

Formal Languages and Compilers

Lab III: Regular Expressions and Automata

Alessandro Artale

Free University of Bozen-Bolzano
Faculty of Computer Science – POS Building, Room: 2.03
artale@inf.unibz.it
<http://www.inf.unibz.it/~artale/>

Formal Languages and Compilers — BSc course

2019/20 – Second Semester

$$W = \underline{a^* b} \notin L_1$$

$$V = \{a, b\}$$

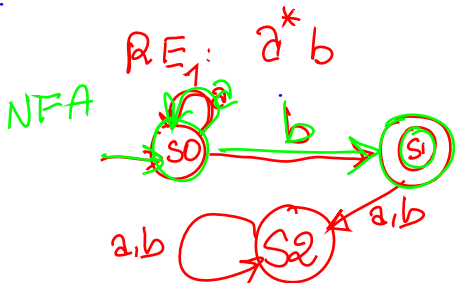
Board

$$L_1 = \{a^m b \mid m \geq 0\}$$

minimal string = b

1. RE = ?

2. Show both the NFA & the DFA



Total

$$S_D: S \times V \rightarrow S$$

$$S(S_0, a) = S_0$$

$$S(S_0, b) = S_1$$

$$S_N: S \times V \rightarrow 2^S$$

$$S(S_1, a) = \emptyset$$

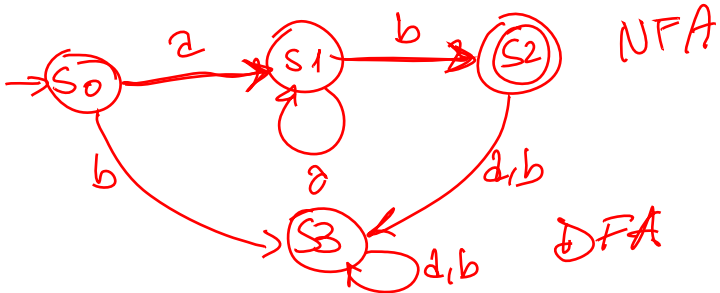
Board

$$L = \{a^n b \mid n \geq 1\}$$

MINIMAL STRING:
ab

1. RE: $a^+ b \approx a a^* b$

2. Show both the NFA & the DFA



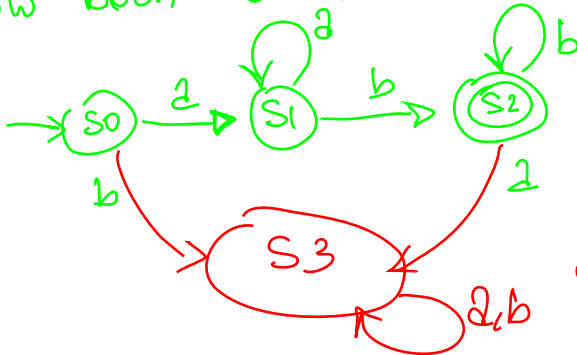
Board

$$L_3 = \{ a^n b^m \mid n, m \geq 1 \}$$

1. RE:

Minimal strings: ab

2. Show both the NFA & the DFA



NFA

DFA

$$\delta: S \times V \rightarrow \underline{S}$$

Board

$L_4 = \{w \in \{a, b, c\}^* \mid w \text{ contains at least one "a" and one "b"}\}$

e.g. $ab, ba, c\underline{a}cc\underline{b}b,$
 $cc\underline{b}b\underline{a}$

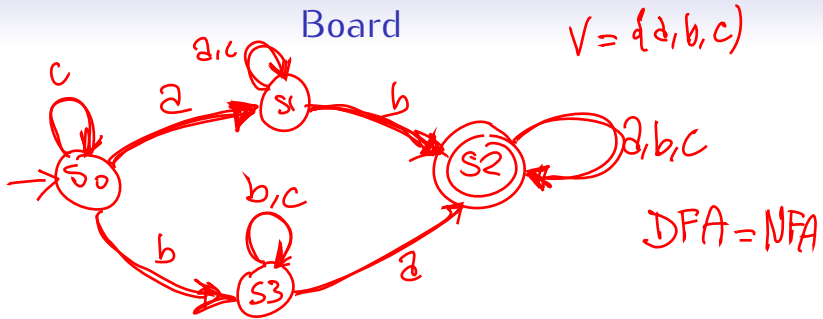
Not ok: $c, cccbb, c\underline{a}c\underline{a}$

1. RE:

2. Show the DFA

Minimal strings:

- ab
- ba



$$RE: c^* a (a|c)^* b \mid b (b|c)^* a \quad (a|b|c)^*$$

Board

$L_5 = \{ \omega \in \{0,1,2\} \mid \text{the final digit of } \omega \text{ appeared also before} \}$

Ex. 12102, 0121001, 0000, 111, 2212

Not valid: 210, 12210, 02001

1. RE =

2. Show the NFA

3. Show the DFA

Minimal strings:

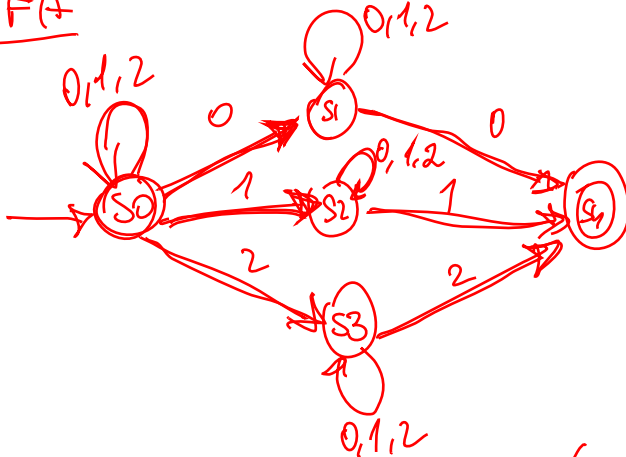
00

11

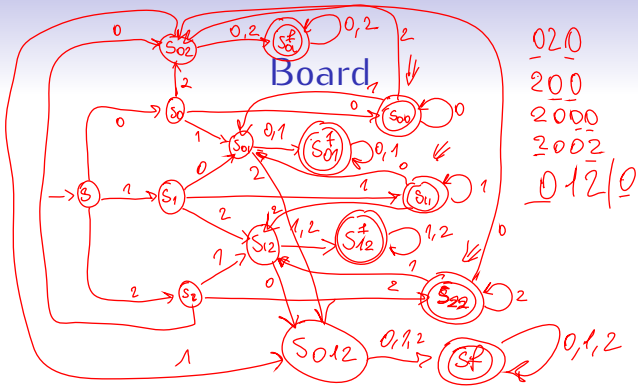
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NFA

Board



RE. $r_1 = (0|1|2)^*$ $R = r_1 (0r_1 0 | 1r_1 1 | 2r_1 2)$



NFA \rightarrow DFA

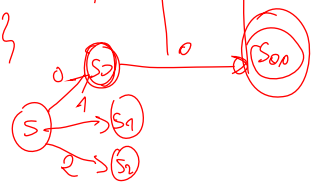
Board

0 1 2

δ_N	0	1	2
$\rightarrow S$	$\{S, S_0\}$	$\{S, S_1\}$	$\{S, S_2\}$
S_0	$\{S_0, S_4\}$	$\{S_0\}$	$\{S_0\}$
S_1	$\{S_1\}$	$\{S_1, S_4\}$	$\{S_1\}$
S_2	$\{S_2\}$	$\{S_2\}$	$\{S_2, S_4\}$
* S_4	\emptyset	\emptyset	\emptyset

$\rightarrow \{S\}$

S_0	0	1	2
$\{S, S_0\}$	$\{S, S_0\}$	$\{S, S_1\}$	$\{S, S_2\}$
$\{S, S_0, S_4\}$	$\{S, S_0, S_4\}$	$\{S, S_0, S_1\}$	$\{S, S_0, S_2\}$
$\{S, S_1\}$	$\{S, S_0, S_1\}$	$\{S, S_1, S_4\}$	$\{S, S_1, S_2\}$
$\{S, S_2\}$	$\{S, S_0, S_2\}$	$\{S, S_1, S_2\}$	$\{S, S_1, S_2, S_4\}$



Board

Board