Week 2

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Week 2 作业

- 教材P78: 3.3.3：In a string of length n, how many of the following are there?
  - Prefixes: n+1
  - Suffixes: n+1
  - Proper prefixes: n-1
  - Substrings: C(n+1,2) + 1 (need to count epsilon in)
  - Subsequences: $\Sigma(i=0,n)\ C(n, i)$

Week 2 作业

- $\{a, b\}^*=\{?\}$, $\{a, b\}^+=\{?\}$
  - (a|b)*, (a|b)+

Week 2 作业

- 判断chomsky语言类型:
  - S -> aSb; S -> ab (Type-2)
  - aSb -> aaSbb; S -> ab (Type-1)
  - S-> aS; S->ab (Type-3)

Week 2 作业

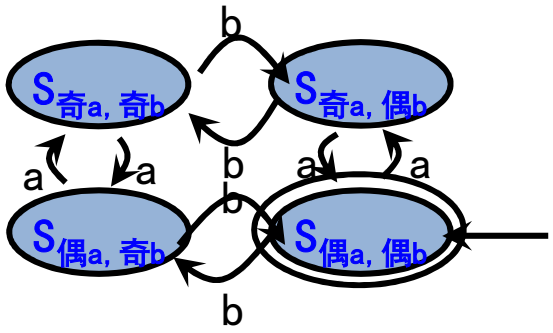
- 教材P78：3.3.2， 3.3.5
- 教材P86：3.4.1，3.4.2
- 教材P96：3.6.3，3.6.4，3.6.5
- 教材P105：3.7.1

回顾

- 3.3.2：下列正则表达式定义了什么语言
  - a(a|b)*a
    - 由a, b组成的，并由a开头和结尾的字符串
  - ((ε|a)b*)*
    - (εb*|ab*)*→ (b*|ab*)* ：空串或所有由a, b组成的字符串

回顾

- **3.3.2：下列正则表达式定义了什么语言**
  - (a|b)*a(a|b)(a|b)
    - 由a, b组成的，并且倒数第三个为a的字符串
  - a*ba*ba*ba*
    - 由a, b组成的，并且只含有3个b的字符串
  - (aa|bb)*((ab|ba)(aa|bb)*(ab|ba)(aa|bb)*)*
    - 由偶数个a和偶数个b组成的字符串



回顾

- 3.3.5：为自然语言构造RE
  - All strings of lowercase letters that contain the five vowels in order.
    - S -> other* a (other|a)* e (other|e)* i (other|i)* o (other|o)* u (other|u)*
    - other -> [bcdfghjklmnpqrstvwxyz]
  - All strings of lowercase letters in which the letters are in ascending lexicographic order.
    - a* b* ... z*
  - Comments, consisting of a string surrounded by /* and */, without an intervening */, unless it is inside double-quotes (")
    - \/* ([^*"]* | "[^*"]“ | *+ [^/])* *\/

回顾

- 3.3.5：为自然语言构造RE
  - All strings of digits with no repeated digits. Hint: Try this problem first with a few digits, such as {O, 1, 2}.
  - All strings of digits with at most one repeated digit.
    - p_0 -> 0
    - p_1 -> ((1 | $p_0$1)($p_0$1)*p_0?) | p_0
    - ……
    - p_8 -> ((8 | $p_7$8)($p_7$8)*p_7?) | p_7 = q_9 (without number '9')
    - p_9 -> ((9 | $p_8$9)($p_8$9)*p_8?) | p_8
    - Ans_1 -> p_9?
    - Ans_2 ->(9^+ | q_9^+)($q_9 9^+$)*q_9? | … | (0^+ | q_0^+)($q_0 0^+$)*q_0? | ε

回顾

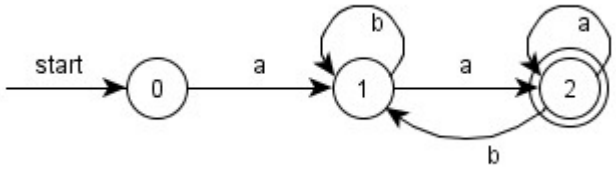
- 3.3.5：为自然语言构造RE
  - All strings of a's and b's with an even number of a's and an odd number of b's.
    - S -> (FE* G | (aa)* b) (E | GE* G)*
    - E -> b(aa)* b
    - F -> a(aa)* b
    - G -> b(aa)* ab | a
  - The set of Chess moves, in the informal notation, such as p-k4 or kbp x qn.
    - moves -> pieces x pieces | pieces – (K | Q) (N | B | R) [1-8] | 0-0-0 | 0-0
    - pieces -> (K | Q) (N | B | R)? p?

回顾

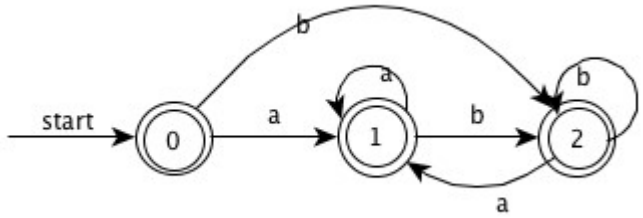
- 3.3.5：为自然语言构造RE
  - All strings of a 's and b's that do not contain the substring abb.
    - $b^* (a^+b?)^*$
  - All strings of a 's and b's that do not contain the subsequence abb.
    - $b^* \mid b^*a^+ \mid b^*a^+ba^*$

回顾

- **3.4.1：给出3.3.2中各正则表达式所描述的状态转换图**
  - a(a|b)*a
    - 最小DFA：

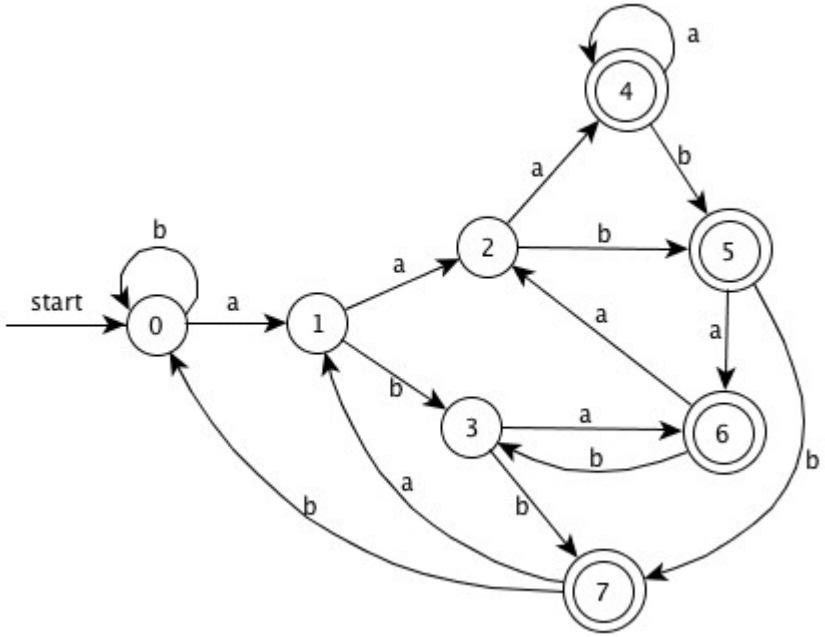


  - ((ε|a)b*)*
    - 最小DFA：



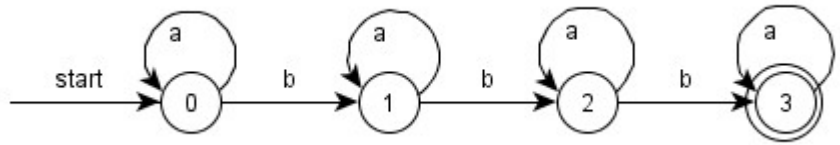
回顾

- **3.4.1：给出3.3.2中各正则表达式所描述的状态转换图**
  - (a|b)*a(a|b)(a|b)
    - 最小DFA：

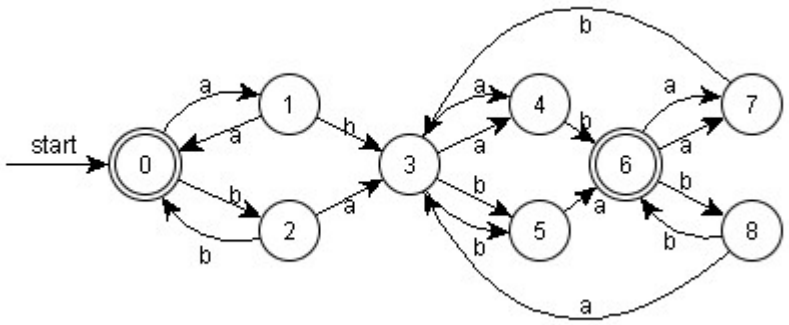


回顾

- **3.4.1：给出3.3.2中各正则表达式所描述的状态转换图**
  - a*ba*ba*ba*
    - 最小DFA：

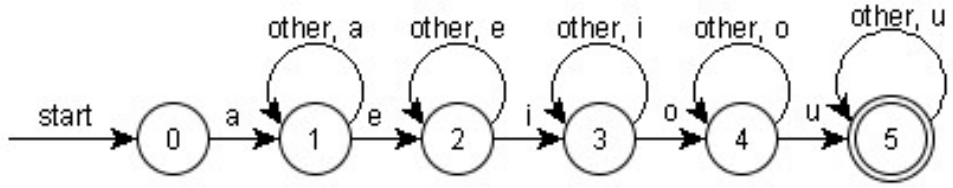


  - (aa|bb)*((ab|ba)(aa|bb)*(ab|ba)(aa|bb)*)*
    - 最小DFA：

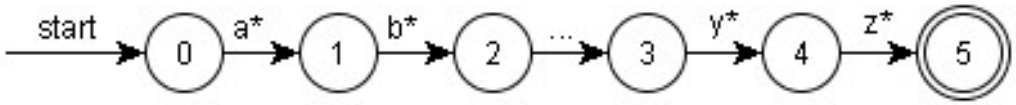


回顾

- **3.4.2：给出3.3.5中各正则表达式所描述的状态转换图**
  - 1) S -> other* a (other|a)* e (other|e)* i (other|i)* o (other|o)* u (other|u)*
    - NFA：

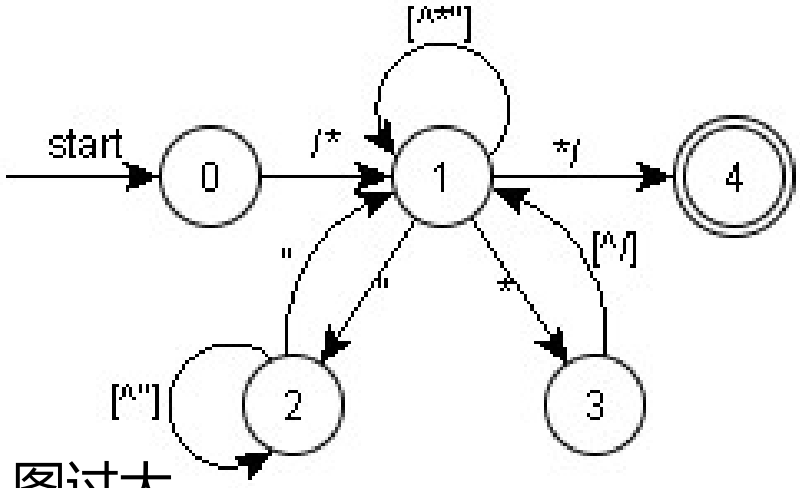


  - 2) a* b* ... z*
    - NFA：



回顾

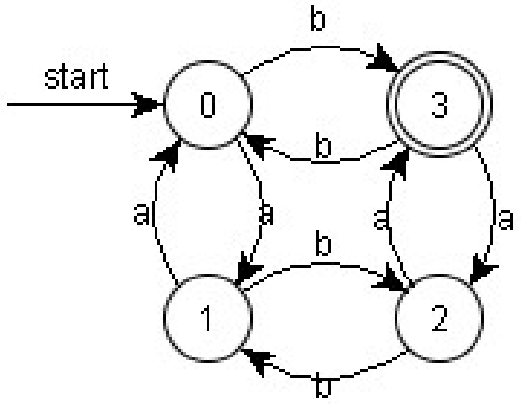
- **3.4.2：给出3.3.5中各正则表达式所描述的状态转换图**
  - 3)
    - \/* ([^*"]* | "[^"]“ | *+ [^/])* *\/
    - NFA：



  - 4) 5) 状态太多，图过大

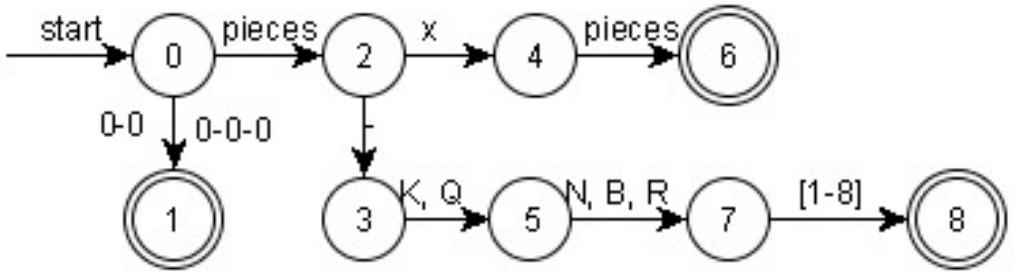
回顾

- **3.4.2：给出3.3.5中各正则表达式所描述的状态转换图**
  - 6)
    - S -> (FE* G | (aa)* b) (E | GE* G)*
    - E -> b(aa)* b
    - F -> a(aa)* b
    - G -> b(aa)* ab | a
    - DFA：



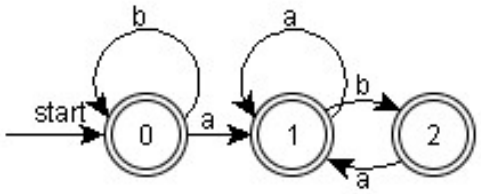
回顾

- **3.4.2：给出3.3.5中各正则表达式所描述的状态转换图**
  - 7)
    - moves -> pieces x pieces | pieces – (K | Q) (N | B | R) [1-8] | 0-0-0 | 0-0
    - pieces -> (K | Q) (N | B | R)? p?
    - NFA

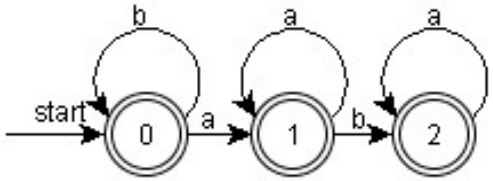


回顾

- **3.4.2：给出3.3.5中各正则表达式所描述的状态转换图**
  - 8) $b^* (a^+b?)^*$
    - DFA：



  - 9) $b^* \mid b^*a^+ \mid b^*a^+b\varepsilon^*$
    - DFA：



回顾

- **3.6.3：For the NFA of Fig. 3.29, indicate all the paths labeled aabb. Does the NFA accept aabb?**
  - (0) -a-> (1) -a-> (2) -b-> (2) -b-> ((3))
  - (0) -a-> (0) -a-> (0) -b-> (0) -b-> (0)
  - (0) -a-> (0) -a-> (1) -b-> (1) -b-> (1)
  - (0) -a-> (1) -a-> (1) -b-> (1) -b-> (1)
  - (0) -a-> (1) -a-> (2) -b-> (2) -b-> (2)
  - (0) -a-> (1) -a-> (2) -b-> (2) -ε-> (0) -b-> (0)
  - (0) -a-> (1) -a-> (2) -ε-> (0) -b-> (0) -b-> (0)

  This NFA accepts "aabb"

回顾

- **3.6.4：Repeat Exercise 3.6.3 for the NFA of Fig. 3.30.**
  - (0) -a-> (1) -ε-> (0) -a-> (1) -b-> (2) -b-> ((3))
  - (0) -ε-> (3) -a-> (0) -a-> (1) -b-> (2) -b-> ((3))
  - (0) -a-> (1) -ε-> (0) -a-> (1) -ε-> (0) -ε-> (3) -ε-> (2) -b-> (3) -ε-> (2) -b-> ((3))
  - (0) -ε-> (3) -a-> (0) -a-> (1) -ε-> (0) -ε-> (3) -ε-> (2) -b-> (3) -ε-> (2) -b-> ((3))
  - .....

  This NFA accepts "aabb"

回顾

- **3.6.5：Give the transition tables for the NFA**
  - 1. Exercise 3.6.3.

state	a	b	ε
0	{0,1}	{0}	∅
1	{1,2}	{1}	∅
2	{2}	{2,3}	{0}
3	∅	∅	∅

回顾

- **3.6.5：Give the transition tables for the NFA**
  - 2. Exercise 3.6.4.

state	a	b	ε
0	{1}	∅	{3}
1	∅	{2}	{0}
2	∅	{3}	{1}
3	{0}	∅	{2}

回顾

- **3.6.5：Give the transition tables for the NFA**
  - 3. Figure 3.26.

state	a	b	ε
0	∅	∅	{1,2}
1	{2}	∅	∅
2	{2}	∅	∅
3	∅	{4}	∅
4	∅	{4}	∅

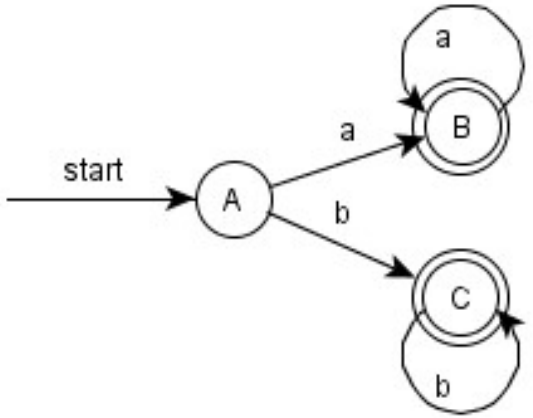
回顧

- 3.7.1：Convert to DFA's the NFA's of
  - 1. Fig. 3.26.

Transition table

NFA State	DFA State	a	b
{0,1,3}	A	B	C
{2}	B	B	∅
{4}	C	∅	C

DFA



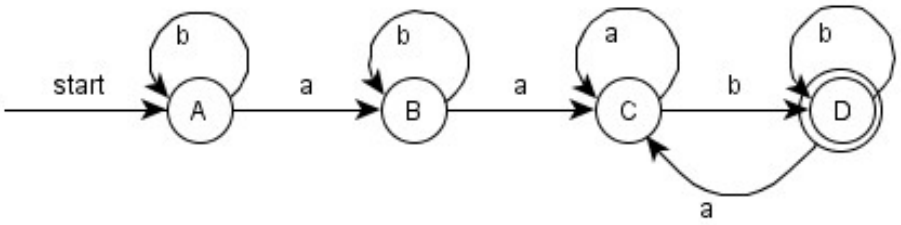
回顧

- 3.7.1：Convert to DFA's the NFA's of
  - 2. Fig. 3.29.

Transition table

NFA State	DFA State	a	b
{0}	A	B	A
{0,1}	B	C	B
{0,1,2}	C	C	D
{0,2,3}	D	C	D

DFA



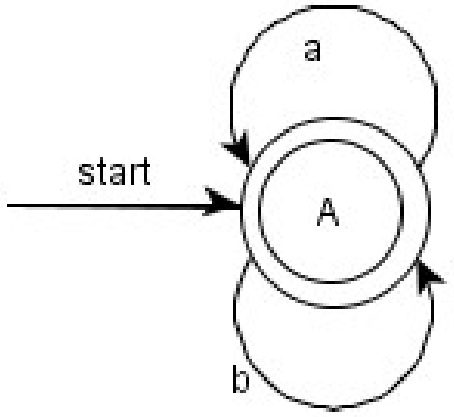
回顧

- 3.7.1：Convert to DFA's the NFA's of
  - 3. Fig. 3.30.

Transition table

NFA State	DFA State	a	b
{0,1,2,3}	A	A	A

DFA



Thank you!