

```

1 #include "mainwindow.h"
2 #include <QString>
3 #include <iostream>
4 #include <QApplication>
5 #include <thread>
6 #include <cstdlib>
7 #include <mutex>
8 #include <chrono>
9 #include <cstdlib>
10 #include <QPushButton>
11 #include <QObject>
12 #include <random>
13 using namespace std;
14 MainWindow *w;
15 int agent=-1;
16
17 //light_there
18 int match=0;//light_match
19 int tobacco=0;//light_tobacco
20 int paper=0;//light_paper
21 int light_s1=0;//S_match
22 int light_s2=0;//S_tobacco
23 int light_s3=0;//S_paper
24 int s1=0,s2=0,s3=0;
25 int Text=0,stop=0;
26
27 mutex agent_Mutex;
28 mutex agent_Mutex1;
29 mutex agent_Mutex2;
30 mutex agent_Mutex3;
31 mutex smoker_Mutex1;
32 mutex smoker_Mutex2;
33 mutex smoker_Mutex3;
34

```

UI 控制變數

Thread 共同變數

UI 控制變數

Mutex lock

Random 隨機從三個原料中選兩個材料，共有三種可能，將隨機選中組合對應的 agent\_thread 解鎖。

```
35 void rAgent(){
36     while(1){
37         agent_Mutex.lock();
38         agent = rand()%3;
39         if(agent==0){
40             agent_Mutex1.unlock();//match,tobacco
41         }
42         else if(agent==1){
43             agent_Mutex2.unlock();//match,paper
44         }
45         else if(agent==2){
46             agent_Mutex3.unlock();//tobacco,paper
47         }
48     }
49 }
```

Agent\_thread:

提供 match & tobacco 兩種原料的 Agent，提供之後，通知三個 smokers 來領原料。

```
51 void agent_1(){
52     while(1){
53         agent_Mutex1.lock();
54         if(agent==0 && match+tobacco+paper==0){
55             match=1;
56             tobacco=1;
57             cout << endl;
58             cout << "|||||||\\n";
59             cout << "| match tobacco |\\n";
60             cout << "|||||||\\n";
61             // Sleep(2000);
62             this_thread::sleep_for(chrono::seconds(2));
63             smoker_Mutex1.unlock();
64             smoker_Mutex2.unlock();
65             smoker_Mutex3.unlock();
66         }
67     }
68 }
```

Agent\_thread:

提供 match & paper 兩種原料的 Agent，提供之後，通知三個 smokers 來領原料。

```
69 void agent_2(){
70     while(1){
71         agent_Mutex2.lock();
72         if(agent==1 && match+tobacco+paper==0){
73             match=1;
74             paper=1;
75             cout << endl;
76             cout << "|||||||\\n";
77             cout << "| match paper |\\n";
78             cout << "|||||||\\n";
79             // Sleep(2000);
80             this_thread::sleep_for(chrono::seconds(2));
81             smoker_Mutex1.unlock();
82             smoker_Mutex2.unlock();
83             smoker_Mutex3.unlock();
84         }
85     }
86 }
```

Agent\_thread:

提供 tobacco & paper 兩種原料的 Agent，提供之後，通知三個 smokers 來領原料。

```
87 void agent_3(){
88     while(1){
89         agent_Mutex3.lock();
90         if(agent==2 && match+tobacco+paper==0){
91             tobacco=1;
92             paper=1;
93             cout << endl;
94             cout << "|||||||\\n";
95             cout << "| tobacco paper |\\n";
96             cout << "|||||||\\n";
97             // Sleep(2000);
98             this_thread::sleep_for(chrono::seconds(2));
99             smoker_Mutex1.unlock();
100             smoker_Mutex2.unlock();
101             smoker_Mutex3.unlock();
102         }
103     }
104 }
```

### Smoker\_thread:

手上握有 match 的 smoker，只有當 Agent 提供另外兩種原料 tobacco、paper 時，才可以抽煙，抽完菸後，通知 Agent 發原料。

```
106 void smoke_match(){
107     while(1){
108         smoker_Mutex1.lock();
109         unsigned seed = chrono::system_clock::now().time_since_epoch().count();
110         default_random_engine generator(seed);
111         poisson_distribution<int> distribution(2.5);
112         int number = distribution(generator);
113         while(number>5||number<0){
114             number = distribution(generator);
115         }
116         this_thread::sleep_for(chrono::seconds(number));
117         if(tobacco==1 && paper==1){
118             s1=-1;
119             light_s1=1;
120
121             cout << "Hey, I'm match.\n";
122             Text=1;
123             // Sleep(2000);
124             this_thread::sleep_for(chrono::seconds(2));
125             tobacco=0;
126             paper=0;
127             cout << "goto smoke!\n";
128             Text=4;
129             // Sleep(2000);
130             this_thread::sleep_for(chrono::seconds(5));
131             cout << "Agent wake up!\n";
132             Text=5;
133             light_s1=0;
134             s1=0;
135             agent_Mutex.unlock();
136         }
137         else{
138             light_s1=-1;
139             s1=1;
140             this_thread::sleep_for(chrono::seconds(1));
141             s1=0;
142             light_s1=0;
143         }
144     }
145 }
```

### Smoker\_thread:

手上握有 tobacco 的 smoker，只有當 Agent 提供另外兩種原料 match、paper 時，才可以抽煙，抽完菸後，通知 Agent 發原料。

```
147 void smoke_tobacco(){
148     while(1){
149         smoker_Mutex2.lock();
150         unsigned seed = chrono::system_clock::now().time_since_epoch().count();
151         default_random_engine generator(seed);
152         poisson_distribution<int> distribution(2.5);
153
154         int number = distribution(generator);
155         while(number>5||number<0){
156             number = distribution(generator);
157         }
158         this_thread::sleep_for(chrono::seconds(number));
159         if(match==1 && paper==1){
160             s2=-1;
161             light_s2=1;
162
163             cout << "Hey, I'm tobacco.\n";
164             Text=2;
165             // Sleep(2000);
166             this_thread::sleep_for(chrono::seconds(2));
167             match=0;
168             paper=0;
169             cout << "goto smoke!\n";
170             Text=4;
171             // Sleep(2000);
172             this_thread::sleep_for(chrono::seconds(5));
173             cout << "Agent wake up!\n";
174             Text=5;
175             light_s2=0;
176             s2=0;
177             agent_Mutex.unlock();
178         }
179         else{
180             light_s2=-1;
181             s2=1;
182             this_thread::sleep_for(chrono::seconds(1));
183             s2=0;
184             light_s2=0;
185         }
186     }
187 }
```



### Smoker\_thread:

手上握有 paper 的 smoker，只有當 Agent 提供另外兩種原料 tobacco、match 時，才可以抽煙，抽完菸後，通知 Agent 發原料。

```
193 void smoke_paper(){
194     while(1){
195         smoker_Mutex3.lock();
196         unsigned seed = chrono::system_clock::now().time_since_epoch().count();
197         default_random_engine generator(seed);
198         poisson_distribution<int> distribution(2.5);
199
200         int number = distribution(generator);
201         while(number>5||number<0){
202             number = distribution(generator);
203         }
204         this_thread::sleep_for(chrono::seconds(number));
205         if(match==1 && tobacco==1){
206             s3=-1;
207             light_s3=1;
208
209             cout << "Hey, I'm paper.\n";
210             Text=3;
211             // Sleep(2000);
212
213             this_thread::sleep_for(chrono::seconds(2));
214             match=0;
215             tobacco=0;
216             cout << "goto smoke!\n";
217             Text=4;
218             //Sleep(2000);
219             this_thread::sleep_for(chrono::seconds(5));
220             cout << "Agent wake up!\n";
221             Text=5;
222             light_s3=0;
223             s3=0;
224             agent_Mutex.unlock();
225         }
226         else{
227             light_s3=-1;
228             s3=1;
229             this_thread::sleep_for(chrono::seconds(1));
230             s3=0;
231             light_s3=0;
232         }
233     }
234 }
```

## Main 函示

```
236 int main( int argc, char** argv){
237     QApplication a(argc, argv);
238     w=new MainWindow();
239
240     w->show();
241
242     cout << "Check\n";
243     smoker_Mutex1.lock();
244     smoker_Mutex2.lock();
245     smoker_Mutex3.lock();
246     agent_Mutex1.lock();
247     agent_Mutex2.lock();
248     agent_Mutex3.lock();
249     thread mThreadA(rAgent);
250     thread mThreadA_1(agent_1);
251     thread mThreadA_2(agent_2);
252     thread mThreadA_3(agent_3);
253     thread mThreadM(smoke_match);
254     thread mThreadT(smoke_tobacco);
255     thread mThreadP(smoke_paper);
```