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Homework 13.42

CISP440

Source Code

```
1 #include <iostream>
2 #include <fstream>
3 #include <cstring>
4
5 #define STATES 40
6
7 char nextState[STATES][2]; // = {{1, 0},{1, 2},{3, 0},{1, 4},{3, 0},};
8 unsigned char state = 0;
9 int count = 0;
10 char instr[80];
11
12 void print_StateTable()
13 {
14     printf (".....a.....b\n\n");
15
16     int l = strlen(instr) + 1;
17     for(int s = 0; s < l; s++) {
18         printf ("%5i", s);
19         for(int ch = 0; ch < 2; ch++)
20             printf ("%5i", (int)nextState[s][ch]);
21         printf ("\n");
22     }
23 }
24
25 int strncmp_olap(char * str1, char * str2, int n)
26 {
27     // Compares first n characters of str1,
28     // with last n characters of str2.
29     // Returns 0 (false) if they match
30     int i, j;
31     //int l1 = strlen(str1);
32     int l2 = strlen(str2);
33
34     for(i = 0, j = l2 - n; i < n ; i++, j++)
35         if(str1[i] != str2[j])
36             return true;
37
38     return false;
39 }
40
41 void strclean (char str[], int size)
42 {
43     for (int i = 0; i < size; ++i)
44         str[i] = '\0';
45 }
46
47 void generate_StateTable(void)
48 {
49     char got[80];
50     strclean (got, 80);
51     int max_olap = 0;
```

```

52     printf("Generating state table for %s...\n", instr);
53     for (char c = 'a'; c <= 'b'; ++c) {
54         for (unsigned s = 0; s < (strlen (instr) + 1); ++s) {
55             strcpy (got, instr);
56             got[s + 1] = '\0';
57             got[s] = c;
58             max_olap = 0;
59             for (size_t x = 1; x <= strlen(instr) && x <= strlen(got); ++x)
60                 if (!strncmp_olap (instr, got, x))
61                     max_olap = x;
62             printf ("State: %i --- Input: %c --- Next State: %i\n", s, c, max_olap);
63             nextState[s][c - 97] = max_olap;
64             strclean(got, 80);
65         }
66     }
67 }
68
69 void process(char ch)
70 {
71     // move to next state
72     state = nextState[state][ch - 'a'];
73
74     // output count if we are in the accept state
75     if(state == strlen(instr))
76         printf("%i\n", (count + 2)); // +2 for notepad
77
78     count++; //another ch bites the dust!
79 }
80
81 void clean_and_run (char str[])
82 {
83     char ch;
84     for (int i = 0; i < STATES; ++i)
85         for (int j = 0; j < 2; ++j)
86             nextState[i][j] = 0;
87     count = 0;
88     strcpy (instr, str);
89     state = 0;
90     generate_StateTable();
91     print_StateTable();
92     std::ifstream in("./monkeydata.txt");
93     if(!in){
94         printf ("Error opening file\n");
95     }
96     printf ("The search string was found in the following locations:");
97     while(in){
98         in.get(ch);
99         if(in)
100             process(ch);
101     }
102     printf ("\n");
103     in.close();
104 }
105

```

```

106 int main()
107 {
108     char inputs[5][80] =
109     {
110         "abbbbbbaaaaaba",
111         "abbbbaabbbbbaaa",
112         "aaaaaaabaaaaaaaa",
113         "aabbbababaaababbaaaa",
114         "aaaabababaaaaabbaaaa"
115     };
116
117     for (int i = 0; i < 5; ++i)
118         clean_and_run (inputs[i]);
119 }

```

Output for *abab*

```

1  Generating state table for abab...
2  State: 0  -  Input: a  -  Next State: 1
3  State: 1  -  Input: a  -  Next State: 1
4  State: 2  -  Input: a  -  Next State: 3
5  State: 3  -  Input: a  -  Next State: 1
6  State: 4  -  Input: a  -  Next State: 3
7  State: 0  -  Input: b  -  Next State: 0
8  State: 1  -  Input: b  -  Next State: 2
9  State: 2  -  Input: b  -  Next State: 0
10 State: 3  -  Input: b  -  Next State: 4
11 State: 4  -  Input: b  -  Next State: 0
12 s a b
13
14 0 1 0
15 1 1 2
16 2 3 0
17 3 1 4
18 4 3 0
19 The search string was found in the following locations: 10 18 20 22 42 44 57

```

Output for longer strings on monkeydata.txt

```

1  Generating state table for abbbbbbaaaaaba...
2  State: 0  -  Input: a  -  Next State: 1
3  State: 1  -  Input: a  -  Next State: 1
4  State: 2  -  Input: a  -  Next State: 1
5  State: 3  -  Input: a  -  Next State: 1
6  State: 4  -  Input: a  -  Next State: 1
7  State: 5  -  Input: a  -  Next State: 1
8  State: 6  -  Input: a  -  Next State: 1
9  State: 7  -  Input: a  -  Next State: 8
10 State: 8  -  Input: a  -  Next State: 9
11 State: 9  -  Input: a  -  Next State: 10
12 State: 10 -  Input: a  -  Next State: 11
13 State: 11 -  Input: a  -  Next State: 12

```

```

14 State: 12 - Input: a - Next State: 1
15 State: 13 - Input: a - Next State: 14
16 State: 14 - Input: a - Next State: 1
17 State: 0 - Input: b - Next State: 0
18 State: 1 - Input: b - Next State: 2
19 State: 2 - Input: b - Next State: 3
20 State: 3 - Input: b - Next State: 4
21 State: 4 - Input: b - Next State: 5
22 State: 5 - Input: b - Next State: 6
23 State: 6 - Input: b - Next State: 7
24 State: 7 - Input: b - Next State: 0
25 State: 8 - Input: b - Next State: 2
26 State: 9 - Input: b - Next State: 2
27 State: 10 - Input: b - Next State: 2
28 State: 11 - Input: b - Next State: 2
29 State: 12 - Input: b - Next State: 13
30 State: 13 - Input: b - Next State: 3
31 State: 14 - Input: b - Next State: 2

```

```

32      s      a      b

```

```

33
34      0      1      0
35      1      1      2
36      2      1      3
37      3      1      4
38      4      1      5
39      5      1      6
40      6      1      7
41      7      8      0
42      8      9      2
43      9     10      2
44     10     11      2
45     11     12      2
46     12      1     13
47     13     14      3
48     14      1      2

```

```

49 The search string was found in the following locations: 5077 53880 57482 61285
    66494 80262 119794 169265 242783 259711 269479 271361 283906 294517
    313362 396414 397377 451759 474456 483354 486143 492499 517816 518153
    529233 603810 607742 610225 660560 681593 691197 697109 715967 729454
    744731 745794 762426 769510 773623 785018 808429 832841 866329 878156
    886661 895209 907118 920754 934252 937950 955080 969094 982463 985894
    987694

```

```

50 Generating state table for abbbbaabbbbbaaa...

```

```

51 State: 0 - Input: a - Next State: 1
52 State: 1 - Input: a - Next State: 1
53 State: 2 - Input: a - Next State: 1
54 State: 3 - Input: a - Next State: 1
55 State: 4 - Input: a - Next State: 1
56 State: 5 - Input: a - Next State: 6
57 State: 6 - Input: a - Next State: 7
58 State: 7 - Input: a - Next State: 1
59 State: 8 - Input: a - Next State: 1
60 State: 9 - Input: a - Next State: 1
61 State: 10 - Input: a - Next State: 1

```

```

62 State: 11 - Input: a - Next State: 12
63 State: 12 - Input: a - Next State: 13
64 State: 13 - Input: a - Next State: 14
65 State: 14 - Input: a - Next State: 1
66 State: 0 - Input: b - Next State: 0
67 State: 1 - Input: b - Next State: 2
68 State: 2 - Input: b - Next State: 3
69 State: 3 - Input: b - Next State: 4
70 State: 4 - Input: b - Next State: 5
71 State: 5 - Input: b - Next State: 0
72 State: 6 - Input: b - Next State: 2
73 State: 7 - Input: b - Next State: 8
74 State: 8 - Input: b - Next State: 9
75 State: 9 - Input: b - Next State: 10
76 State: 10 - Input: b - Next State: 11
77 State: 11 - Input: b - Next State: 0
78 State: 12 - Input: b - Next State: 2
79 State: 13 - Input: b - Next State: 8
80 State: 14 - Input: b - Next State: 2
81     s     a     b
82
83     0     1     0
84     1     1     2
85     2     1     3
86     3     1     4
87     4     1     5
88     5     6     0
89     6     7     2
90     7     1     8
91     8     1     9
92     9     1    10
93    10     1    11
94    11    12     0
95    12    13     2
96    13    14     8
97    14     1     2
98 The search string was found in the following locations: 3692 45918 64066 65730
    68524 102266 114614 118318 136108 140600 154295 201246 214378 216635
    234324 236956 240713 300866 310298 326261 336370 430809 451785 464929
    492593 524330 558423 576431 591517 599976 606468 640610 660601 690676
    693867 696466 713356 718577 731507 741857 743229 752968 793695 802751
    821602 840639 843170 853711 863020 866081 878779 885092 889436 900534
    923351 954342 955282 965049 967668 977052 995191
99 Generating state table for aaaaaaabaaaaaaa...
100 State: 0 - Input: a - Next State: 1
101 State: 1 - Input: a - Next State: 2
102 State: 2 - Input: a - Next State: 3
103 State: 3 - Input: a - Next State: 4
104 State: 4 - Input: a - Next State: 5
105 State: 5 - Input: a - Next State: 6
106 State: 6 - Input: a - Next State: 7
107 State: 7 - Input: a - Next State: 7
108 State: 8 - Input: a - Next State: 9
109 State: 9 - Input: a - Next State: 10

```

```

110 State: 10 - Input: a - Next State: 11
111 State: 11 - Input: a - Next State: 12
112 State: 12 - Input: a - Next State: 13
113 State: 13 - Input: a - Next State: 14
114 State: 14 - Input: a - Next State: 15
115 State: 15 - Input: a - Next State: 7
116 State: 0 - Input: b - Next State: 0
117 State: 1 - Input: b - Next State: 0
118 State: 2 - Input: b - Next State: 0
119 State: 3 - Input: b - Next State: 0
120 State: 4 - Input: b - Next State: 0
121 State: 5 - Input: b - Next State: 0
122 State: 6 - Input: b - Next State: 0
123 State: 7 - Input: b - Next State: 8
124 State: 8 - Input: b - Next State: 0
125 State: 9 - Input: b - Next State: 0
126 State: 10 - Input: b - Next State: 0
127 State: 11 - Input: b - Next State: 0
128 State: 12 - Input: b - Next State: 0
129 State: 13 - Input: b - Next State: 0
130 State: 14 - Input: b - Next State: 0
131 State: 15 - Input: b - Next State: 8

```

```

132      s      a      b

```

```

133
134      0      1      0
135      1      2      0
136      2      3      0
137      3      4      0
138      4      5      0
139      5      6      0
140      6      7      0
141      7      7      8
142      8      9      0
143      9     10      0
144     10     11      0
145     11     12      0
146     12     13      0
147     13     14      0
148     14     15      0
149     15      7      8

```

```

150 The search string was found in the following locations: 9056 10857 99115
      112437 117500 142126 147356 232769 305324 379599 380854 401160 405362
      419031 437357 467445 493911 496837 499375 578092 621662 739214 756885
      802906 817966 878708 897099 907729 972969

```

```

151 Generating state table for aabbbababaaababbbaaaa...

```

```

152 State: 0 - Input: a - Next State: 1
153 State: 1 - Input: a - Next State: 2
154 State: 2 - Input: a - Next State: 2
155 State: 3 - Input: a - Next State: 1
156 State: 4 - Input: a - Next State: 1
157 State: 5 - Input: a - Next State: 6
158 State: 6 - Input: a - Next State: 2
159 State: 7 - Input: a - Next State: 8
160 State: 8 - Input: a - Next State: 2

```

```

161 State: 9  - Input: a  - Next State: 10
162 State: 10 - Input: a  - Next State: 11
163 State: 11 - Input: a  - Next State: 12
164 State: 12 - Input: a  - Next State: 2
165 State: 13 - Input: a  - Next State: 14
166 State: 14 - Input: a  - Next State: 2
167 State: 15 - Input: a  - Next State: 1
168 State: 16 - Input: a  - Next State: 17
169 State: 17 - Input: a  - Next State: 18
170 State: 18 - Input: a  - Next State: 19
171 State: 19 - Input: a  - Next State: 20
172 State: 20 - Input: a  - Next State: 2
173 State: 0  - Input: b  - Next State: 0
174 State: 1  - Input: b  - Next State: 0
175 State: 2  - Input: b  - Next State: 3
176 State: 3  - Input: b  - Next State: 4
177 State: 4  - Input: b  - Next State: 5
178 State: 5  - Input: b  - Next State: 0
179 State: 6  - Input: b  - Next State: 7
180 State: 7  - Input: b  - Next State: 0
181 State: 8  - Input: b  - Next State: 9
182 State: 9  - Input: b  - Next State: 0
183 State: 10 - Input: b  - Next State: 0
184 State: 11 - Input: b  - Next State: 3
185 State: 12 - Input: b  - Next State: 13
186 State: 13 - Input: b  - Next State: 4
187 State: 14 - Input: b  - Next State: 15
188 State: 15 - Input: b  - Next State: 16
189 State: 16 - Input: b  - Next State: 0
190 State: 17 - Input: b  - Next State: 0
191 State: 18 - Input: b  - Next State: 3
192 State: 19 - Input: b  - Next State: 3
193 State: 20 - Input: b  - Next State: 3
194      s      a      b
195
196      0      1      0
197      1      2      0
198      2      2      3
199      3      1      4
200      4      1      5
201      5      6      0
202      6      2      7
203      7      8      0
204      8      2      9
205      9     10      0
206     10     11      0
207     11     12      3
208     12      2     13
209     13     14      4
210     14      2     15
211     15      1     16
212     16     17      0
213     17     18      0
214     18     19      3

```



```

215      19    20    3
216      20    2    3
217 The search string was found in the following locations: 184444 291637
218 Generating state table for aaaabababaaaaabbbaaa...
219 State: 0 - Input: a - Next State: 1
220 State: 1 - Input: a - Next State: 2
221 State: 2 - Input: a - Next State: 3
222 State: 3 - Input: a - Next State: 4
223 State: 4 - Input: a - Next State: 4
224 State: 5 - Input: a - Next State: 6
225 State: 6 - Input: a - Next State: 2
226 State: 7 - Input: a - Next State: 8
227 State: 8 - Input: a - Next State: 2
228 State: 9 - Input: a - Next State: 10
229 State: 10 - Input: a - Next State: 11
230 State: 11 - Input: a - Next State: 12
231 State: 12 - Input: a - Next State: 13
232 State: 13 - Input: a - Next State: 14
233 State: 14 - Input: a - Next State: 4
234 State: 15 - Input: a - Next State: 6
235 State: 16 - Input: a - Next State: 17
236 State: 17 - Input: a - Next State: 18
237 State: 18 - Input: a - Next State: 19
238 State: 19 - Input: a - Next State: 20
239 State: 20 - Input: a - Next State: 4
240 State: 0 - Input: b - Next State: 0
241 State: 1 - Input: b - Next State: 0
242 State: 2 - Input: b - Next State: 0
243 State: 3 - Input: b - Next State: 0
244 State: 4 - Input: b - Next State: 5
245 State: 5 - Input: b - Next State: 0
246 State: 6 - Input: b - Next State: 7
247 State: 7 - Input: b - Next State: 0
248 State: 8 - Input: b - Next State: 9
249 State: 9 - Input: b - Next State: 0
250 State: 10 - Input: b - Next State: 0
251 State: 11 - Input: b - Next State: 0
252 State: 12 - Input: b - Next State: 0
253 State: 13 - Input: b - Next State: 5
254 State: 14 - Input: b - Next State: 15
255 State: 15 - Input: b - Next State: 16
256 State: 16 - Input: b - Next State: 0
257 State: 17 - Input: b - Next State: 0
258 State: 18 - Input: b - Next State: 0
259 State: 19 - Input: b - Next State: 0
260 State: 20 - Input: b - Next State: 5
261      s      a      b
262
263      0      1      0
264      1      2      0
265      2      3      0
266      3      4      0
267      4      4      5
268      5      6      0

```

| | | | |
|-----|----|----|----|
| 269 | 6 | 2 | 7 |
| 270 | 7 | 8 | 0 |
| 271 | 8 | 2 | 9 |
| 272 | 9 | 10 | 0 |
| 273 | 10 | 11 | 0 |
| 274 | 11 | 12 | 0 |
| 275 | 12 | 13 | 0 |
| 276 | 13 | 14 | 5 |
| 277 | 14 | 4 | 15 |
| 278 | 15 | 6 | 16 |
| 279 | 16 | 17 | 0 |
| 280 | 17 | 18 | 0 |
| 281 | 18 | 19 | 0 |
| 282 | 19 | 20 | 0 |
| 283 | 20 | 4 | 5 |

284 The search string was found in the following locations: 250176 729136