a + aaa + \ldots\right]^+$
8. $(a + b)^* = b^*(ab^*)^*$? $a + b + \varepsilon + \ldots$ $= a^+$
9. $(a + b)^* = (a^* b^*)^*$?

$(b^*a)^*b^*$ $\longrightarrow$ $(b^*a)^*\,b^0$ $\longrightarrow$ $(b^*a)^*$

$[a + ba + bba + \cdots]^*$

$L = \{aba,\ ababba,\ \cdots\}$

$(a+b)^*$

$+$

$(b^*a)^*\,b^+$ $\longrightarrow$ $[(a+ba+bba+\cdots)]^*\,(b+bb+\cdots)$

$ababba$

$\Sigma = (a, ab)^*$ $\longrightarrow$ ~~bba~~

- $\Sigma^0 = \varepsilon$
- $\Sigma^1 = \{a\}$
- $\Sigma^2 = \{aa, ab\}$
- $\Sigma^3 = \{aaa, aab, aba\}$

$A = a^* b$

$B = a b^*$

$(A \cup B)^*$

$\rightarrow (a+b)^*$

$\rightarrow b^* B^*$

$\rightarrow A^* a^*$

Equivalent

Thank You