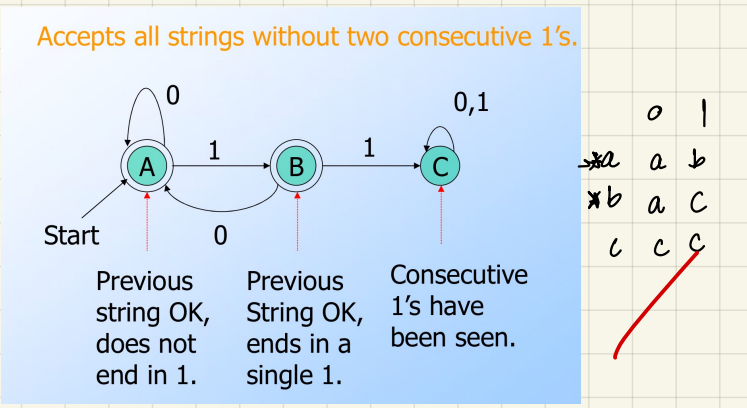
Chapter

Alphabet → String → Language.

CFG CFL context-free grammar Languages.

Java ใช้ algorithm ของ regex .*ing

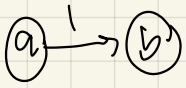
FA → DFA / NFA



	0	1
→*a	a	b
*b	a	c
c	c	c

* Transition function

$\delta(a,1) = b$



* Extended Transition function

$\delta(q, wa) = \delta(\delta(q, w), a)$

Example

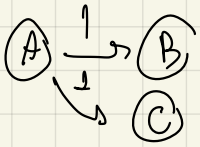
	0	1
→A	A	B
B	A	C
C	C	C

$\delta(b, 011) = \delta(\delta(\delta(b,0),1),1)$
$= \delta(\delta(a,1),1)$
$= \delta(b,1)$
$= c$ *

RL = accept DFA

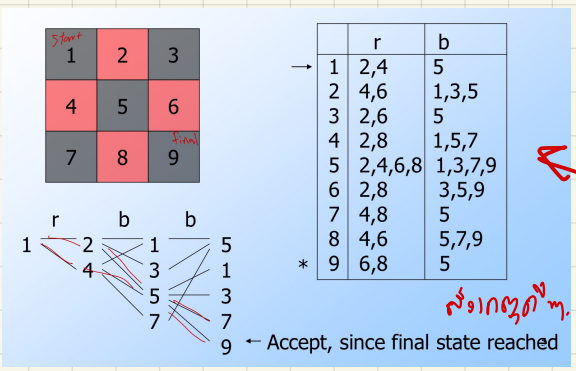
NRL = $\{0^n 1^n \mid n \geq 1\}$

NFA อนุญาตให้มีได้มากกว่า 1 final state ได้ ไม่ผิด



$\delta(A,1) = \{B,C\}$

Subset Construction



	r	b
→ 1	2,4	5
2	4,6	1,3,5
3	2,6	5
4	2,8	1,5,7
5	2,4,6,8	1,3,7,9
6	2,8	3,5,9
7	4,8	5
8	4,6	5,7,9
* 9	6,8	5

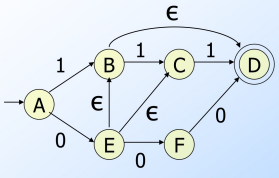
สร้างมาเพิ่ม

	r	b
→ 1	2,4	5
2	4,6	1,3,5
3	2,6	5
4	2,8	1,5,7
5	2,4,6,8	1,3,7,9
6	2,8	3,5,9
7	4,8	5
8	4,6	5,7,9
* 9	6,8	5

	r	b
→ {1}	{2,4}	{5}
{2,4}	{2,4,6,8}	{1,3,5,7}
{5}	{2,4,6,8}	{1,3,7,9}
{2,4,6,8}	{2,4,6,8}	{1,3,5,7,9}
{1,3,5,7}	{2,4,6,8}	{1,3,5,7,9}
* {1,3,7,9}	{2,4,6,8}	{5}
* {1,3,5,7,9}	{2,4,6,8}	{1,3,5,7,9}

ดูหน้า 21 p - 20.-

ε-NFA

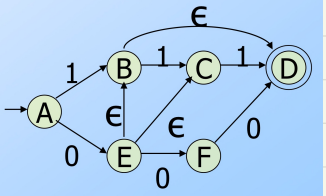


	0	1	ε
→ A	{E}	{B}	∅
B	∅	{C}	{D}
C	∅	{D}	∅
* D	∅	∅	∅
E	{F}	∅	{B, C}
F	{D}	∅	∅

Closure of State

ε.

- Example: CL(A) = {A}; CL(E) = {B, C, D, E}.



Regular Expressions

$1^+ = \{1, 11, 111, \ldots\}$

$1^* = \{\epsilon, 1, 11, 111, \ldots\}$

$L(a) = \{a\}$

$L(\epsilon) = \{\epsilon\}$

$L(\emptyset) = \emptyset$

$E_1 + E_2 = L(E_1) \cup L(E_2)$

$E_1 E_2 = L(E_1) \cdot L(E_2)$

$L E_1^* = L(E_1)^*$

* → concat → ϵ

Example.

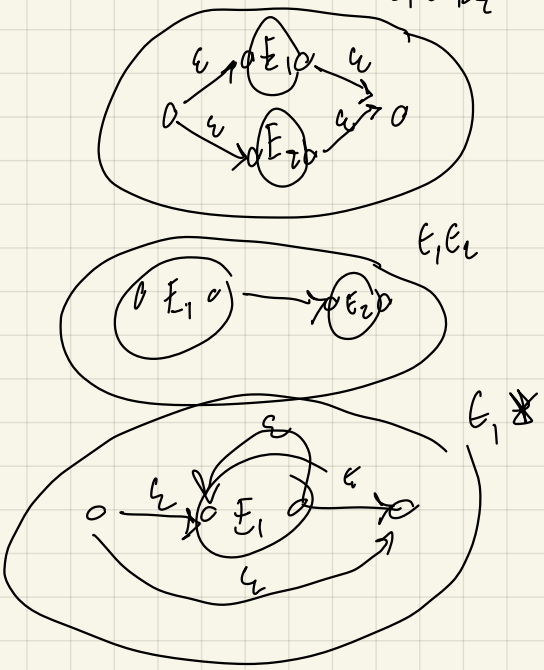
$L(01) = \{01\}$

$L(01+0) = \{01, 0\}$

$L(0(1+0)) = \{01, 00\}$

$L(0)^* = \{\epsilon, 0, 00, \ldots\}$

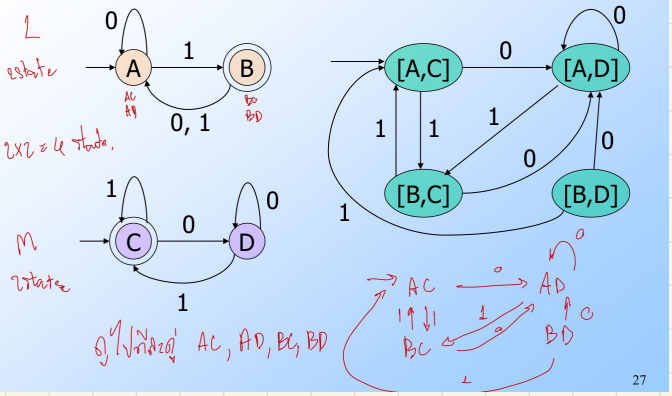
RE ε-NFA



Decision Yes, No

มีวิธี check ว่า 2 ภาษา RL ใดๆ ใช้ Pumping Lemma

Example: Product DFA



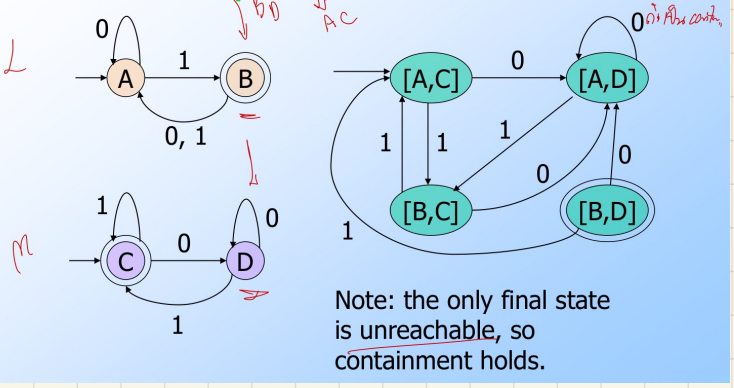
Containment

$L \subseteq M$

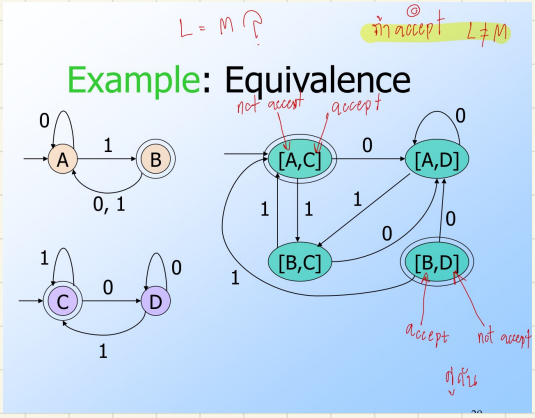
$L = M$ คือ ไม่สามารถหาตัวอย่างได้

$L \neq M$ คือ accept

Example: Containment



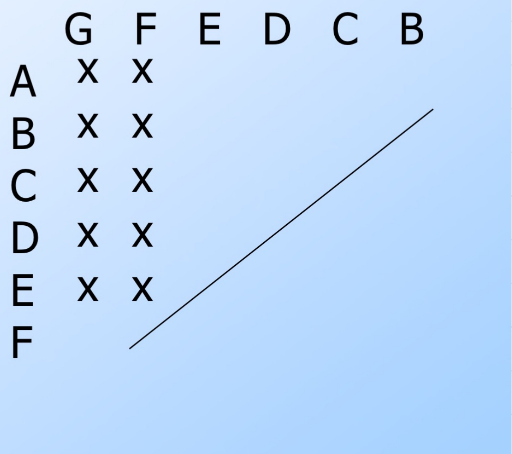
Example: Equivalence



State Minimization

บท 5 หน้าที่ 40 Example. ฟังดี ...

		r	b
→	A	B	C
	B	D	E
	C	D	F
	D	D	G
	E	D	G
*	F	D	C
*	G	D	G



Start with marks for

Example: ϵ-NFA-to-NFA

ε-NFA

		0	1	ϵ
→	A	{E}	{B}	∅
	B	∅	{C}	{D}
	C	∅	{D}	∅
*	D	∅	∅	∅
	E	{F}	∅	{B, C}
	F	{D}	∅	∅

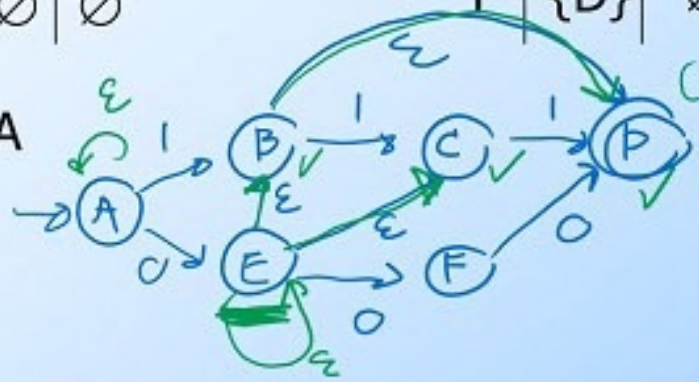
NFA

		0	1
→	A	{E}	{B}
*	B	∅	{C}
	C	∅	{D}
*	D	∅	∅
*	E	{F}	{C, D}
	F	{D}	∅

CL(A) = {A, B}

CL(E) = {B, C, D, E}

ϵ-NFA



หัวข้อการนำเสนอ