OS Decoration Project2 Report

Yuhao Quan, 522031910395

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1 BurgerBuddies

1.1 algorithm

Algorithm 1: BurgerBuddies Algorithm
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1 Semaphore chef_order ← 0 ;
2 Semaphore rack_is_full ← 0;
3 Semaphore rack_is_empty ← 0;
4 Semaphore customer_ready ← 0;
5 Semaphore cashier_ready ← 0;
6 Semaphore exit_mutex ← 0;
7 Integer shared_cnt ← 0;

8 **Function** *Chef Function*:
9   **while** *True* **do**
10   wait chef_order;
11   wait rack_is_full;
12   signal chef_order;
      `// Chef is making a burger.`
13   signal rack_is_empty;
14   **end**
15 **return**

16 **Function** *Cashier Function*:
17   **while** *True* **do**
18   wait customer_ready;
      `// Cashier is taking an order.`
19   wait rack_is_empty;
      `// Cashier is giving a burger.`
20   signal rack_is_full;
21   signal cashier_ready;
22   **end**
23 **return**

24 **Function** *Customer Function*:
   `// Customer comes`
25   signal customer_ready;
26   wait cashier_ready;
   `// Customer gets a burger`
27   wait exit_mutex;
28   shared_cnt ← shared_cnt+1;
29   **if** *shared_cnt = customers number* **then**
      `// Exit the program.`
30   **end**
31   signal exit_mutex;
32 **return**

1.2 result

1   Output:
2 Chef 0 is making a burger
3 Customer 0 comes
4 Customer 2 comes
5 Customer 4 comes
6 Customer 5 comes
7 Chef 2 is making a burger
8 Customer 1 comes
9 Chef 1 is making a burger
10 Cashier 0 is taking an order
11 Customer 3 comes
12 Customer 6 comes
13 Cashier 1 is taking an order
14 Customer 7 comes
15 Chef 0 is making a burger
16 Cashier 0 is giving a burger
17 Cashier 1 is giving a burger
18 Cashier 0 is taking an order
19 Customer 2 gets a burger
20 Chef 2 is making a burger
21 Cashier 1 is taking an order
22 Customer 0 gets a burger
23 Chef 1 is making a burger
24 Cashier 0 is giving a burger
25 Cashier 1 is giving a burger
26 Cashier 0 is taking an order
27 Customer 1 gets a burger
28 Chef 0 is making a burger
29 Cashier 1 is taking an order
30 Customer 5 gets a burger
31 Chef 2 is making a burger
32 Cashier 0 is giving a burger
33 Cashier 1 is giving a burger
34 Cashier 0 is taking an order
35 Cashier 1 is taking an order
36 Chef 1 is making a burger
37 Customer 4 gets a burger
38 Chef 0 is making a burger
39 Customer 3 gets a burger
40 Cashier 0 is giving a burger
41 Cashier 1 is giving a burger
42 Customer 7 gets a burger
43 Chef 1 is making a burger
44 Chef 2 is making a burger
45 Customer 6 gets a burger
46

1.3 error detection

If fewer than four parameters are passed, the remaining missing parameters will be filled in with default values in order. Similarly, if too many or too few parameters are passed, an error will be reported.

```c
if (argc == 5) {
    chefs_num = atoi(argv[1]);
    max_burgers = atoi(argv[2]);
    cashier_num = atoi(argv[3]);
    customers_num = atoi(argv[4]);
}
if (argc == 4) {
    chefs_num = atoi(argv[1]);
    max_burgers = atoi(argv[2]);
    cashier_num = atoi(argv[3]);
}
if (argc == 3) {
    chefs_num = atoi(argv[1]);
    max_burgers = atoi(argv[2]);
}
if (argc == 2) {
    chefs_num = atoi(argv[1]);
}

if (chefs_num < 1 || chefs_num > 20 || max_burgers < 1 || max_burgers > 20 ||
    cashier_num < 1 || cashier_num > 20 || customers_num < 1 || customers_num
    > 20) {
    printf("Invalid input\n");
    return 0;
}
```

2   SantaClaus

2.1   algorithm

Algorithm 2: SantaClaus Algorithm

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1 Semaphore santa ← 0;
2 Semaphore reindeer ← 0;
3 Semaphore elf ← 0;
4 Semaphore reindeer_full ← 1;
5 Semaphore elf_full ← 1;
6 Semaphore santa_mutex ← 1;
7 Semaphore reindeer_mutex ← 1;
8 Semaphore elf_mutex ← 1;
9 Integer reindeer_count ← 0;
10 Integer elf_count ← 0;

11 **Function** *SantaClaus Function***:**
12   Integer cnt ← 0 ;
13   **while** *cnt < 30* **do**
14   wait santa;
15   **if** *reindeer_count = 9* **then**
                    // PrepareSleigh.
16   signal reindeer;
17   **end**
18   **if** *elf_count = 3* **then**
                    // HelpElves.
19   signal elf;
20   **end**
21   signal santa_mutex;
22   cnt ← cnt+1;
23   **end**
24   Terminate the program;
25 **return**

```
 1  Function Reindeer Function:
 2  │   while True do
    │   │   // Reindeer is back
 3  │   │   wait reindeer_mutex;
 4  │   │   wait reindeer_full;
 5  │   │   signal reindeer_full;
    │   │   // Reindeer is waiting for Santa Claus
 6  │   │   reindeer_count ← reindeer_count+1;
 7  │   │   if reindeer_count = 9 then
 8  │   │   │   wait reindeer_full;
 9  │   │   │   wait santa_mutex;
10  │   │   │   signal santa;
11  │   │   end
12  │   │   signal reindeer_mutex;

13  │   │   wait reindeer;
14  │   │   reindeer_count ← reindeer_count-1;
    │   │   // GetHitched
15  │   │   if reindeer_count = 0 then
16  │   │   │   signal reindeer_full;
17  │   │   else
18  │   │   │   signal reindeer;
19  │   │   end
20  │   end
21  return
22  Function Customer Function:
23  │   while True do
    │   │   // Elf needs help.
24  │   │   wait elf_mutex;
25  │   │   wait elf_full;
26  │   │   signal elf_full;
    │   │   // Elf is waiting for help.
27  │   │   elf_count ← elf_count+1;
28  │   │   if elf_count = 3 then
29  │   │   │   wait elf_full;
30  │   │   │   wait santa_mutex;
31  │   │   │   signal santa;
32  │   │   end
33  │   │   signal elf_mutex;
34  │   │   wait elf;
35  │   │   elf_count ← elf_count-1;
    │   │   // GetHelp.
36  │   │   if elf_count = 0 then
37  │   │   │   signal elf_full;
38  │   │   else
39  │   │   │   signal elf;
40  │   │   end
41  │   end
42  return
```

2.2   result

4

53 Elf 3 is waiting for help
54 Elf 7 needs help
55 Elf 7 is waiting for help
56 Reindeer 1 is back
57 Reindeer 1 is waiting for Santa Claus
58 Reindeer 6 is back
59 Reindeer 6 is waiting for Santa Claus
60 Elf 0 needs help
61 Elf 0 is waiting for help
62 Santa Claus is helping elves
63 Elf 6 needs help
64 Elf 8 needs help
65 Reindeer 3 is back
66 Reindeer 3 is waiting for Santa Claus
67 Elf 1 needs help
68 Reindeer 7 is back
69 Reindeer 7 is waiting for Santa Claus
70 Elf 2 needs help
71 Elf 3 is getting help
72 Elf 9 needs help
73 Reindeer 0 is back
74 Reindeer 0 is waiting for Santa Claus
75 Reindeer 4 is back
76 Reindeer 4 is waiting for Santa Claus
77 Elf 5 needs help
78 Reindeer 8 is back
79 Reindeer 8 is waiting for Santa Claus
80 Elf 4 needs help
81 Santa Claus is preparing sleigh
82 Elf 7 is getting help
83 Reindeer 2 is getting hitched
84 Elf 3 needs help
85 Reindeer 5 is getting hitched
86 Elf 0 is getting help
87 Reindeer 1 is getting hitched
88 Elf 7 needs help
89 Reindeer 2 is back
90 Elf 6 is waiting for help
91 Elf 8 is waiting for help
92 Elf 1 is waiting for help
93 Santa Claus is helping elves
94 Elf 0 needs help
95 Reindeer 5 is back
96 Reindeer 6 is getting hitched
97 Elf 6 is getting help
98 Reindeer 3 is getting hitched
99 Elf 8 is getting help
100 Reindeer 1 is back
101 Reindeer 6 is back
102 Reindeer 7 is getting hitched
103 Elf 6 needs help
104 Elf 1 is getting help
105 Reindeer 3 is back
106 Elf 8 needs help
107 Reindeer 0 is getting hitched
108 Elf 2 is waiting for help

109 Elf 9 is waiting for help
110 Reindeer 4 is getting hitched
111 Elf 5 is waiting for help
112 Santa Claus is helping elves
113 Reindeer 7 is back
114 Elf 2 is getting help
115 Reindeer 8 is getting hitched
116 Elf 1 needs help
117 Reindeer 0 is back
118 Elf 9 is getting help
119 Reindeer 2 is waiting for Santa Claus
120 Reindeer 5 is waiting for Santa Claus
121 Reindeer 1 is waiting for Santa Claus
122 Reindeer 6 is waiting for Santa Claus
123 Reindeer 3 is waiting for Santa Claus
124 Reindeer 7 is waiting for Santa Claus
125 Reindeer 0 is waiting for Santa Claus
126 Reindeer 8 is back
127 Reindeer 8 is waiting for Santa Claus
128 Reindeer 4 is back
129 Reindeer 4 is waiting for Santa Claus
130 Santa Claus is preparing sleigh
131 Elf 5 is getting help
132 Reindeer 2 is getting hitched
133 Elf 2 needs help
134 Elf 9 needs help
135 Elf 4 is waiting for help
136 Elf 3 is waiting for help
137 Elf 7 is waiting for help
138 Santa Claus is helping elves
139 Elf 4 is getting help
140 Reindeer 5 is getting hitched
141 Elf 3 is getting help
142 Elf 5 needs help
143 Reindeer 2 is back
144 Reindeer 1 is getting hitched
145 Elf 4 needs help
146 Elf 7 is getting help
147 Reindeer 5 is back
148 Elf 0 is waiting for help
149 Elf 6 is waiting for help
150 Elf 8 is waiting for help
151 Santa Claus is helping elves
152 Reindeer 6 is getting hitched
153 Elf 7 needs help
154 Elf 0 is getting help
155 Elf 3 needs help
156 Reindeer 1 is back
157 Elf 6 is getting help
158 Reindeer 3 is getting hitched
159 Elf 8 is getting help
160 Elf 0 needs help
161 Elf 6 needs help
162 Reindeer 7 is getting hitched
163 Reindeer 6 is back
164 Reindeer 3 is back

165 Elf 1 is waiting for help
166 Elf 2 is waiting for help
167 Elf 9 is waiting for help
168 Santa Claus is helping elves
169 Elf 1 is getting help
170 Reindeer 0 is getting hitched
171 Reindeer 7 is back
172 Elf 8 needs help
173 Elf 2 is getting help
174 Reindeer 8 is getting hitched
175 Reindeer 0 is back
176 Elf 1 needs help
177 Elf 9 is getting help
178 Reindeer 4 is getting hitched
179 Elf 5 is waiting for help
180 Elf 4 is waiting for help
181 Elf 7 is waiting for help
182 Santa Claus is helping elves
183 Elf 5 is getting help
184 Reindeer 8 is back
185 Elf 2 needs help
186 Reindeer 2 is waiting for Santa Claus
187 Reindeer 5 is waiting for Santa Claus
188 Reindeer 1 is waiting for Santa Claus
189 Reindeer 6 is waiting for Santa Claus
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206 Elf 6 is waiting for help
207 Santa Claus is helping elves
208 Reindeer 2 is back
209 Elf 3 is getting help
210 Elf 0 is getting help
211 Elf 3 needs help
212 Reindeer 1 is getting hitched
213 Elf 7 needs help
214 Reindeer 5 is back
215 Reindeer 6 is getting hitched
216 Elf 6 is getting help
217 Reindeer 1 is back
218 Elf 0 needs help
219 Reindeer 3 is getting hitched
220 Elf 8 is waiting for help

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224 Elf 8 is getting help
225 Reindeer 6 is back
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227 Elf 6 needs help
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230 Reindeer 0 is getting hitched
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249 Reindeer 5 is waiting for Santa Claus
250 Reindeer 1 is waiting for Santa Claus
251 Reindeer 6 is waiting for Santa Claus
252 Reindeer 3 is waiting for Santa Claus
253 Reindeer 7 is waiting for Santa Claus
254 Reindeer 0 is waiting for Santa Claus
255 Reindeer 8 is waiting for Santa Claus
256 Elf 3 is waiting for help
257 Elf 7 is waiting for help
258 Elf 0 is waiting for help
259 Santa Claus is helping elves
260 Elf 5 needs help
261 Elf 3 is getting help
262 Reindeer 4 is back
263 Reindeer 4 is waiting for Santa Claus
264 Santa Claus is preparing sleigh
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267 Elf 7 is getting help
268 Reindeer 5 is getting hitched
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270 Reindeer 2 is back
271 Reindeer 1 is getting hitched
272 Elf 0 is getting help
273 Reindeer 6 is getting hitched
274 Reindeer 5 is back
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276 Elf 6 is waiting for help

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