ePAL - Approximate Text Searching

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Outline

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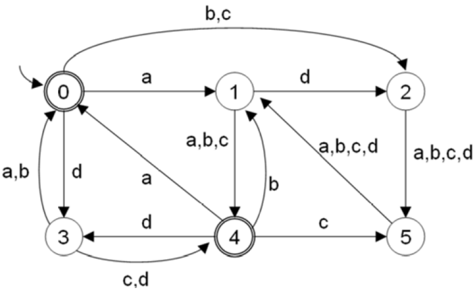
Example 1

Automaton A_1 is given by its transition table. Draw its transition diagram.

	a	b	c	
0	0	1	3	
1	2	2	5	F
2	3	0	2	
3	3	4	1	F
4	1	4	4	
5	5	0	5	

Example 2

Automaton A_2 is given by its transition diagram. Draw its transition table.



Example 3

Make a decision if automaton A_1 accepts the following words

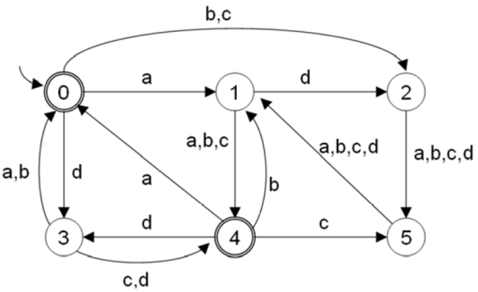
1. *adddca*
2. *bbcca*
3. *bbccaba*

	a	b	c	
0	0	1	3	
1	2	2	5	F
2	3	0	2	
3	3	4	1	F
4	1	4	4	
5	5	0	5	

Example 4

Make a decision if automaton A_2 accepts the following words

1. *adddca*
2. *bbcca*
3. *bbccaba*



Example 5

Draw a state diagram of an automaton that accepts just all words over alphabet $\{0, 1\}$ which

1. contain subsequence 01,
2. do not contain subsequence 01,
3. contain a single character 1 and an arbitrary number of characters 0,
4. begin and end with symbol 1,
5. represent binary represenations of numbers $0, 1, 2, 3, 4, 5, 6, 7$ in their all 1-, 2- 3- digits sequences.

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Example 6

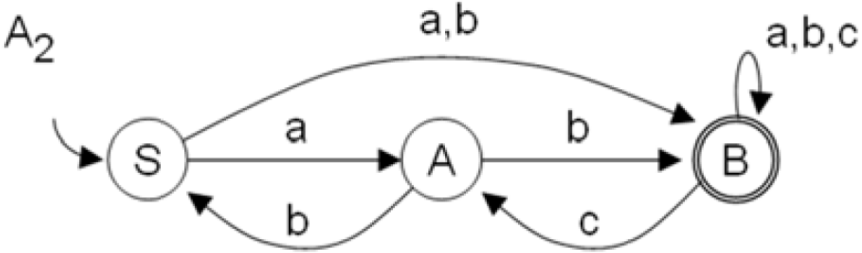
Automaton A_1 is given by its transition table. Determine its equivalent deterministic automaton

A_1

	a	b	c	d	
0	0, 1		2	2	
1		0, 2			F
2	1		1, 2	0, 2	

Example 7

Automaton A_2 is given by its transition table. Determine its equivalent deterministic automaton



Example 8

Create an NFA over alphabet $\{a, b, c\}$ that accepts all words both beginning and ending with chain

1. *abc*,
2. *acaca*,

Example 9

Create an NFA over alphabet $\{a, b, c\}$ that accepts all words notcontaining chain

1. abc,
2. $acaca$,

Example 10

Create an NFA and its related DFA that searches for a given exact pattern

1. *aaba*,
2. *abaa*,

Example 11

Create an NFA and its related DFA that searches for all subchains of a given pattern

1. *abcab*,
2. *accbc*,

Example 12

Create an NFA and its related DFA that searches for all chains having Hamming distance at most 2 from a given pattern:

1. *bbaabb*,
2. *acacab*,

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Example 13

Write all words of length at most 5 of a language described by the following regular expression over alphabet $\{0, 1\}$

1. $(01|0) \star 0$
2. $0(10|0)\star$

Example 14

Write a regular expression describing a language over alphabet $\{0, 1\}$ such that

1. each word contains only zeros,
2. each word contains just one 1,
3. each word contains at least one 1,
4. each word contains at least two 1,
5. each word contains an even number of 1,
6. each word contains an odd number of 1,

Example 15

Write a regular expression describing a maximum set M of words over alphabet $\{a, b, c\}$ such that

1. each word in M starts and ends with symbol b,
2. each word in M contains just one occurance of symbol c anywhere in the word,
3. no word in M contains synmbol a on an odd position (positions are indexed from 1).

Example 16

Create an automaton that searches for words described by regular expression R over alphabet A.

- $A = \{a, b, c\}$
- $R = c * (ac + bb)*$

Example 17

Create an automaton that searches for words described by regular expression R over alphabet A.

- $A = \{0, 1\}$
- $R = 0 * (101 + 11) * 0$

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Example 18

We are given two languages L_1 and L_2 over alphabet $\{0, 1\}$. Words of L_1 are described by expression $0*1*0*1*0*$, words of L_2 are described by expression $(01|10)*$.

1. Find the shortest non-empty word of intersection $L_1 \cap L_2$,
2. Find the longest word of intersection $L_1 \cap L_2$,
3. Find the shortest non-empty word that belongs to L_1 but it is not contained in L_2,
4. Find the shortest non-empty word that belongs to L_2 but it is not contained in L_1,
5. Find the shortest non-empty word of union $L_1 \cup L_2$.

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Example 19

Find all word occurances in text T having Hamming distance at most k from pattern P. Use the method of dynamic programming.

- $T = aacacacbaabbbcbbcacc$
- $P = abbcba$
- $k = 2$

Example 20

Find all word occurances in text T having Hamming distance at most k from pattern P. Use the method of dynamic programming.

- $T = 000111011000101010111110$
- $P = 110010$
- $k = 3$

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Example 21

Find all words over alphabet $\{a, b, c\}$ having Levenshtein distance k from pattern $P = aba$.

- 1
- 2

Example 23

Find all word occurances in text T having Levenshtein distance at most k from pattern P.

- $T = aacacacbaabbbcbbcacc$
- $P = abbcba$
- $k = 2$

Example 24

Find all word occurances in text T having Levenshtein distance at most k from pattern P.

- $T = 010011101000010101011100$
- $P = 11100$
- $k = 2$

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Example 25

Create a DFA over alphabet A that accepts just words from set M over this alphabet.

- $A = \{a, b, c\}$
- $M = \{a, b, ba, bc, aaa, bab, ccc, abbc, abcc\}$

Example 26

Create a DFA over alphabet A that accepts just words from set M over this alphabet.

- $A = \{0, 1\}$
- $M = \{10, 11, 101, 111, 1011, 1101, 10001, 10011, 10111, 11101, 11111\}$

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Example 27

Create a table of a simulation for a searching automata using the method of bitwise paralelism in text T having Hamming distance k from pattern P.

- $T = abcbcaaccbbaa$
- $P = bbac$
- $k = 2$

Example 28

Create a table of a simulation for a searching automata using the method of bitwise paralelism in text T having Hamming distance k from pattern P.

- $T = accbbaaabcba$
- $P = acbb$
- $k = 2$

References I