

Lab8 Report

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Q1

Code:

```
1 /*dad_mem_mutex.c*/
2 #include <stdio.h>
3 #include <stdlib.h>
4 #include <string.h>
5 #include <fcntl.h>
6 #include <time.h>
7 #include <sys/stat.h>
8
9 pthread_mutex_t mutex;
10
11 void *mom(){
12     int fd;
13     printf("Mom comes home.\n");
14     sleep(rand()%2+1);
15     printf("Mom checks the fridge.\n");
16     fd=open("fridge", O_CREAT|O_RDWR|O_APPEND, 0777);
17     pthread_mutex_lock(&mutex);
18     if(lseek(fd,0,SEEK_END)==0){
19         printf("Mom goes to buy milk...\n");
20         //sleep(rand()%2+1);
21
22         printf("Mom comes back.\n");
23         if(lseek(fd,0,SEEK_END)>0)
24             printf("What a waste of food! The fridge can not hold so much milk!\n");
25         else{
26             write(fd,"milk",4);
27             printf("Mom puts milk in fridge and leaves.\n");
28         }
29     }
30     else{
31         printf("Mom closes the fridge and leaves.\n");
32     }
33     pthread_mutex_unlock(&mutex);
34     close(fd);
35 }
36
```

```

36
37 void *dad(){
38     int fd;
39     printf("Dad comes home.\n");
40     sleep(rand()%2+1);
41     printf("Dad checks the fridge.\n");
42     fd=open("fridge", O_CREAT|O_RDWR|O_APPEND, 0777);
43     pthread_mutex_lock(&mutex);
44     if(lseek(fd,0,SEEK_END)==0){
45         printf("Dad goes to buy milk...\n");
46
47         //sleep(rand()%2+1);
48         printf("Dad comes back.\n");
49         if(lseek(fd,0,SEEK_END)>0)
50             printf("What a waste of food! The fridge can not hold so much milk!\n");
51         else{
52             write(fd,"milk",4);
53             printf("Dad puts milk in fridge and leaves.\n");
54         }
55
56     } else{
57         printf("Dad closes the fridge and leaves.\n");
58     }
59     pthread_mutex_unlock(&mutex);
60     close(fd);
61 }

```

Result:

```

os12011702@vmos-tony:~/oslab/lab8$ ./milk
Mom comes home.
Dad comes home.
Dad checks the fridge.
Dad goes to buy milk...
Dad comes back.
Dad puts milk in fridge and leaves.
Mom checks the fridge.
Mom closes the fridge and leaves.

```

Q2

Code:

注：为了方便结果展示，mom和sister在发现冰箱空时一次只买5瓶牛奶，并且当儿子或父亲累计喝到30瓶时程序直接结束

```

1 /*dad_mem_mutex.c*/
2 #include <string.h>
3 #include <fcntl.h>
4 #include <time.h>
5 #include <sys/stat.h>
6
7 #include <pthread.h>
8 #include <unistd.h>
9 #include <stdio.h>
10 #include <stdlib.h>
11 #include <sys/types.h>
12
13 pthread_mutex_t mutex = PTHREAD_MUTEX_INITIALIZER;
14 pthread_cond_t cond = PTHREAD_COND_INITIALIZER;
15
16 int fd = 0;
17 int cond_signal = 0;
18 int milk;
19
20 int you_drink = 0;
21 int dad_drink = 0;
22
23 int check_fridge(){
24     fd=open("fridge", O_CREAT|O_RDWR|O_APPEND, 0777);
25     milk = lseek(fd,0,SEEK_END);
26     //printf("checked:%d\n", milk);
27     close(fd);
28     return milk;
29 }
30
31 void take_milk(){
32     fd = open("fridge", O_CREAT|O_RDWR|O_TRUNC , 0777);
33     close(fd);
34     fd= open("fridge", O_CREAT|O_RDWR|O_APPEND, 0777);
35     write(fd, "milk", milk-1);
36     milk--;
37     close(fd);
38 }
39
40 void buy_milk(char who[]){
41     printf("%s is going to buy milk.\n", who);
42     fd=open("fridge", O_CREAT|O_RDWR|O_APPEND, 0777);
43     write(fd, "milk", 5);
44     milk = 5;
45     close(fd);
46 }
47
48 void *mom(){
49     sleep(rand()%2+1);
50     while (1){
51         pthread_mutex_lock(&mutex);
52         while(check_fridge()>0){
53             pthread_cond_wait(&cond, &mutex); //wait for cond_signal and unlock mutex
54         } //question 2
55         buy_milk("mom");
56         pthread_mutex_unlock(&mutex);
57     }
58 }
59
60 void *sister(){
61     sleep(rand()%2+1);
62     while (1){
63         pthread_mutex_lock(&mutex);
64         while(check_fridge()>0){
65             pthread_cond_wait(&cond, &mutex); //wait for cond_signal and unlock mutex
66         } //question 2
67         buy_milk("sister");
68         pthread_mutex_unlock(&mutex);
69     }
70 }
71

```

```

72 void *you(){
73     sleep(rand()%2+1);
74     while (1){
75         pthread_mutex_lock(&mutex);
76         int num=check_fridge();
77
78         if(num > 0){
79             take_milk();
80             you_drink++;
81             printf("You takes milk for %d times\n", you_drink);
82             if(you_drink>=30){
83                 exit(0);}
84         }
85         else{
86             pthread_cond_signal(&cond);
87         }
88         pthread_mutex_unlock(&mutex);
89     }
90 }
91
92 void *dad(){
93     sleep(rand()%2+1);
94     while (1){
95         pthread_mutex_lock(&mutex);
96         int num=check_fridge();
97
98         if(num > 0){
99             take_milk();
100            dad_drink++;
101            printf("Dad takes milk for %d times\n", dad_drink);
102            if(dad_drink>=30){
103                exit(0);}
104        }
105        else{
106            pthread_cond_signal(&cond);
107        }
108        pthread_mutex_unlock(&mutex);
109    }
110 }

```

```

2 int main(int argc, char * argv[]){
3     srand(time(0));
4     pthread_t p1, p2, p3, p4;
5     int fd = open("fridge", O_CREAT|O_RDWR|O_TRUNC , 0777); //empty the fridge
6     close(fd);
7     // Create two threads (both run func)
8     pthread_create(&p1, NULL, mom, NULL);
9     pthread_create(&p2, NULL, dad, NULL);
0     pthread_create(&p3, NULL, you, NULL);
1     pthread_create(&p4, NULL, sister, NULL);
2
3
4     // Wait for the threads to end.
5     pthread_join(p1, NULL);
6     pthread_join(p2, NULL);
7     pthread_join(p3, NULL);
8     pthread_join(p4, NULL);
9
0
1 }
2

```

Result:

```
os12011702@vmos-tony:~/oslab/lab8$ ./milk2
sister is going to buy milk.
Dad takes milk for 1 times
Dad takes milk for 2 times
Dad takes milk for 3 times
Dad takes milk for 4 times
Dad takes milk for 5 times
sister is going to buy milk.
Dad takes milk for 6 times
Dad takes milk for 7 times
Dad takes milk for 8 times
Dad takes milk for 9 times
Dad takes milk for 10 times
sister is going to buy milk.
You takes milk for 1 times
You takes milk for 2 times
You takes milk for 3 times
You takes milk for 4 times
You takes milk for 5 times
sister is going to buy milk.
Dad takes milk for 11 times
Dad takes milk for 12 times
Dad takes milk for 13 times
Dad takes milk for 14 times
Dad takes milk for 15 times
mom is going to buy milk.
Dad takes milk for 16 times
Dad takes milk for 17 times
Dad takes milk for 18 times
Dad takes milk for 19 times
Dad takes milk for 20 times
sister is going to buy milk.
You takes milk for 6 times
You takes milk for 7 times
You takes milk for 8 times
You takes milk for 9 times
You takes milk for 10 times
sister is going to buy milk.
Dad takes milk for 21 times
Dad takes milk for 22 times
Dad takes milk for 23 times
```

```
Dad takes milk for 24 times
Dad takes milk for 25 times
mom is going to buy milk.
You takes milk for 11 times
You takes milk for 12 times
You takes milk for 13 times
You takes milk for 14 times
You takes milk for 15 times
sister is going to buy milk.
Dad takes milk for 26 times
Dad takes milk for 27 times
Dad takes milk for 28 times
Dad takes milk for 29 times
Dad takes milk for 30 times
os12011702@vmos-tony:~/oslab/lab8$
```